

J. E. B. Bannister

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VOL. VIII.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.

By SIR CLEMENTS MARKHAM, K.C.B., F.R.S., President.*

THE great event of the year that has occurred since our last anniversary has been the coming of the International Geographical Congress to London. We gratefully acknowledge the generous assistance which came from public bodies and from patriotic individuals not otherwise connected with us; but the reception and organization of the Congress was our own work. This Society, through committees appointed by its Council, arranged all the details, it guaranteed the necessary expenditure, and two-thirds of the subscriptions came from ourselves. We have every reason to feel satisfied with the result. The total number of members of the Congress was 1552, of whom 950 were Fellows of the Royal Geographical Society. Forty different colonial and foreign governments were represented by 451 members, of whom 72 were appointed to represent thirty foreign governments, and 189 were appointed to represent seventy geographical societies and twenty other societies of kindred aims.

The work done by the Congress was of permanent value. The number of papers published in the Report is 82, some being reviews of work done, but most of them being original disquisitions. The most important papers of the former class were the admirable record of the work of the Great Trigonometrical Survey of India by our lamented colleague General Walker, and the accounts of the surveys of South Africa by Dr. Gill, the astronomer royal at Cape Town. But all branches of our science received attention, and the papers were nearly equally distributed among them, the largest number being on subjects relating to surveying and oceanography, and next coming those on the

* Delivered at the Anniversary Meeting, June 15, 1896.

physical geography of the land and on questions relating to Polar and to African exploration.

The Report of the Congress has just been published in the form of an octavo volume of 1100 pages, edited by our librarian, Dr. Mill. It includes an introduction giving an account of the origin of the International Geographical Congress, a diary of the proceedings, an account of the hospitality offered to the members, and an analysis of the membership. The body of the Report contains the papers read at the Congress, with the subsequent discussions.

My own impressions respecting the advantages to geographical science derivable from the meetings of the International Congress are very favourable, and I believe that my opinion is shared by others who have had experience of its work. Not only do these meetings afford occasions for taking stock of the advances that have been made in the various branches of our science, and of bringing forward new methods for discussion, and new projects for consideration, but they also give opportunities for the leading geographers of the world to meet together, to exchange ideas, and in many instances to form permanent friendships. Geographers of various nationalities thus become known to each other, misunderstandings are explained, points of agreement are emphasized, and personal acquaintance smooths away many difficulties, and ensures future cordial co-operation in the great work in which all geographers are interested.

Two very important measures were adopted at the last Congress which are well calculated to improve the organization and secure continuity for the labours of successive meetings. One was the arrangement by which an international committee of the forty Vice-Presidents was formed to consider various details of management, and to discuss the resolutions submitted by members before they are put to the vote at the final general meeting. The other was that the executive, including the President and Secretaries, should hold office until the meeting of the next Congress, thus giving a continuity to the work it did not previously possess. Sixteen resolutions were passed by the final general meeting, eight being simple expressions of opinion involving no farther action of the executive. But these deliberate expressions of opinion by the assembled geographers of the world may be confidently expected to carry some weight, and to influence the further discussion of the questions they deal with. The other resolutions will entail some work on the President and Secretaries of the Congress. Some of them involve the collection of information and opinions from the Geographical Societies of the World, with the duty of reporting the results to the next Congress. The subjects which are to be investigated in this way include the systematizing of geographical publications, the planning of a general bibliography of geography, the promotion of Professor Penck's idea of a map of the world on the scale of 1 : 1,000,000, the

orthography of place-names, and the feasibility of introducing a decimal division of angles and of time. It will be seen that the work undertaken for the Congress by the President and Secretaries by no means came to an end with the week of meeting, but that it will be continuous until the meeting at Berlin in 1899, when they will have to give an account of their stewardship.

One resolution of the Congress referred to the improvement of the position of geography in the education of this country. Efforts in this direction have been made by our Council for a quarter of a century. Readerships in geography at the two Universities of Oxford and Cambridge have been subsidized for ten years, and the time is now about to expire during which this help was to be given. We have not secured that full recognition of our science which is its due, and which it holds in the university courses of other countries. Still, there can be no doubt that our persevering advocacy has done good throughout the country. I hear, from time to time, of excellent geographical work being done in some of our secondary schools, notably at St. Olaves, Southwark, and at the Roan School at Greenwich; while the Society's prizes given to the nautical schools on board the *Worcester* and *Conway* have had a marked effect in improving the teaching of geography. I also have great pleasure in being able to announce that the University of Oxford has resolved to continue the geographical readership after the subsidy from our Society has been withdrawn; so that we have the satisfaction of knowing that our persevering efforts have been rewarded by a permanent advance in the right direction—so far, at least, as Oxford is concerned. I cannot doubt that, when the time is ripe, Cambridge will come to a similar resolution.

There can, however, be no hope that geography will obtain its proper place in the educational system of this country until efficient teachers have been trained, and have had time to make their influence felt in the secondary schools and in public examinations, as well as in the universities. I am informed of a very striking circumstance connected with one of our leading public schools. The fifth form was taught history, and the master illustrated his lesson with occasional geographical descriptions. One day the whole form came to him and asked to be taught geography. He could not comply, owing to the fact that geography was excluded from the curriculum, but he promised to get proper books and direct their reading. This shows that the great and urgent needs are the recognition of geography as a branch of knowledge to be included in the work of all secondary schools, and the supply of efficient teachers. It is in this direction, therefore, that our efforts should now be turned, and it is proposed that a London School of Geography should be formed, of university rank, which would, at the proper time, seek affiliation to the proposed teaching University of London. A detailed scheme, prepared by Mr. Mackinder, is now under the consideration of

our Council, and meanwhile a prospect is thus opened of gradually but surely founding a system of training and instruction through which the science, which of all others is the most important to the interests of this great empire, will receive due attention. Men will be supplied in sufficient numbers, who will have been trained to teach geography as it should be taught. It is hoped, also, that the students will not be confined to those who are about to enter the teaching profession.

It will be found that, in every calling, a man's efficiency is increased by becoming a sound geographer. The value of geography will eventually be understood and appreciated throughout the educated classes of the community; it will receive due attention in the secondary schools and in the examinations; and thus, through the machinery of the proposed School of Geography, the great aim and object of our Society will gradually but surely be secured.

I have, however, always considered the instruction of intending travellers to be the most important and the most successful part of our educational efforts. Instruction in surveying, mapping, and the fixing of positions by astronomical observations; in geology, botany, and photography, has been provided for some years. The Council has this year made the course more complete by adding three other subjects, namely, zoology, anthropological measurements, and instruction as to what and how to observe in the field, from the general geographical standpoint. Our explorers, if they can be persuaded to allow sufficient time to go through the course we offer to them, before proceeding on their expeditions, will be thoroughly qualified travellers, able to take a place in the front rank of scientific geographers, and thus to maintain and uphold the credit of their country. This has rarely been the case hitherto.

Our afternoon meetings, which were commenced last year, have been continued; and there was one of special interest, when Dr. Mill submitted a scheme for the geographical description of the British Islands, based on the Ordnance Survey. Taking the one-inch maps as a basis, his proposal is that a memoir should be prepared for each sheet, treating each subject from the geographical standpoint, and the memoirs being all on the same general plan. The great utility of such a series of memoirs will be clear to every geographer. There can be little doubt that the scheme will be appreciated by the general public; and, as Dr. Mill justly remarks, the generalization of geography, in the coming century, will find a multiplicity of applications in economic, political, and social life, which will be of the utmost national importance. There are abundant materials for such memoirs, and already there are numerous diligent workers at the various branches into which the subject will be divided, scattered over all parts of the British Isles. I think that it is the duty of a Society like ours to take the lead in a great imperial work of this kind, and a special committee of the Council is now giving

careful consideration to the plan on which it should be conducted, and to the feasibility of making a commencement.

Our labours connected with the library have been somewhat retarded by the heavy work entailed upon our staff by the recent meeting of the International Geographical Congress; still, good progress has been made. The authors catalogue was completed and published at the close of last session. The work of preparing cards and slips, with the titles of all our books, and of the articles in all the volumes of transactions and journals, for the subjects catalogue, has steadily advanced, until now upwards of 38,870 such titles have been written out. It remains to complete the classification of these cards, and the subjects catalogue will at once be available for reference in the library. Meanwhile, the copious bibliography published monthly in the *Journal* has been cut out, pasted on cards, and classified by Dr. Mill for four years, so that the subjects catalogue is actually complete for all accessions from the present month upwards to 1892. The question of printing must be postponed until the whole is collected on cards, cross-references supplied, and the entries classified. Probably two years will elapse before this is completed; but within six months the arrangement will be sufficiently advanced to make the catalogue a work of very great usefulness to all Fellows of the Society who are engaged in geographical study or research.

We are about to receive legacies under the wills of Mr. Jackson, formerly of the French Geographical Society, and of our gold medallist, Mr. Chandless, the South American explorer, who has been so good as to leave us £500. Mr. Chandless was one of the best travellers of the present century. He was the first to examine two great tributaries of the river Amazon, the Purus and the Aquiri, from their mouths to the end of navigation, and his work was not in the nature of a reconnaissance, but was an elaborate scientific survey. His loss is much to be deplored, for he would have admirably represented South America on our Council. Indeed, our losses have been exceptionally heavy during the last year. In Mr. Joseph Thomson the Society has to mourn the loss of a most enthusiastic and successful African traveller, whose highest merit was that his explorations never caused injury or death to a single native. Sir Thomas Wade, an eminent Chinese scholar, and Dr. Robert Brown, a distinguished naturalist and prolific writer, with special knowledge both of the northern regions and of Morocco, were most valuable members of our Council; and in our secretary, Mr. Seeböhm, we have lost a most obliging and warm-hearted colleague, whose great knowledge of ornithology frequently illustrated and gave additional interest to our discussions. The most irretrievable loss we have sustained is caused by the death of General Walker, whose knowledge of geodesy and of surveying in all its branches, and whose intimate acquaintance with the geography of Central Asia, rendered his services to the Society indispensable. There is, however, one way by which we can do honour

to his memory : we can advocate and promote, by every means in our power, that survey of the northern slopes of the Himalayan system of mountains which he had at heart.

It is there that the largest unexplored Asiatic area is to be found. Some years ago I amplified the comparison between the ranges of the Himalayas and the Andes which was originally instituted by Warren Hastings, after having studied the works of La Condamine. But in truth the differences in the physical aspects of the two regions are as great as the resemblances. Whereas the western cordillera of the Andes is a maritime range sloping down to the shores of the Pacific, the northern Himalayan range buttresses that lofty plateau which forms, as General Walker has pointed out, the largest protuberance on the Earth's surface. The Chang, as the Tibetan portion of this lofty region is called, was unknown twenty-five years ago, but it has since been traversed both from east to west, and from north to south, most recently by our gold medallist, Mr. St. George Littledale, who crossed the northern Kuen-Lun range and reached the plateau a year ago. In the interval between the journey of Pundit Krishna in 1872 and that of Mr. Littledale, the plateau has been traversed several times. Pundit Krishna, advancing northwards from the valley of the Tsanpu, crossed the northern range of the Himalayas and reached the plateau by the pass called Khalamba-la, 17,200 feet above the sea. He discovered and made a survey of Lake Tengri-nor, and described the grand range of mountains to the south-east of it.

It is to the desirability of completing the exploration of this mighty range, that I am anxious to turn the attention of geographers. But first it will be well to contemplate the aspects of the great plateau to which it forms a southern buttress, and to review briefly the knowledge that has been acquired of it since the journey of Pundit Krishna, which culminates with the narrative of Mr. Littledale's great achievement.

In 1874, Nain Sing reached the plateau from its eastern side. He too, in traversing the elevated plains, traced the line of snowy peaks to the south for 180 miles, and found that one of the peaks, called Targot-yap, was 25,000 feet above the sea. Coming from the west, he crossed the plateau to Lake Tengri-nor, and descended to Lhasa, after having traversed 1200 miles of previously unknown country. In 1891, Major Bower also crossed the great plateau from west to east, taking a more northern route than that of Nain Sing. It was traversed from north to south by Prince Henry of Orleans and M. Bonvalot on the east side, and by Mr. Littledale, who advanced across its centre ; while several travellers have visited the eastern side, where the great Chinese and Burmese rivers take their rise. Pundit Krishna left Lhasa in 1879, and examined this eastern boundary of the plateau, crossing the region twice, from Lhasa to Chaidan, and from Chaidan to Darchendo. Mr. Rockhill, in 1892, coming from the north, penetrated as far as the Namon pasture lands ; and Prjevalsky also advanced for some distance into the great Chang.

From the narratives of these intrepid travellers we gather information respecting the elevated Tibetan plateau, which, however, is only the eastern portion of a far more extensive mass. The Pamirs, the plateau north of the Mustagh range, and the Tibetan Chang together form a mass extending over 30 degrees of longitude, which General Walker calculated to be 1700 miles long and 300 miles broad, with an area of 500,000 square miles, and an average height of 14,000 feet. The Chang or Tibetan portion, consisting chiefly of rounded hills and intervening valleys, has no defined watershed, the rivers flowing in various directions and terminating in large salt lakes, which are from 15,000 to 17,000 feet above the sea. Not a single tree is to be seen over this vast expanse, but the rain and snowfall is heavy, and Major Bower says that nourishing grass springs up during the short summer, which maintains large numbers of yak and antelope. Nain Sing, whose route was to the south of that of Bower, found willows and tamarisks round the Thachup lake, at a height of 15,000 feet, and even a few fields of barley, and villages on the plain of Omba, 15,200 feet above the sea. To the eastward the character of the scenery changes. The rounded undulating bare hills are succeeded by well-wooded mountains, there are rapid rivers in the deeply out valleys, while the yak and antelope give place to deer and pheasants.

Although several intrepid travellers have crossed the Chang in various directions, a vast area still remains unknown, especially towards the north-west. But I think it is to the mountains which form its southern buttressing wall, and which rise from the valley of the Tsanpu or Brahmaputra, that the efforts of explorers should now be directed. The western portion of the northern Himalayan range is known as the Karakorum, separating the valley of the Indus from that of the Yarkand. Its glaciers were surveyed by Colonel Godwin Austen, and have since been visited by Sir Martin Conway. One of its peaks, appropriately named Mount Godwin Austen, attains a height of 28,000 feet; while its passes, such as Karakorum and Chang-chenmo, are the loftiest in the world. The Tibetan continuation of the Karakorum, which is still almost unknown, commences at the famous central peak or knot called Kailas by the Hindus, and Gangri by the Tibetans, which is 22,000 feet above the sea. Continuing in an easterly direction, it forms the northern watershed of the Tsanpu or Brahmaputra. It appears to be a magnificent range of mountains. Pundit Krishna reported one of its peaks to be at least 25,000 feet above the sea, and the Khalamba-la pass 17,200 feet high. The name given to it by Mr. Brian Hodgson is Nyenchhen-tangla, and the same name is referred by Pundit Krishna to one of its peaks. The only traveller who has crossed the range is Pundit Krishna, when he traversed the Khalamba-la (17,200 feet); but Mr. Littledale reached the Goring-la (19,587 feet), which is more to the east. He speaks of the magnificent range of the Ninchen-Tangla, as a succession of snow-clad peaks and glaciers, partially hidden in clouds and vapour, which added

to their size and grandeur, while above all towered, with cliffs of appalling steepness, the great peak of Charimaru, 24,153 feet high. Mr. Littledale describes this peak as one of the most impressive mountains he had ever seen, from one point of view appearing as a needle-shaped rock piercing the sky, and from another as a sharp ridge, having a peak at either end. This I believe to be the whole of the knowledge we now possess of this most interesting range of mountains. Commencing at the knot of Kailas, it forms the northern boundary of the Tsanpu valley to about the 90th meridian, and then turns north-east, so as to become the eastern boundary of the Chang, while on its eastern slopes are the headwaters of the three great rivers of Salwin, Mekong, and Yang-tsze.

The portion of this northern Himalayan chain from Kailas to the Goring-la of Littledale, a distance of 600 miles, requires to be explored. It has once been crossed by the Khalamba pass, and a second pass was reached, but not crossed by Mr. Littledale. The Pundit Nain Sing traced the line of its peaks for 180 miles from a great distance, and Mr. Littledale gazed with admiration on the beautiful outline of a snowy ridge which shot up into the sky to a height of 24,153 feet, to the east of the Goring-la—the peak of Charimaru. This is the sum of our knowledge respecting this range of lofty mountains, which is alike the northern range of the Himalayan system and the southern buttressing range of the great Chang or Tibetan plateau, as the Kuen-lun is the northern buttressing range. A more accurate knowledge of its configuration is a great geographical desideratum. Its peaks along the hundreds of miles of its extent should be measured, its passes should be explored, the nature and extent of its glaciers ascertained, as well as its geological formation, and its relation to the great interior plateau. Here, then, is a piece of work which is well calculated to arouse the ambition of future explorers. Captain Deasy, with his companion, Mr. Pike, is now starting on his contemplated journey in this direction; and I am sure that any other young explorers who resolve to undertake this achievement, will receive the cordial assistance of our Council.

Running in a north-westerly direction from the Charimaru peak, the south-eastern scarp of Tibet, with the meridional chains which branch from it, offers an equally important field of work to the explorer. Through these meridional chains, which together only have a width of 150 miles, flow three great rivers, whose courses have not yet been completely brought to our knowledge. These are the Dichu, the Chiamdochu, and the Giama or Nu-chu, which are known in their lower courses as the Yang-tsze, the Mekong, and the Salwin. In 1879 Pundit Krishna crossed the upper waters of these rivers and the intervening parallel ranges, at points where the latter were from 8000 to 12,000 feet above the sea; and they were traversed in 1892 by Major Bower. The Abbé Desgodins frequently traversed the Lu-tu-kiang river, which he believed to be the Salwin, and had a station near the banks for more than a year.

Lastly, Prince Henri d'Orleans, to whose interesting narrative we had the pleasure of listening on the 18th of last month, crossed the rivers in a daring and important journey from China to Assam, and established the correctness of Desgodin's conclusion, while ascertaining that the Irawadi rose in mountains within sight of his route, thus having a course some 600 miles shorter than those of the three rivers, Salwin, Mekong, and Yang-tsze. His Highness accounted for the volume of the Irawadi being greater than that of the Salwin by the fact that the former receives tributaries traversing a wide area, while the latter, though its course is much longer, flows through a deep ravine with ridges on either side, having a very limited drainage area.

The difficulty of travelling in this region of the rivers is very great. Prince Henry had to cross thirteen chains of mountains in two months, and there are savage tribes, such as the Mishmis, to be encountered. These are obstacles to be overcome, and give zest to an expedition. Many are the willing volunteers who would eagerly come forward to complete the discovery of the courses of these rivers, and to delineate more exactly the range where the main tributaries of the Irawadi take their rise. These are undertakings of the greatest geographical and commercial importance, and, together with the survey of the northern Himalayan chain, they should be zealously and persistently promoted and supported until the work is done. There are many unknown parts of the world, and it will be long before their exploration is completed and all is made clear to us; but few offer greater credit to the traveller, and more extension to geographical knowledge, than the solution of these Asiatic problems, to which I should add the completion of the discovery of the unknown portion of the course of the Brahmaputra.

We have had two very important communications this year relating to the geography of the African continent, one of which considerably increased our knowledge of the region between Somali-land and Lake Rudolf. Although Dr. Donaldson Smith encountered many difficulties, and was much harassed and delayed by native opposition, he succeeded in the main object of his expedition and brought back much valuable information, which was alike new and suggestive. The region from the most western point reached by Dr. Donaldson Smith to the Nile, and extending northwards to the Abyssinian province of Godjam, is very little known, and I pointed out in my opening address in 1893 that this was the most interesting portion of the African continent which remained to be explored. It includes Enarea and Kaffa, the latter district being of sufficient elevation above the level of the sea to yield good crops of coffee. The papers by Mr. Robinson and Mr. Wallace on Hausaland were of special interest owing to the excellent progress made by the Royal Niger Company, and to the valuable results that are likely to be derived from Mr. Robinson's study of the Hausa language. I am glad also to announce that Captain Vandeleur has returned from Uganda

with very interesting geographical information as the result of his travels.

There is one branch of our science which, more than any other, connects it with historical research. I allude to the effects which the operations of mankind have had on the physical geography of many regions. These effects have often been mischievous and deleterious, as, for example, where forests have been destroyed on the west coast of Spain, in Italy and Sicily, and in other parts. But they have generally been beneficial. The drainage of swamps has improved the climate and increased the productive powers of the soil. Irrigation works in dry and hot countries have had an equally beneficial effect. I make special allusion to the action of man on nature, because last year a great work was completed which will have the effect of altering the physical aspect of an extensive region. I allude to the completion of the Periyar project in the Madras Presidency.

The range of mountains extending down the peninsula of India to Cape Comorin, called the Western Ghâts, is covered with forests, and two of its peaks reach an altitude of over 8000 feet. The country on the west side is superabundantly supplied with water by the south-west monsoon; while to the eastward the tanks catch the scanty rainfall,—and often there is scarcity of water, sometimes causing famine. In the far south the river Periyar has its sources in a mountainous country, covered with dense forest, which is almost unexplored. The river flows northward between the ridges of the mountains, receiving tributaries, and seeking an outlet to the sea. At length it breaks through the rocky barriers and reaches the coast, but on the western side where water is not wanted, instead of on the east side where it is so scarce and so urgently needed.

The districts of Madura and Ramnad were dependent on their tanks being filled with rain-water for the very existence of the people; while this great volume of the priceless fluid was being wasted in the Travancore backwaters. Here, then, is an instance of the possibility of a geographical mistake being corrected by the intelligence and energy of man. More than a century ago the native minister of the Ramnad principality had proposed that an attempt should be made to cut a trench by which the Periyar should be forced to give up some of its waters to the thirsty plains of Madura. But the difficulties were very great. It would be necessary to make a tunnel through the mountain ridge which forms the water-parting, and the forest region in which the work must be carried on is frightfully unhealthy. Still, the enormous benefit to a large population was obvious, and several detailed proposals were submitted by collectors and district engineers. Many years ago I myself crossed the mountain range from Travancore to Madura, and, after going over the ground, I sent in a report urgently representing the propriety of including the Periyar project among the irrigation schemes that should be promptly undertaken.

Year after year passed away. At length the project was sanctioned, and, thanks to the ability and perseverance of Captain Pennycuik, the engineer in charge of the works, the needful dams were built, the tunnel was excavated, and last year the life-giving waters of the Periyar were turned over from the western to the eastern side of the peninsula. Lord Wenlock, the late governor of Madras, had the satisfaction of terminating the period of his rule by inaugurating this great and beneficent work, with Captain Pennycuik, who had borne the heat and burden of the day, standing by his Excellency's side to receive that praise which was his due.

I have thought it right to give a place in my address to the Periyar project on the occasion of its completion, because it is the most striking example, within my knowledge, of the power of man to alter permanently the physical geography of a region. Madura was an arid plain, constantly parched for want of water. Henceforward it will be effectually irrigated, and its whole character will be altered. We may see, in many parts of the world, the alterations in climate and in the physical conditions of a country which may, in the course of time, be caused by the reckless or ill-conceived operations of its occupants; but here we are shown how, by careful calculations and engineering skill of a high order, backed by administrative sympathy and foresight, a geographical change may be wrought which will be productive of good to a large community. Those who opened the sluice gate and let forth the beneficent flood, are benefactors to the human race; and I am happy to be able to announce that both Lord Wenlock and Captain Pennycuik are to be our guests this evening.

Before entering upon the concluding part of my address, in which I propose to refer to polar efforts and to our absent friends in the far North, I must touch briefly on the plans which were explained to us last February by Professor Milne, for the establishment of observatories for recording earthquakes and other movements of the Earth's crust in various parts of the world. In this country I feel little doubt that Professor Milne will obtain sufficient aid to establish a suitably equipped seismic observatory, and he will find sympathetic co-operation in Europe and the United States. It is desirable, also, that such an observatory should be established in South America, and another somewhere in Mexico. I am informed that the present President of Mexico is likely to take an interest in the proposal, and I have, therefore, addressed a letter to Señor Romero, the Mexican Minister in London, on the subject. When these proposed observatories are at work in sufficient numbers and at suitable distances, there can be no doubt that their simultaneous observations will result in a great increase of our knowledge respecting seismic phenomena. I am sure that our Council will be desirous of co-operating with Professor Milne, for by fostering and promoting his plans we shall be helping to advance a most interesting investigation,

which forms a part of the great body of knowledge which is included in the science of geography.

No less than four Arctic expeditions are now actually at work ; while the one which has long made all geographers turn eagerly for news to the head of Baffin's Bay has returned. It will be conceded that Lieut. Peary's most remarkable journey over the Greenland ice represents the finest and the most important piece of glacial work that has ever been performed.

Our thoughts have been much with the gallant little *Fram* during the last few months, and there has been anxiety owing to the report which came from Siberia, and which has since been found to be without any foundation. I only partly share that anxiety. Nansen is not a man to turn back until he has either achieved his glorious enterprise, or has done all, and more than all, that seems possible with the means at his disposal. He should not be at the end of his resources. Before that time arrives he will secure the safety of his people by timely retreat. For he is not fool-hardy. His lofty enthusiasm is tempered with forethought and prudence, as is the case with all great leaders of men. We may, therefore, hear of him this summer ; but I shall not be surprised if we do not, nor should there be any great anxiety until next spring. Meanwhile I trust that Cape Chelyuskin and the New Siberia islands will be visited this summer, on the chance of obtaining tidings. No fitter man could be found for that duty than our associate Captain Wiggins, the indefatigable navigator of the Kara Sea.

Mr. Montefiore furnished us, last November, with a very encouraging and a very satisfactory account of the progress of the Jackson-Harmsworth expedition. The only misfortune was that the *Windward* was unable to return in the autumn, and was obliged to winter at Franz Josef Land. But the little Arctic settlement had been formed ; a winter had been successfully passed ; the equipments had been tried ; the explorers were in good health ; and Mr. Jackson had not only commenced his sledge-travelling, but had made some interesting discoveries. Our gallant friends had become acclimatized, and were imping their wings for a more glorious flight this spring. Mr. Harmsworth's munificent support of geographical exploration has been well rewarded already, and he has every reason to be satisfied with the result so far. On the return of the *Windward* next autumn, we may confidently expect to receive tidings of very important discoveries in the direction of the pole. There never has been a private Arctic expedition despatched from these shores on so complete a scale, nor has there been one on which such anxious care has been lavished in every department of the work. The narrative of Mr. Montefiore convinced us that it was ably commanded, and that the leader was well and zealously supported. We may, therefore, anticipate that all will be done that gallant and well-trained men can do. We hope that they will command success. We are certain that they

will deserve it. May God speed them in their glorious efforts during the coming season.

Great interest has been taken in the exceptionally daring and original undertaking of M. Andrée to cross the north pole in a balloon, with two companions. When we listened to the most interesting account he gave of his plan at the Congress, and to his ready and pertinent replies to all objections, we felt that, if the thing could be done, M. Andrée was the man to do it. I believe that all his preparations have been made. The Swedish minister in London has made excellent arrangements for supplying information respecting the balloon to all the circumpolar tribes and settlers. M. Andrée will start from Spitzbergen this month, and he will take with him the hearty good wishes of all geographers. It is not likely to be many weeks before we hear of this most remarkable enterprise having been completed.

The coasts of the Spitzbergen archipelago are now well known, with the exception of some of the outlying islands to the eastward, where the sea is generally blocked with ice. As one who has enjoyed several delightful cruises in the Training Squadron, both in northern and in tropical seas, I rejoiced to hear that the four ships of which it is composed visited Spitzbergen last year, and that the officers did useful work in making a survey of Recherche bay. An interesting account of the visit of the Training Squadron to Spitzbergen, by Commander Coke and Lieut. Rolleston, of H.M.S. *Active*, was published in our *Journal*. As regards the interior, Baron Nordenskiöld has traversed the North-East island. But the interior of the main island has never been explored. It occurred to our associate, Sir Martin Conway, after his return from the glaciers of the Karakorum, that here was a field where good and useful geographical work might be done. With characteristic energy, he made himself a complete master of Spitzbergen literature from the earliest times, consulted all available authorities, and was confirmed in his first impression. He therefore made up his mind to undertake the task of exploration this summer. Parts of the interior of Spitzbergen are known to be covered with glacier, but naked peaks and ridges have been sighted from the coast, and there is reason for the belief that valleys and plains will be found, which are not filled up with glacial ice. In that case the interior will be of great interest, not only to geographers, but also to geologists and naturalists. Sir Martin Conway's expedition will be conveyed to Ice Fjord, whence the explorers will push inland in a northerly direction. Sir Martin has five companions: Mr. Trevor Battye, who gave us such an entertaining monograph on Kolguev island, is the naturalist; Mr. Gregory, the African traveller, and Mr. Garwood, are the geologists; and a young cousin of Sir Martin Conway goes as artist; while Mr. Studley accompanies the expedition as sportsman. They are all young and enthusiastic men. Some have experience already; others have to win their

spurs. They are sure to do their best, and they go forth with the hearty good wishes of their brother geographers.

Of the Arctic Regions there is a good report to make, but our strenuous efforts to secure the exploration of the southern polar regions have not as yet been successful. In 1893, Mr. Larsen, a Norwegian captain, did some excellent work to the south of the South Shetland islands. Last year the Norwegian whaler *Antarctic*, sailing from Melbourne, penetrated through the pack, and, for the first time since 1842, the Victoria Land of Sir James Ross was sighted. Two landings were effected, the first on one of the Possession islands, the second on the mainland near Cape Adare. Mr. Borchgrevink, a young and enthusiastic Norwegian, served on board the *Antarctic*, and, returning to Europe, he gave us an animated narrative of the voyage at one of the meetings of the Congress. He has since shown great zeal for the renewal of Antarctic work, and I rejoice to hear that there will be an English Antarctic whaling venture this year, and that Mr. Borchgrevink has succeeded in making an arrangement by which he will be landed at Cape Adare, with a few chosen companions, and pass the winter on the Antarctic continent. He contemplates the exploration of part of the interior on *ski*, or Norwegian snow-shoes, and the whaler will return for the explorers in the following summer. This is a most praiseworthy undertaking, not without risk, but with the promise of useful results, and, in the name of my geographical associates, I heartily wish Mr. Borchgrevink all the success that his scientific ardour can anticipate, and a safe return.

The great desire of scientific men throughout the world, as well as of all patriotic Britons, is that a Government Antarctic expedition should be equipped for the complete attainment of all those valuable results which are so urgently needed, more particularly as regards a magnetic survey, and which can only be effectually secured by an expedition under naval discipline. The decision of our Government to follow the numerous glorious precedents of the past, would be quite as advantageous to the navy as to science. All the scientific societies of Great Britain and of Australia expressed their cordial concurrence in the importance of despatching an Antarctic expedition, and their willingness to appoint delegates to form a deputation for the purpose of representing the numerous results to be obtained. I therefore wrote to the First Lord of the Admiralty to request him to receive a deputation, at the same time referring to the facts that he was in office when the *Challenger* was commissioned, and that the work of an Antarctic expedition was a complement to that of the scientific expedition which he had himself inaugurated.

Mr. Goschen replied that, owing to the outlook abroad, every shilling that could be obtained from Parliament, and every man that could be made available, would be urgently needed for our fighting fleets, and as his answer could not then be favourable, he did not wish to take up

the time of the proposed deputation. But we do not look upon this reply as altogether discouraging as regards the future. He expressed his full appreciation of the great importance of the results of Antarctic discovery. The threatening political clouds which were gathering when the year opened may disperse. There can be no doubt of the great professional advantages derived by naval officers and men who are employed on difficult services. It may dawn upon the authorities that the building of ships is not more important than the training of those who fight them; and in that case we have the high authority of Admiral of the Fleet, Sir E. Commerell, and of many others whose opinions cannot be ignored, that polar service is the best nursery that can be supplied for naval men. Meanwhile the great importance of the scientific results of an Antarctic expedition continues to increase. Under the above circumstances, there is full justification for a renewal of the application that was made last year; and I believe that there is reason to hope that the influences which were adverse will be weaker, and that the arguments in favour of following the great precedents of former days will have more force.

A review of our progress during the year that is past is, on the whole, satisfactory. The Congress was a great success. Excellent work has been done in Asia, in Africa, and in the Polar Regions. Above all, there is evidence of a great revival of geographical interest in the rising generation. Volunteers for all kinds of enterprises are numerous, zealous, and of the best sort. This is a good sign, and is of excellent augury. It betokens a future for the Society of continued activity and usefulness.

Admiral Wharton has kindly provided me with the report which follows on the Admiralty Surveys during the year (p. 44).

THE PAMIRS AND THE SOURCE OF THE OXUS.*

By the Right Hon. GEORGE N. CURZON, M.P.

THERE is a passage in a now too-little-read book by a famous author that depicts the very curiosity whereby I was led in the autumn of 1894 to make the geographical researches which this paper will attempt to record. In his 'Anatomy of Melancholy,' the ingenious Burton, summarizing the problems of natural history or physical geography which he would fain have solved, speaks thus: "I would examine the Caspian Sea, and see where and how it exonerates itself after it hath taken in Volga, Iaxares, Oxus, and those great rivers. I would find out with Trajan the fountains of Danubius, of Ganges, and of Oxus." To myself also the Oxus, that great parent stream of humanity, which has equally impressed the imagination of Greek and Arab, of Chinese and Tartar, and which, from a period over three thousand years ago, has successively figured in the literature of the Sanskrit Puranas, the Alexandrian

* Paper read at the Royal Geographical Society, February 18, 1895. Map, p. 96.

historians, and the Arab geographers, had always similarly appealed. Descending from the hidden "Roof of the World," its waters tell of forgotten peoples, and whisper secrets of unknown lands. They are believed to have rocked the cradle of our race. Long the legendary water-mark between Iran and Turan, they have furrowed a deep channel in the destinies and character of mankind. Already in 1888 I had crossed the Oxus in its middle course at Charjui, in the now Russianized territories of Bokhara. There, in the beautiful words of our English poet, I had beheld how—

"The majestic river floated on
Out of the mist and hum of that low land,
Into the frosty starlight, and there moved
Rejoicing through the hushed Chorasman waste
Under the solitary moon."

But the Oxus then before me was the Oxus of the plains only; it was—

"Oxus forgetting the bright speed he had
In his high mountain-cradle of Pamere."

And, with the poet, my imagination had flown eastwards and upwards to that aerial source, and had longed to pierce the secrets that were hidden behind the glaciers of the Pamirs and the snowy sentinels of the Hindu Kush. Where did this great river really rise? Which among the several confluent streams of its upper course was the true parent stream? This was a question that had been obscured by the imperfect information or the erroneous hypotheses of previous travellers, as well as complicated by the diplomatic sophistries of rival statesmen. At least four separate and mutually destructive claims had been made to the honour of parentage. It was in the main, so far as geography is concerned, in order to solve these doubts, and at the same time to see from personal observation those much debated lands of the Pamir or Pamirs, which have been variously represented as grassy plains and horrible wildernesses, as a certain death-trap for invading armies, and yet as the vulnerable gates of Hindustan, that I planned the journey which I now proceed to sketch. In dealing with it, I shall pass lightly over all other portions but those relating to the Upper Oxus valley and the Pamirs, in connection with which it is my desire in this paper to supply, so far as possible, a monograph of existing, though for the most part unpublished, information about the regions within or contiguous to that area.

During the six months of my absence in the autumn and winter of 1894, I really undertook two distinct journeys, which had little but a common political interest to unite them. The first was to the Indian frontier states of the Hindu Kush, the Pamirs, and the Oxus. The second was to Afghanistan. The distance covered on horseback or on foot in the two was just short of 1800 miles, much of it over ground of great difficulty. The fact that, while on the Indian frontier and

the Pamirs, I accomplished a daily average march of over 21 miles for fifty-four marching days, excluding halts, is no criterion of ordinary opportunities, since it was due solely to the exceptional kindness shown me by every British officer on the frontier, notably Captain Younghusband, a former Gold Medallist of this Society, as well as to the arrangements made in advance for my transport by the local chiefs and rajahs, notably by the Thum of Hunza, through whose territories I passed.

Similarly in Afghanistan, my daily marching average, with a large camp and an escort of over seventy men, was 27 miles. But this again was owing to the generous entertainment of the Amir, who laid out horses for me along the route. I make this explanation in order, on the one hand, to account for the apparent rapidity of a journey which, under ordinary conditions, would occupy probably nearly double the time, and, on the other hand, to disavow a credit to which I am not in the least entitled.

The first section of my journey was as follows. Leaving Srinagar, I marched up the military road that has been built since 1890 to connect the valley of Kashmir with the British military outpost of Gilgit. This road is a little short of 200 miles in length, and crosses the Himalayas by one of two passes—the Burzil, which is 13,450 feet in height, and the Kamri, which is 300 feet lower. Of this part of the journey, however, since it is well described both in Mr. Knight's and Mr. Conway's books, I shall here say nothing. From Gilgit I followed the Hunza-Nagar valley to Baltit, the capital of Hunza; and from there, in the middle of September, my friend Mr. Lennard, a noted *shikari*, who in 1891 had shot *Ovis Poli* on the Taghdumbash Pamir, and I started forth, escorted by the Thum and his Wazir and a crowd of Hunza men, for the Kilik Pass, by which we passed from Anglo-Indian territory to the Chinese possession of the Taghdumbash Pamir. There we stayed a few days to shoot *Ovis Poli*, and then made our way across the eastern watershed of the Pamirs by the Wakh-jir Pass to the headwaters of the Oxus and the Pamir-i-Wakhan. From there I paid a visit to Lake Chakmak and the Little Pamir. For some mysterious reason, the Indian Government was averse to my going on to the Victoria Lake and the Great Pamir. Accordingly from here I retraced my steps, and Lennard and myself marched down the Oxus valley to Sarhad, the frontier outpost of Afghan arms in Wakhan. From there we recrossed the Hindu Kush by the low depression known as the Baroghil Pass, beyond which we separated—Lennard to return over the Darkot Pass, with its formidable snow and glaciers, to Yasin and Gilgit; I to follow down the gorge of the Yarkhun river (which in its later course is variously known as the Mastuj, Chitral, Kashkar, and Kunar river) to Mastuj. There I was joined by Captain Younghusband, Political Officer in Chitral, who accompanied me for a further distance of 65 miles down

the same valley to the capital of that state, where we were hospitably entertained and treated with the greatest distinction by Nizam-ul-Mulk, the Mehtar or ruler, since treacherously murdered. From Chitral, finding it impossible to make, as I had hoped to do, the then untravelled but most important march to Peshawur, a distance only of 180 miles, or to Jellalabad, a distance of 160 miles, I was compelled to retrace my steps; and Captain Younghusband and I marched back to Mastuj, and from there, by the Chamarkand pass, Ghizar, Gupis, and Punial, along the valley of the Ghizar and Gilgit river, back to Gilgit. From Gilgit I followed down the Indus to the interesting post of Chilas, one of several small highland communities, of Aryan origin, inhabiting the mountainous and almost unexplored country called by themselves Shinkai. In 1892 Chilas passed into British hands, and is now the outpost of British arms among the frontier republics of the Indus valley. After leaving Chilas, I recrossed the Himalayas by the Babusar pass, 13,400 feet, and re-entered British Indian territory, descending to Abbottabad by the as yet little-known Khagan valley, which is the most direct route from Gilgit to any Indian military base. This was the termination of the first part of my journey.

When, a little later, I started for Afghanistan at the invitation of the Amir, I marched up by the ordinary road from Peshawur through the Khyber pass to Jellalabad and Kabul, a distance of 180 miles. This time I was alone. After a fortnight in Kabul, the Amir gave me permission to leave his country by way of Kandahar; and accordingly I marched down by the well-known route, 325 miles in length, passing through Ghuzni and Kelat-i-Ghilzai to Kandahar, that was last traversed by the armies of Sir Donald Stewart and Lord Roberts in 1880. From Kandahar I rode 65 miles to Chaman, the British frontier outpost in Beluchistan, where I again touched a railway and civilization. I shall say nothing of my journey in Afghanistan here, since its main features were of political rather than geographical interest; but shall revert at once to my earlier experiences, both in approaching and, still more, after crossing the Hindu Kush.

Upon the stupendous natural features of the region embraced by the Himalayan and Hindu Kush ranges, comment has more than once been made in papers read before this Society. Here a labyrinth of the highest peaks in the world lift their unscaled pinnacles above the deepest valleys, the most sombre ravines. Within a range of 70 miles, there are eight crests with an elevation of over 24,000 feet, while the little state of Hunza alone is said to contain more peaks of over 20,000 feet than there are over 10,000 feet in the entire Alps. The longest glaciers in the globe outside of the Arctic circle pour their frozen cataracts down the riven and tortured hollows of the mountains. Great rivers foam and thunder in flood-time along the resounding gorges, though sometimes reduced in winter—the season of low waters—to errant threads.



THE HUNZA VALLEY AND BAKAPUSHI.

Avalanches of snow, and—still more remarkable—of mud, come plunging down the long slopes, and distort the face of nature as though by some lamentable disease. In this great workshop of primæval forces, wherever the imprisoned energies are not still at work, they have left their indelible traces in the stormy outline of the crags, in the water-marks of lakes that have burst their bounds and have fled, in the artificial structure of the alluvial terraces, in the deep scouring of the impetuous streams.

There is, further, a certain gradation of landscape-impression, in the northward march from Kashmir to the Pamirs, that is not without an instructive as well as an æsthetic significance. On the earlier parts of the road to Gilgit, the traveller rides through the shade of pine forests and skirts romantic glens. Soon he passes into a region where there are neither trees nor flowers, where the mountains exhibit only a sterile and forbidding gradient, and where across the bald summits of the passes the snow-laden gales shriek a sentence of death to animal and man. The Indus valley, with its brown and verdureless rocks, enclosing the Tartarean trough in which the inky volume of the great river rolls by, accentuates the mournful impression. Then in the Hunza valley, which is undoubtedly one of the most remarkable scenes in the world, Nature seems to exert her supremest energy, and in one chord to exhaust almost every note in her vast and majestic diapason of sound. She shows herself in the same moment tender and savage, radiant and appalling, the relentless spirit that hovers above the ice-towers, and the gentle patroness of the field and orchard, the tutelary deity of the haunts of men.

Never can I forget the abruptness and splendour of the surprise when, shortly after leaving the fort of Chalt, 30 miles beyond Gilgit, there burst upon our view the lordly apparition of the great mountain Rakapushi, lifting, above the boulder-strewn or forest-clad declivities of his lower stature, 18,000 feet of unsullied ice and snow to a total height of 25,550 feet above the sea. I shall always say that next to the sight of Kinchinjunga from beyond Darjiling, this is the finest mountain spectacle that I have seen. Rakapushi is one of the most superbly modelled of mountains. Everywhere visible, as we ascend the valley, he keeps watch and ward over the lower summits, and over the smiling belts of green and orchard-plots below that owe their existence to his glacial bounty. But up above his true and imperial majesty is best revealed. There enormous and shining glaciers fill the hollows of his sides, and only upon the needle point of his highest crest is the snow unable to settle. As we gaze at Rakapushi, indeed, we find an unconscious answer to the poet's query—

“ What pleasure lives in height (the shepherd sang)—
In height and cold, the splendour of the hills ? ”

For there, in more than fancy, we can—

“ Walk
“ With Death and Morning on the silver horns ; ”

There before us are—

“The firths of ice
That huddling slant in furrow-cloven falls
To roll the torrent out of dusky doors.”

And though our eye, aching with the dazzling vision, may seek a transient solace in the restful verdure of the lower and terraced slopes, and may even dip into the deep gorge where the river hums 1000 feet below our feet, yet it cannot for long resist the enchantment of those glimmering peaks, and ever hankers for the fascination of the summit.

The distance from Gilgit to Hunza is 61 miles, which we covered easily in three days. In former times, and up till the brilliant little campaign in the winter of 1891, by which the British became the practical masters of the country, the road, if it could be so called without a grim jest, consisted in many parts of rocky and ladder-like tracks up the mountainsides, and of narrow galleries, built out with timbers, round the edges of the cliffs. It has since been much improved by the sappers attached to the Gilgit garrison. Outside Baltit, the capital of Hunza, we were met by the Thum, or Mir, or Rajah, as he is variously called, Mohammed Nazim Khan, a young man of about twenty-eight years of age, whom the Indian Government invested with the ruling title after his elder brother, Safdar Ali Khan, a murderer and fratricide of more than ordinary activity, had fled before the British advance in 1891. The Thum was accompanied by his Wazir, Humaiun Beg, the representative of a family in which that dignity has been hereditary for generations, and himself the most agreeable and capable personality in the Hindu Kush states. I visited the Thum in the so-called castle of Baltit, a most picturesque edifice—the model of a feudal baron's stronghold—that rises to a considerable height above the flat-roofed cubes of the town. I was received in a chamber opening on to the roof, where the Russian explorer, Captain Grombchevski, had opened negotiations with Safdar Ali Khan in 1888. To this apartment it was necessary to ascend by a rude ladder, conducting to a hatchway in the floor. This might be thought a primitive mood of entrance; but then the castle of Baltit (so called because it was originally built by Baltis, from Baltistan) is not precisely a Windsor.

At Baltit, as also at Gilgit and at Chitral, I witnessed the native game of polo, which, after being introduced into India by its Mussulman conquerors nine hundred years ago, and having been the favourite game of the Mogul Emperors, found a refuge in these two out-of-the-way corners of the Hindu Kush states on the one hand, and Manipur on the other, until about thirty years ago it was brought back to its former haunts by the British officer. The Nagar men are reputed to be the best players in the Hindu Kush area; but the Kanjutis (the name by which the Hunza people are described north of the Hindu Kush) are little inferior. The game, as most people know, is played on a narrow strip of ground, frequently destitute of grass, surrounded by a low wall of

stones upon which the spectators take their seats, and from which the ball rebounds into play. The ground at Hunza is about 280 yards in length by 30 in width; but that at Chitral is wider, and has a curious bay or projection at one side. The goals are low white stones fixed in the ground, and at Hunza were only about 7 feet apart. The local band, consisting of a big drum, a couple of kettledrums, and two or three clarionets with a note very much like a bagpipe, accompany the performance, and when a goal is scored indulge in the most frantic din. The players, who range in number from four to twelve or more a-side, ride the native ponies, with the roughest of bits, on the highest of saddles, and use a much shorter polo-stick than is common in England, an almond-wood handle being rudely fitted into a heavy plane or willow-wood head. The native ball is of wood and is also very heavy; but the British officers, who habitually join the natives in the game, have among other reforms introduced the lighter English ball of bamboo-root. At Baltit they have also Anglicized the indigenous game by reducing the absurd and indefensible number of players, by persuading them to abandon the rule under which a goal was not scored until one of the side that had struck the ball between the posts had dismounted and picked it up, with the result of a frightful and even dangerous scuffle, and by somewhat modifying the pretty fashion of striking off. Under the native rules the opener of the game or the winner of the last goal galloped at full speed from one corner of the ground, with the whole of the rest of the field behind him, and when he came to the centre threw the ball into the air and struck it with his polo stick, frequently—such was the skill of the best players—scoring a goal from the stroke. There is a well-known Nagar player at the present moment who may usually be counted on for a goal in this fashion. At Baltit he now only gallops down one quarter of the distance before striking off; and his adversaries, awaiting him in the centre, have a chance of saving the goal. There is one respect, however, in which it is found difficult to modify the native practice, and that is in respect of "off-side" and "crossing," about which no scruple is entertained whatsoever. With its clumsy implements and with its ill-groomed steeds the native game of polo nevertheless excels in picturesqueness any that I have elsewhere witnessed. The men ride like demons, and perform feats of horsemanship of which the English game is innocent. At Chitral the beaten side had to dance to the victors; and it was the particular pleasure of the Mehtar (since unhappily murdered) to select as captain of the opposite team to himself, which was invariably beaten, an old gentleman who had previously made an unsuccessful attempt upon his life, and upon whom it amused him to wreak this playful revenge.

From Baltit Lennard and I commenced our march to the Pamirs. The distance to the Kilik Pass is about 81 miles, over one of the worst tracks in the world. At a little beyond Baltit the valley of the Hunza

river, which from Chalt has pursued an easterly course, turns due north, and the river cuts a deep gash or furrows an uproarious channel along its bottom in its descent from the watershed of the Pamirs. The scenery also changes. In place of the richly cultivated terraces and the



THUM AND WAZIR OF HUNZA.

abounding orchards of both the Hunza and the Nagar slopes in the lower valley, we find only rare villages and still rarer cultivation, and are in a region of rocks and stones. Big glaciers propel their petrified cascades to the very edge of the river. In many places this required

to be forded. Sometimes the road is only conducted round the edge of the precipices that overhang the torrent by artificial ladders and ledges, built out from the cliff with stones loosely laid upon supports of brushwood and timber jammed into the interstices of the rock. This sounds very dreadful, but in practice is much less alarming, the galleries, though only lasting for a few days, being sufficiently strong at the beginning, and being slightly inclined inwards toward the cliff. In the course of a very few days I underwent the bodily labours of a Parliamentary session, and parted with the superfluous physical accretions of an entire London season. Over this vile stretch of country there are two tracks, the upper or summer track, which avoids the river-bed, then filled with a fierce and swirling torrent, and climbs to the summit of the cliffs, several thousand feet above the water; and the lower or winter track, which can only be pursued when, the melting of the snow by the hot summer suns being over, the current dwindles to a number of fordable channels, across and amid the boulder-piled fringes of which the traveller picks his way. The second track is not commonly available till the beginning of October; but a few cloudy days had sensibly lowered the river, and it was thought that, with the aid of the Thum's people, who accompanied us in large numbers, the route might be found practicable, except in a few places where, to avoid the still swollen stream, we should require to scale the heights. The whole of our baggage, tents, etc., had to be carried on the backs of men, the route being quite impracticable for baggage-animals. We had riding-horses ourselves, but there were many places where these had to be abandoned and swum across the river. I was very favourably impressed with the Hunza men, who were strong, cheerful, and willing, and struck me as both the most masculine and the most agreeable of the Aryan tribes of the Hindu Kush. Those persons who contended that we should do an injury to them, and heap up trouble for ourselves, by interfering with their liberty, which, as interpreted by their chiefs, was merely the liberty to harry and plunder and slay their less manly or warlike neighbours, are shown to have talked nonsense, as croakers usually do. The people themselves extracted very little from the raids, the proceeds of which were commonly pocketed by the chiefs; and I have no doubt that many a converted freebooter lent a not unwilling back to the transport of our loads.

Perhaps the least agreeable part of the journey was the compulsory fording of the river, which was swift and icy cold, many times in the day. The Hunza men, however, are capital and fearless swimmers. Stripping, they plunged into the water and swam on either side of our ponies, holding them up and preventing them from being swept down. In order to reward them, we offered prizes for a swimming contest across the river and back. Their style is a hand-over-hand swimming, and many of the men were carried down at least 300 yards before they

succeeded in getting out on the further bank. They also swam with *mussuks*, or inflated goat-skins, lying with their stomachs on the skins and propelling themselves with their hands and feet. By this method in flood-time they bring their women across the river, strapping the lady on to a *mussuk* and swimming at its side themselves. This part of the valley is called Little Guhjal, its inhabitants being Wakhis who originally emigrated from Big Guhjal, or Wakhan, and who still speak the Wakhi language. On the second day we crossed the snout of three glaciers; one of which, the great Pasu glacier, comes striding down to the river's edge with a wilderness of *séracs* and ice-towers, and terminates in a prodigious moraine. On the third day we crossed the Batur glacier, which is a long twisting ice-flood over 20 miles in length. Its surface was split up with lofty pinnacles and crevasses, and we picked our way across in a little over an hour, over ice-hills sprinkled with a black gravelly *débris*. The retrospect was a frozen strait of choppy waves, ridge upon ridge of ice, some snow-white, others as black as soot. This glacier is constantly changing its track, and is sometimes quite impassable. In this neighbourhood, also, we observed gold-washing on the banks of the river, a man crouching with a wooden trough on a heap of stones by the water's edge, shovelling into it a pile of soil, and then laboriously washing and sifting it out with the aid of a bowl made from a gourd. In this way a few grains are penuriously extracted, and are bought by the Mir with grain, being used by him to pay his annual tribute of 20 ozs. of gold-dust to the Kashmir government, as well as a few *tolas* of gold, which for sake of historical scruples or political expediency, he is still most inexplicably allowed to pay to China.

On the fourth day we passed on the right or west bank of the river the *nullah* that conducts to the difficult Irshad Pass leading to Sarhad, in Wakhan, as well as to the Chilinji Pass, which conducts into the Karumbar valley of Yasin. Of both of these passes, hitherto undescribed and almost unknown, I shall have something to say later on. According to the presence or absence of snow on a particular peak in this part of the main valley do the Hunza people know whether the Irshad Pass is or is not open. A little later we crossed, on the east bank, the deep and narrow gorge down which the Khunjerab river flows from the Khunjerab Pass, leading on to the Taghdumbash Pamir. On the fifth day, following up the valley, which gradually rose, and was filled with clumps of willow and birch in the river's bed, we reached Murkush, just below the junction of the two *nullahs* that conduct respectively to the Kilik and Mintaka Passes, leading on to the same Pamir. Pursuing the former or left hand of these, we camped at an elevation of 13,360 feet (having risen 5300 feet since leaving Baltit), at a few miles from the foot of the Kilik Pass. On the morrow we crossed the latter. I took the elevation on the summit with a boiling-point thermometer, ordinary thermometer, and aneroid, and found it to be 15,870 feet. The

top of the Kilik is a long flattish plateau, covered with stones and interspersed with grassy swamps and standing water. There was no snow on the pass itself, though the snow-line was but little above us on the surrounding mountains, which were draped in white. This is the pass of which Captain Grombchevski, who crossed it in August, 1888, penned the somewhat hyperbolic report that it is "exceedingly easy, so that a cart with a full team of horses could follow it." Here we bade good-bye to the Thum of Hunza and his men, the limits of whose jurisdiction we had reached, and were met by the Kirghiz chief of the Taghdumbash Pamir, who is a Chinese subject, and who had received instructions to attend upon us while in Chinese territory. In his company we marched down about 6 miles to our new camp on the Taghdumbash.

Before leaving this portion of the Hindu Kush, or rather of that section of the main range which, extending from this point eastwards to the Karakoram, is locally designated the Mustagh range, let me say an additional word about the passes already mentioned, by which access across it is gained to the Pamirs. They are four in number, viz. in the direction from east to west, the Khunjerab, the Karchenai, the Mintaka, and the Kilik. The Khunjerab Pass* was visited on the north side by Captain Younghusband in 1889, and has since been explored by Lieutenant Cockerill. It is a winter pass only, and is all but impracticable for baggage-animals. Its elevation has been determined as 15,420 feet. The Karchenai Pass is reported to be even worse, but is still unknown. Mintaka means the "Pass of a Thousand Ibex," and is also locally called Kirish, i.e. *poshtin*, or sheepskin coat, which name appears in the Russian military topographical map as Kershin. The same map gives the elevation as 15,740 feet. Lieutenant Cockerill made it 15,430 feet; Captain Younghusband, 15,300 feet. It is an easy pass, free from snow in the summer, and practicable for ponies, and is the pass by which Captain Grombchevski rode back from Hunza in 1888 on to the Taghdumbash Pamir. Lastly, as to the several altitudes that have been registered for the Kilik, whereas the Russian map marks it as 16,100 feet, Colonel Woodthorpe, in the Lockhart Mission in 1886, made it 15,600 feet by aneroid; Lieutenant Cockerill, 15,670 feet; myself by hypsometer, 15,870 feet. I would here say, with respect to the varying figures of different authorities, that not merely, as is obvious, must much, if not nearly all, depend upon the nature and reliability of the instrument employed—the aneroid, so far as my own experience goes, being a thoroughly capricious and untrustworthy guide at those elevations—but a good deal of the variation may also be accounted for by the difference of the actual spot in or near to the summit at which the observation is made. When a pass is deep in snow the track is obliterated, and a traveller makes his way across as best he can, and takes his altitude where the

* This is the pass called Ghundrab in Mohammed Amin's report. *Vide Davies' 'Report on Trade Routes of the North-West Frontier,' Appendix, p. cccxvi.*

position is most favourable. Only when the pass is snow-free can the mathematical summit be accurately determined. It will also have been manifest, from the description of the two passes last named, that while the crossing of the passes themselves is for some five months of the year attended with not the slightest difficulty either for man or beast, the real obstacles are only encountered, and the amazing military strength of the frontier is only ascertained after the passes have been crossed, and the descent begins into the gorges and defiles on their southern side. Crossing the Kilik or the Mintaka is by no means the same thing as getting to Hunza; and I may further add, that getting to Hunza is a very different thing from invading India.

From the summit of the Kilik Pass I looked down upon the first and



NATIVE POLO-PLAYERS.

easternmost of the tracts of country that are called Pamirs; and here, accordingly, I pause to discuss what that name means, how it arose, to what districts it applies, what are the distinctive characteristics, what the hydrography and the orography, and who the inhabitants of the country so named. To this I shall add a list of the mediæval travellers who in different ages are known to have visited or traversed the Pamirs, and a description of the various stages by which that country has been opened to our knowledge. Finally, I will name the European travellers who have in recent times penetrated to these little-known spots for purposes of official exploration, travel, or sport. As regards the literature of the subject, I need here only mention the writings of such travellers as have in modern times themselves visited the Pamirs,

and could therefore speak from eye-witness. Of these, five have written books in the English language: Captain Wood's account of his celebrated pioneer journey in 1837-8 to the Victoria Lake source of the Oxus;¹ Sir Thomas Gordon's description of the visit paid to the Pamirs in 1874 by certain members of Sir Douglas Forsyth's second expedition to Yarkand;² a translation of M. Bonvalot's French work describing his arduous spring crossing of the Pamirs in 1887;³ (with which may be compared his companion M. Capus' independent account, in the French language, of the same journey⁴); Lord Dunmore's book;⁵ and Major Cumberland's narrative of sport on the Eastern Pamirs.⁶ Papers have further been communicated to this Society, and have been published in the *Journal* by certain of the above travellers, viz. by Captain Wood,⁷ by Colonel Gordon⁸ and Colonel Trotter⁹ (his companion), and by Lord Dunmore,¹⁰ as also by Mr. Littledale,¹¹ Captain Young-husband,¹² and Captain Bower.¹³ To these must be added the invaluable compilations of two writers, in whom the lack of eye-witness was more than compensated by profound scholarship, viz. Sir Henry Rawlinson¹⁴ and Sir Henry Yule.¹⁵ Both, however, wrote at a time when geographical information about the Pamirs was singularly imperfect.

Firstly, as to the name Pamir. Its earliest known occurrence is in the description of the journey of the Chinese Buddhist pilgrim, Hwen Thsang, in the seventh century A.D. He crossed this elevated region and called it Pomilo, a name which resembles the pronunciation Pamil, still reported by some travellers as being used by the Kirghiz at the present day.¹⁶ Marco Polo, more than 600 years later, called it Pamier.

¹ 'A Journey to the Source of the River Oxus.' By Capt. John Wood, I.N. New edit. London: 1872.

² 'The Roof of the World.' By Col. T. E. Gordon. London: 1876.

³ 'Through the Heart of Asia.' Translated by C. B. Pitman. 2 vols. London: 1889.

⁴ 'Le Toit du Monde.' Par G. Capus. Paris: 1890.

⁵ 'The Pamirs.' By the Earl of Dunmore. 2 vols. London: 1893.

⁶ 'Sport on the Pamirs.' By Major C. S. Cumberland. London: 1895.

⁷ *Journal of the R.G.S.*, vol. x., 1840, p. 530.

⁸ *Ibid.*, vol. xlv., 1876, p. 381.

⁹ *Ibid.*, vol. xlviii., 1878, p. 173. *Vide* also Colonel Trotter's report in the published Report of the Forsyth Mission. Calcutta: 1875.

¹⁰ *Geographical Journal*, vol. ii., 1893, p. 385.

¹¹ *Proceedings of the R.G.S.*, vol. xiv., 1892, p. 1.

¹² *Ibid.*, vol. xiv., 1892, p. 205.

¹³ *Geographical Journal*, vol. v., 1895, p. 240.

¹⁴ "Monograph on the Oxus," in the *Journal of the R.G.S.*, vol. xlii., 1872, p. 482.

¹⁵ "Papers connected with the Upper Oxus Region," in the *Journal of the R.G.S.*, vol. xlii., 1872, p. 438; and Introduction to new edition of Wood's 'Oxus,' 1872.

¹⁶ *E.g.* Fedchenko and Capus (*As. Quart. Rev.*, 1892, p. 238). Marco Polo can hardly, however, have acquired the name, as Prof. Vambéry has suggested, from the Kirghiz, since it was not till the sixteenth century that they came into the Pamirs, being driven southwards by the Kalmuks.

Mirza Haidar, a prince of Kashgar, whose work, the 'Tarikh-i-Rashidi,' written about the year 1543, has recently been edited by Mr. Ney Elias, adopted the modern form, Pamir.¹ The Portuguese Jesuit, Benedict Goes, in 1603 used the phrase Serpanil, which, as Yule suggested, probably signifies Sir-i-pamir, i.e. "Head of the Pamir;" a name closely analogous to the Sir-i-kul, or "Head of the Lake," which was mentioned to Wood in 1838, and mistaken by him for the title of the Great Pamir Lake itself. The Kirghiz whom I met adopted the pronunciation Pämër rather than Pämîr. The use of the name, in some form or other, is therefore amply attested for a period of 1200 years.

What, then, is its origin? Here an ample field has been provided for the ingenuity alike of the amateur philologist and of the student; nor can it be said that the scholarship of the one has carried us much further than the conjectures of the other. The various suggestions may be classified according as the word is supposed to be of Sanskrit, of Turki, or of Persian origin. Under the first heading falls the conjecture of Burnouf,² who regarded it as a contraction of *Upa Meru*, i.e. the country above Mount Meru, the legendary holy mountain of Hindu mythology, which was supposed to be the abode of the gods, and the centre of the universe. To the same class belongs Sir H. Rawlinson's conjecture that the word may be a contraction of Fan-mir, or Famir (the Arabic pronunciation), i.e. the lake country of the Fani, or Φαννοί, who, according to Strabo (Lib. xi. cap. 14), founded the Greek kingdom of Bactria to the east; *mir* being, he says, a Sanskrit word signifying primarily "sea" (e.g. *mare*, *mer*, and English *mere*), but also "lake," a form which reappears in Kash-mir and Aj-mir.³ To this theory the objection among others may, I think, reasonably be taken that there is no ground for adopting the Arabic pronunciation, the more so as the name "Pamilo" has been shown to have been in common acceptance long before the Arabs can ever have heard of the word at all. Next comes the Turki school. Colonel Gordon and the members of the Forsyth Mission in 1874 were told by their guides that the word meant "a wilderness, a place depopulated, abandoned, waste, yet capable of habitation." Professor Vambéry has likewise said that it means "a plain or sterile tract of country." For this interpretation I believe there to be no foundation other than the inventiveness of the Kirghiz guides, who, like most cicerones, are not first-rate etymologists. Dr. Leitner has said, but I do not know on what authority, that it is a Turki or Yarkandi word meaning "high plain, elevated valley, tableland, or plateau." Major Montgomerie's Mirza suggested the

¹ 'The Book of Prince Hyder of Kashgar.' Edited with notes by Ney Elias. London: 1894. *Vide* also a condensed account of the same work by R. B. Shaw, in the *Journal of the R.G.S.*, vol. xvi., 1876, p. 277.

² *Vide* Humboldt's 'Asie Centrale,' vol. i. p. 104; vol. ii. p. 390.

³ *Journal of the R.G.S.*, vol. xlii., 1872, pp. 489, 496.

derivation *pa* (belongs), and *mir* (chief), i.e. the territory belonging to the chief of Badakshan, which is, of course, absurd. Finally, there is the school of Persian partisans, whose hypotheses do not in every case err on the side of timidity. By some of these the word Pamir is said to be a contraction of Bam-i-Dunya, or "Roof of the World," another local appellation for the same region, which was mentioned to Wood in 1838. This, I think, is frankly fantastic. Others have suggested Bam-yar, or "Roof of the Earth" (*bam* being a Persian and *yar* a Turki word), which is perhaps worse. Finally comes a series of derivatives of the Persian word *pai*, signifying "foot," and some word of kindred sound to *mir*. Of these the least fanciful, and, if a Persian origin be accepted, to my mind the most likely, is the combination *pai* and *mir*, the latter, whether identical or not with the mythical Meru, being a word of not uncommon Central Asian use for "mountain,"* as, e.g., Tirich Mir, the famous mountain in the north of Chitral; Deo Mir, the local name for Nanga Parbat; and Mir Kalan (i.e. Big Mountain), a familiar peak in the Peshawur valley. I should not be so much inclined to identify the Mir in question with any particular peak as to suppose that the allusion may be to the great ranges—the Trans Alai on the north, the Mustagh Ata on the east, and the Hindu Kush on the south by which the Pamir region is ringed, and at whose feet it may legitimately be said to lie.

I next turn to the physical characteristics of the country so named. And here I confess that the gravest misconception appears to have prevailed, and may perhaps even still prevail, in this country as to what the Pamir or Pamirs really are. Only three years ago they were described by an eminent English geographer as a "vast tableland." In a leading article in the leading newspaper they have more recently been said to consist of "a series of bare and storm-swept downs." The word "steppe" is also of frequent application in popular parlance. There is quite a remarkable concentration of these errors of a slipshod nomenclature in a passage in Yule's Introduction to the second edition of Wood's 'Journey to the source of the Oxus,' published as recently as 1872. "We know now with something like certainty that the core of this mountain mass forms a great elevated plateau, the greatest part of which appears to consist of stretches of tolerably level steppe, broken and divided by low rounded hills." Elsewhere he writes, "Mountains in some places lift themselves out of the steppe."

Now, beyond the fact that the general elevation of the Pamir valleys is from 12,000 to 14,000 feet, and that they are consequently at a higher level than the surrounding countries, there is nothing in their superficial character in the least degree calculated to suggest a tableland or plateau, which I take to mean a broad stretch of flat and elevated land,

* In Baber's 'Memoirs' (translated by Leyden and Erskine), p. 313, *Mir* is said to mean a hill.

surrounded, maybe, and even interspersed, but not positively broken up, with mountain masses. Nor can anything less like a down or a steppe be conceived than the troughs or valleys, of no great width, shelving downwards to a river-bed, or lake, and uniformly framed on either hand by mountains whose heads are perpetually covered with snow, which anybody who has been to the Pamirs will at once recognize as a fair description of those regions. In reality, over the entire region embraced by the title, it has been calculated that the plains or valleys constitute less than one-tenth of the total area. Correctly described, a Pamir in theory, and each Pamir in fact, is therefore neither a plain nor a down, nor a steppe, nor a plateau, but a mountain valley of glacial formation,



BAND AND SPECTATORS ON POLO GROUND.

differing only from the adjacent or other mountain valleys in its superior altitude, and in the greater degree to which its trough has been filled up by glacial detritus and alluvium, and has thereby approximated in appearance to a plain owing to the inability of the central stream to scour for itself a deeper channel; this inability again being attributable to the width of the valleys and the consequent absence of glaciers on any scale, and to the short summers, which do not last long enough or experience a sufficiently fierce sun to admit of a very powerful erosive impetus being communicated to the melting snow.

Every Pamir, then, that I saw possessed the same characteristics associated with a greater or less width. These were—the bordering

presence of successive mountain peaks, snow-crowned above, sometimes seamed with ice-fields, and terminating in steep shingle slopes or boulder-strewn undulations lower down; in the bottom of the valley a river or stream or mountain torrent, noisily spreading itself over a stony bed or meandering in a peaty track, and sometimes feeding a lake or succession of lakes; and on either bank of the stream or lake a more or less level expanse of spongy soil, usually covered with a coarse yellow grass, and frequently broken up by swampy patches exactly like the ground on a Scottish moor. With the grassy stretches, which are green and flower-bestrewn in the summer only, and during the rest of the year—when not covered with snow—are sere and yellow, are interspersed expanses of sand and clay and stones, very often overlaid with a powdery incrustation of magnesium (where the saline properties in the soil have become exhausted) that glitters like a hoar-frost in the sun.

The main and differentiating features, therefore, of a Pamir are the abundance of pasturage, affording excellent food for every variety of animal; and the almost total absence either of timber or of cultivation. There are parts of the Pamirs where a few trees grow, and where a scant tillage is practised; * but these are not sufficiently numerous to invalidate the general proposition which I have stated. Hence it arises that such opposite verdicts have been passed by different travellers upon the fertility or reverse of the Pamirs. Those who expect some sort of forest growth, some signs of plantation, natural or artificial, or some evidences of settled human habitation, have, on finding none of these, denounced in savage terms the sullen inhospitality of the scene. Those, on the other hand, who have seen either their own animals or the Kirghiz flocks grow fat upon the succulent Pamir grass have spoken in glowing terms of these mountain pastures. The fact is that the Pamirs are both fertile and barren, both habitable and desolate, both smiling and repellent, according to the point of view from which they are regarded. They are among the deliberate paradoxes of nature.

* These are in the adjoining valleys rather than on the Pamirs themselves. Ivanoff mentions a forest growth consisting of creepers, reeds, rose, willow, dwarf birch, mountain poplar, bramble, liquorice root, honeysuckle, spurge, and black currant; but the traveller will certainly meet with few or none of these on the ordinary Pamirs. He also says that barley and wheat are sometimes cultivated; but this has not been the experience of the Russian garrison of the Murghabi fort or Pamiraki Poste, who, during the few years of their occupation, have attempted, with little or no success, to grow potatoes, radishes, and other vegetables. The poverty of the resources is really, however, best indicated by the paucity of inhabitants. In 1892 the *Turkestan Gazette* said that the only permanent population of the Pamirs consisted of 250 *kibitkas* or 1500 Kirghiz, and these of inferior breed and stamina. Their number is said now to have fallen to 1000. A previous number of this Journal (February, 1893, p. 159) contained an extract from a lecture delivered at Moscow in January, 1893, by a Spanish traveller, M. Ximénès, on his alleged recent travels in the Pamirs, in the course of which he said, "The magnificent pasture-lands of the Pamirs afford nourishment to herds of superb cattle and excellent mountain horses." M. Ximénès, however, I have reason to believe, was never nearer to the Pamirs than Tashkend.

It is owing to the climatic conditions under which this peculiar region subsists that the unfavourable verdict has on the whole prevailed. Possessing a mean elevation of from 12,000 to 14,000 feet above the sea, with peaks that rise to 20,000 feet and higher, buried deep in snow during seven months of the year, and often inaccessible for a much longer time, scourged by icy blasts, destitute of any fuel, save that which is provided by the dung of animals or the roots of desert scrub, and devoid of the meanest consolations of life, it is not surprising that the Roof of the World has been generally voted one of its least desirable portions, and until quite recent times, when fresh reasons were discovered for its examination, has been tacitly excluded from the itinerary of the most intrepid of explorers. That, however, is no reason why we should call it what it is not, or perpetuate the errors of a more ignorant time.

There are eight claimants to the distinction and title of a Pamir, whose pretensions appear to be sufficiently established by local usage, though it is a mistake to suppose that the nomad Kirghiz will at once in each case recognize them by the accepted geographical name. They are as follows :—

1. The Taghdumbash, or Supreme Head of the Mountains Pamir. This is the Pamir lying immediately below and to the north of the Kilik Pass. It is closed on the west by the valley leading up to the Wakh-jir pass into Wakhan, from which point it first stretches away in an easterly direction to Ujad-bai, where it receives a second fork or bay coming from the direction of the Khunjerab Pass on the south, and then turns north, till it finally terminates at the Chinese fort of Tashkurghan, a total distance of about 60 miles. This Pamir lies in a different watershed from the whole of the remaining Pamirs, and is physically, as well as politically, part of a different system. Its elevation ranges from 10,000 feet at its northern to 15,000 feet at its western extremity, and its breadth varies from 1 to 5 miles. Its inhabitants are Kirghiz, Sarikolis, and occasionally a few fugitives from Wakhan. They are under the jurisdiction of China, whose authority is represented by sixty soldiers in the fort at Tashkurghan, and who is as ignorant of the real conditions in her Pamir dominions, and as utterly incapable of defending them, as she has recently been proved to be in places that are the keys of the empire and under the very eye of the central government. At the time of my visit the Kirghiz head-man, who was responsible to the Chinese for the local jurisdiction, was Kasim Beg, who, with his family and flocks, was a fugitive from the more westerly Pamirs that had been occupied by Russia. He has since resigned the post.

2. The second Pamir is the Pamir-i-Wakhan, a narrow strip of grassy valley extending upon the northern bank of the Ab-i-Wakhan, or head stream of the Oxus, for about 20 miles from some distance below its source down to Bozai Gumbaz. It is the narrowest of all the Pamirs,

and is entirely uninhabited, but contains excellent grazing on the slopes.

3. The third is the Pamir-i-Khurd, or Little Pamir, which begins on the south in the valley of the Sarhad branch of the Oxus, a little above Bozai Gumbaz, encloses Lake Chakmak and then runs in a north-easterly direction upon either bank of the Aksu river to the destroyed and evacuated Chinese fort of Aktash. Its total length up to this point is about 60 miles, and it is here separated by a mountain range of no considerable breadth, crossed by the Neza Tash pass (14,920 feet) from the head of the Taghdumbash Pamir and the rival watershed of Chinese Turkestan. This Pamir varies from 1 to 4 miles in width. Though it is commonly regarded as terminating at Aktash, the valley continues with very much the same characteristics in a north-west direction, towards the junction of the Aksu river with the Ak-baital—an almost identical distance—but local caprice seems never to have invested it in this part with the title of a Pamir.

4. The fourth Pamir, as its name implies, is both in length and width the most considerable of all. This is the Pamir-i-Kalan, or Great Pamir, which commences on the south-west at a point below Yol Mazar, in the valley of the Pamir River branch of the Oxus, first explored by Wood, and then runs in an easterly direction, containing Wood's or Victoria Lake, and the small chain of lakes at its eastern extremity, and extending for a total length of about 80 miles as far as the watershed of the Aksu. Its width varies from 1 to 6 miles.

5. Continuing to the north, we next come to the Alichur Pamir, reaching on the west to the borders of Shighnan, drained by a river of the same name, and including the chain of lakes known as Yeshil Kul or Green Lake, Bulun Kul, and Sasik Kul or Putrid Lake. This Pamir is separated on the north by a lofty range of mountains from the next adjoining basin of the Murghab or Aksu.

6. In the watershed of the latter there appears on several maps, and there has been reported by more than one traveller as existing, the Sarez Pamir. In so far as the name is associated with that portion of the valley of the Murghab near Sarez, it has been pointed out by Mr. Ney Elias that it is a misnomer, since the valley there is very mountainous, and has none of the characteristics of a Pamir. Captain Younghusband, however, gives the name to a small piece of more open and grassy valley about 10 miles long below the Russian fort of Murghabi, from which it would appear that the title has been shifted to some distance from the original Sarez.*

* The Sarez Pamir was first reported by Pundit Manphul in 1867 (Davies' 'Report on Trade-Routes of the North-West Frontier,' Appendix, p. cccxxii.) Colonel Gordon in 1874 speaks of the "Siriz Pamir as a continuation of the Aktash valley from Akbalik (i.e. the junction of the Aksu and Ak-baital) westwards to Bartaug, the commencement of inhabited Shighnan, on the west" ('Roof of the World,' p. 158). Colonel Trotter on his map called it Sariz Pamir, but spelt Sirich Fort.

7, 8. The seventh and eighth Pamirs may be more rapidly dismissed. They are the Rang Kul Pamir, containing the lake of that name, which was formerly a Chinese but is now a Russian possession; and the Khargosh or Hare Pamir, which contains the basin of the Great Kara Kul Lake, and lies along the valley of the small stream that flows into it from the south, and along its eastern shore.

These are the main and authentic Pamirs. There are various other stretches of country to which the name has sometimes been applied, but to which it cannot be considered indisputably to appertain. These are, on the western side of the recorded Pamirs, the Pamir-i-Bugrumal, a valley below Yeshil Kul near the head of the Ghund valley, which



OVIS FOLI GROUND, TAGH-DUM-BASH PAMIR.

was mentioned by Colonel Trotter; and on the eastern side, the Mariom or Marian Pamir, which is depicted on some maps as an easterly branch of the Taghdumbash Pamir; and further, again, to the north the Sarikol Pamir. Sarikol, however, is not a Pamir, but a district, and the title is therefore a misnomer. It has also been said that the country lying on the Sarikol side of the Shimshal Pass in the Mustagh range, by which the Kanjutis used to make their raids upon the Yarkand-Leh caravans, is called by them the Shimshal Pamir.* Colonel Gordon further spoke of the Shiwa Pamir in Badakshan.† In each of these cases the appellation,

* *Vide* Biddulph's 'Tribes of the Hindu Kush,' p. 26.

† 'Roof of the World,' p. 162.

even if based upon physical resemblances, seems to be supported by insufficient evidence or usage, and cannot therefore be sustained.

As to the total area of the Pamirs proper, Sir H. Yule said that the plateau, as he called it, was at least 180 miles from north to south, and something like 100 miles from east to west. Mr. Freshfield, at a meeting of this Society in 1892, gave the figures as 280 miles of length by 120-150 miles of breadth. I calculate that the extreme length and breadth are almost exactly equal, and I reckon both at 150 miles, as measured by a compass upon the map.

I have already alluded to nomad Kirghiz as almost the sole inhabitants of the Pamirs. They are supplemented in a few places by wandering camps of Wakhis, Sarikolis, and Tajiks from Shighnan; but the population is kept down by the inability of the women to bear large families in so arduous a climate. With their flocks of sheep and goats, and droves of ponies and yaks, these nomads roam about, pitching their camps where the grass is best or the cold least severe. The bulk of the Kirghiz have at different times acknowledged a sort of general allegiance to China, as till lately the greatest neighbouring Power. Others have been subordinate to the Afghans, whom, however, they appear not to like. They are in reality ready to side with any power and to profess any allegiance that will least compromise their own independence. The Russians, since their appearance on the Pamirs, have claimed to exercise a sort of general suzerainty over the Kirghiz, on the ground that they were subjects of the annexed Khanate of Kokand; to which several of the tribes have replied by emigrating across the border into what is admittedly Chinese territory. I know of no foundation, historical or ethnological, for the claim, no mention of which is made by any of the Russian historians of Kokand (Nazaroff, Khoroshkin, and Nalivkin), while other Russian writers (*e.g.* Zagriashki and Radloff) have unreservedly acknowledged the Kirghiz allegiance to China.

I need not say much about the Pamir climate. It is widely known that for six if not seven months of the year, and certainly from the middle of November to the end of April, the Pamirs are deeply covered with snow, the lakes are frozen, and the passes are well-nigh impassable. The experience of the French travellers, Messrs. Bonvalot, Capus, and Pepin, who crossed the entire region from north to south in April, 1887, gives a fair indication of what may then be expected. On the other hand, at their entrenched encampment of Murghabi or Pamiraki Poste, situated at the junction of the Aksu and Ak-baital rivers, at an elevation of 12,150 feet, we know that 200 Russians have now been stationed throughout the winter for nearly three years. They are reported to have suffered severe hardships, but are well accommodated and housed.* The

* Since the Russians were installed at Murghabi, lat. 38° 8', long. (from Pulkowa) 43° 37', an opportunity has been offered, for the first time in history, of making

Kirghiz detest the neighbourhood of Lake Victoria, and will never voluntarily encamp there, saying that the climate gives them pain in the throat and chest. Their women find great difficulty in child-bearing on the Pamirs, the offspring being usually stillborn. Similarly, at Pamirski Poste the Russians have been unable to keep poultry alive, and have found that dogs will only breed once in three years. In the more southerly Pamirs the chief drawback to comfort is the wind, which usually blows with cutting intensity at some time in the day, and is worse than the cold. In Wakhan there is a particularly vicious wind, named the Bad-i-Wakhan, which blows steadily down the valley of the Oxus without intermission for weeks at a time, but sometimes takes the opposite direction. When I was on the Pamirs in September and October, the temperature, though it commonly sank to below zero (Fahr.) in the night or early morning, was delightful as soon as the sun was high. The air was crisp and invigorating, and, except when the wind was blowing, a more exhilarating climate could not be conceived. I did not myself feel the rarefaction of the air at all seriously below 16,500 feet; but our camp-followers, notably those who had come from India, were affected at a considerably lower level.

As regards the fauna of the Pamirs, I may refer for birds to the

continuous meteorological observations on the Pamirs. The Paris Geographical Society published in its *Comptes Rendus*, No. 1, 1895, the following table, which contains an entire year's observations, from September, 1893, to September, 1894. I have converted the Centigrade into Fahrenheit scale.

Year.	Month.	Mean temperature, Fahr.	Mean nebulosity, per cent.	Rainfall, millimetres.	Prevailing wind.
1893	September	47°	32	2·0	S.W.
	October	30°	22	0·0	S.W.
	November	17°	30	0·1	S.W.
	December	9°	47	4·2	S.W.
	January	-13°	56	2·8	S.W.
1894	February	0°	50	0·9	S.W.
	March	22°	44	0·7	N.E.
	April	34°	44	9·4	N.E.
	May	42°	42	12·4	N.E.
	June	54°	35	4·7	N.E.
	July	62°	50	11·3	N.E.
	August	56°	19	0·0	—

During the above period the minimum temperature recorded was -47° Fahr. in January, and the maximum 82° Fahr. in July. It froze in the morning during every month of the year. The rainfall is the lowest in the entire Russian Empire, seven times less than at Tashkend, and twice less than at Khiva. The north-east winds are much more violent than the south-west, and frequently culminate in hurricanes. In August there is a sort of equilibrium, and the winds blow equally from all points of the compass. Then also the sky is most clear. For some further information on the meteorology of the Pamirs, *vide* M. Capus' notes published in the Bulletin of the Paris Geographical Society, 1892, p. 316.

well-known paper of Severtsoff (translated in "The Ibis" of 1883). He mentions 120 different species, some breeding in the Pamirs, others only migratory, but none absolutely peculiar to the region. I saw myself wild geese and wild-fowl of many descriptions on the lakes. There were also snipe; I shot a quail at an elevation of nearly 14,000 feet on the northern slopes of the Chakmak Lake, and I saw them at 15,000 feet on the Taghdumbash Pamir. Lord Dunmore saw the common seagull on Victoria Lake. *Chikor*,* a bird resembling the French partridge, are very numerous in the Oxus valley, and snow-cocks or snow-pheasants have been frequently reported.† I saw eagles and lammergeier overhead. Hares positively swarm on the Taghdumbash, hopping about among the rocks and stones. There were also numbers of silver foxes, scurrying from burrows in the sandy soil, and a species of marmot. Colonel Gordon also mentions the lynx. Fish are very plentiful in the lakes, and many of the streams swarm with trout. Among the larger fauna, brown, red, and grey bears, snow-leopards and ibex are encountered in the mountains, and wolves and wild dogs chase the *Ovis Poli* over the snowy ridges. The latter animal, or celebrated ram of the Pamirs, is, of course, the chief glory of the region, whilst, owing to the extreme remoteness of its haunts, it still remains the most cherished object of the modern sportsman's ambition. So little information of any scientific value is, however, to be found about it in the English language, that I am tempted to add here the results of my own investigations.

The *Ovis Poli* is only one, though the largest and most famous, of a group of wild sheep that are found in many localities over a wide range in Central Asia, constituting a *genus*, the distinction of whose individual species still lacks scientific determination. Of these the *Ovis Poli*, *Ovis Karelini* (so named from the Russian explorer, Karelin, who was the first to obtain a specimen in the Ala Tau near Semirechinsk, in about 1840), *Ovis Heinsii*, *Ovis Nigrimontanei*, and *Ovis Argali*, have been separately named; the only authority who has devoted a first-hand and exhaustive inquiry to the subject being the Russian naturalist, Severtsoff.‡ The *Ovis Poli* and *Ovis Karelini*, however, share a large

* This is the small *chikor*, or Himalayan red-legged partridge (*Caccabis Chukor* of Gray) which Moorcroft in his travels mistook for the francolin.

† The snow-cock (*Tetrao gallus Himalayensis* of Gray) is identical with the larger *chikor*, a bird as big as a hen-turkey, described by Moorcroft and Vigne, and frequently mentioned to me in the Hindu Kush region, though I never encountered it.

‡ His treatise on the 'Mammals of Turkestan,' translated from the *Trans. of the Imp. Soc. of Naturalists of Moscow*, vol. viii., 1873, appeared in the *Annals and Magazine of Natural History*, vol. xvii., 4th series, 1876, pp. 171, 210, 217-220, 220-226. In the *Proceedings of the Zoological Society of London* have also been printed a number of papers by English writers, viz. Blyth, 1840, p. 62; P. L. Sclater, 1860, p. 443; Colonel Gordon and Dr. Stoliczka, 1874, pp. 53, 425; Captain Biddulph, 1875, p. 157; Sir V. Brooke and B. Brooke, 1875, p. 509; W. T. Blanford, 1884, p. 326. The majority of these relate to the *Ovis Poli*. For accounts by sportsmen of the pursuit of the latter animal, *vide* St. G. Littledale, cap. xii. vol. ii. of 'Big Game Shooting,' in the Badminton Library; and Lord Dunmore and Major Cumberland in the books before cited.

number of characteristics, which differentiate them to some extent from the remaining species.

The *Ovis Poli* was first so named by Blyth (in compliment to its original description by Marco Polo), from a head sent home by Captain Wood from Lake Victoria in 1838. Wood misnamed the animal *butcher*, whereas Blyth identified the *ras* or *reok*, mentioned by Burnes, with the *Ovis Poli*. The Kirghiz name, which I always heard employed, was *gulcha* or *gulja* for the male, and *erbar* for the female. The latter is a smaller animal, and has short horns, lying rather backward.

It is for his magnificent horns, of immense thickness, extraordinary length, wide span, and, in the case of the older rams, double convolution, that the male is specially renowned. The biggest head known to exist is one that had been picked up (not shot), and was presented to Lord Roberts by the Maharaja of Kashmir. Its length from base to tip of the horn is 75 inches; circumference of horn at the base, 16 inches; width of horns from tip to tip, 54½ inches. The recent Boundary Commission measured a single horn of a broken skull, which was lying in a heap at the mouth of the Urta Bel pass, and found it 72 inches. The largest head in the Natural History Museum at Kensington measures 68 inches in the horn, and is from the collection of the late Mr. A. Dalgleish. The biggest head that has fallen to the rifle is 65 inches. The horns are ringed by well-marked indentations or annulations, corresponding to the age of the animal; although it is only the minimum age that can be determined, since the original rings get blunted and worn away as they grow towards the extremity. Enormous numbers of skulls and of broken or rotting horns are strewn all about the Pamira, and are often collected by the Kirghiz in heaps. Judging from their extraordinary abundance, the mortality arising from attacks by wolves and wild dogs, from the severity of the climate, and from combats among the males, must be very great.* The breeding season of the females begins in October.

The locality in which *Ovis Poli* have been chiefly, if not solely, encountered by Englishmen, is the Pamira. Throughout the region between the Great Kara Kul and the southern boundary of the Taghdumbash Pamir they are found in large herds. I did not myself observe more than fifteen or twenty in a herd, but as many as three hundred were seen by the recent Boundary Commission at one time. Their *habitat*, however, is by no means confined to the Pamira, which are merely the south-west corner of their range. Severtsoff says they were met by Semenov in great abundance on the high plains of Aksai, and of Khan Tengri in the Tian Shan mountains, and about the sources of the rivers Karkara, Tekes, and Sarijazin, to the east and south-east of Issik

* The story is told of the *Ovis Poli*, as of other mountain sheep, that, when jumping, the excessive weight of the horns sometimes makes the ram lose his balance and pitch on to his head. But I doubt if there is any foundation for this tale.

Kul. From here their range extends in a south-westerly direction to the Narin, the upper Sir Daria, and the tributaries of the Kashgar Daria, *i.e.* as far as the Alai. The lowest elevation, however, at which Severtsoff or Semenoff reported them was about 10,000 feet. The *Ovis Poli* may be said, therefore, to have a double *habitat*, the western Tian Shan and the Pamira, separated from each other by the Great Alai.

Here, however, we are met by the as yet unsolved problem of the precise identity of the brother sheep, or *Ovis Karelini*. The latter was shot by Forsyth's and Gordon's party in 1872, in the western Tian Shan, to the north-west of Kashgar. They thought it the same as the *Ovis Poli*, though it had smaller horns; but later on, when they compared the two species at Calcutta, they thought them distinct. Undoubtedly there are superficial differences of a marked character, which render the majority of specimens easy of distinction. These differences may be thus summarized :

OVIS POLI.

The range of *O. P.* has already been mentioned. At one place, *viz.* Ulan, above the mountains of Atpash, Severtsoff found *O. P.* and *O. K.* living together.

O. P. has not yet been reported at a lower elevation than 10,000 feet, but is encountered up to 17,000 feet.

O. P. is a larger animal. Severtsoff gave the average height at shoulder as 3 feet 10 inches, average length as 6 feet 7 inches.

O. P. has a much longer and whiter mane, which is 3 to 4 inches long on the spine, and 6 to 7 inches on the throat and neck.

OVIS KARELINI.

Habitat.

O. K. has not been met with in the Pamirs. It is very plentiful, however, in the Semirechinsk province, north of Issik Kul, in the Altai and Sapliiski Altai, and in the mountains and plains between the rivers Chilik and Keben, east of Turgeli; and its range is partly identical with, partly to the northward of, that of *O. P.*

Elevation.

O. K. is found at every elevation from 2000 to 12,000 feet.

Size of Animal.

Average height of *O. K.* at shoulder is 3 feet 6 inches; average length, 5 feet 10 inches to 6 feet.

Colour of Neck and Mane.

There is more brown and grey hair in the mane of *O. K.*, which is also shorter.

Length of Horns.

Herein lies the main difference. *O. K.*'s horns are only three times the length of its skull. The horns of *O. P.* are more than four times the length of its skull. Longest recorded horn, 48½ inches. Longest recorded horn, 75 inches.

Span and Curve of Horns.

O. P.'s horns have a much wider span, and branch further away from the head. In the case of the older rams, they also describe the beautiful twofold outward curve. *O. K.*'s horns are set closer on the head, describe a narrower sweep, and (so far as I have seen) never attain the double twist.

These are the main superficial differences between the majority of the observed specimens of the two sheep. On the other hand, there occurs a point at which even these salient characteristics appear to blend, and at which no immutable difference is left between them. In other words, the abnormal *Ovis Poli* can scarcely be distinguished from the normal *Ovis Karelini*, nor the abnormal *Ovis Karelini* from the normal *Ovis Poli*. Hence it has been contended by Mr. Blanford and others that to speak of them as belonging to different species is erroneous. Perhaps it would be safer at this stage to say that the examination of a much larger number of specimens coming from a much wider area than is accessible, at any rate to the English student, is required, before the latter can arrive at any scientific induction. St. Petersburg would probably afford better materials for such a scrutiny than London. In our Natural History Museum *Ovis Karelini* is labelled as a variety of *Ovis Poli*, because of the prior discovery of the latter.

The mention of Marco Polo's sheep brings me back to the point at which I left my own journey to embark upon a general digression on the Pamirs. This was near the westerly termination of the Taghdumbash Pamir. There the Kirghiz had pitched for us three of those circular huts of felt, spread over a wickerwork frame, which are variously called *akoi* (i.e. white house) and *yourt* by the Kirghiz, *kibitka* (a Tartar word) by the Russians, and *kirgah* (i.e. warm place) by the Afghans. In cold regions like the Pamirs they are incomparably better and more comfortable than any tent. A fire can be lit inside, and the amount of ventilation and degree of warmth can be regulated by pulling the felt coverings on or off the roof. During my subsequent march through Afghanistan in December from Kabul to Chaman, I invariably slept in a *kirgah* lent me by the Amir. The Russian soldiers, in their fort at Murghabi on the Pamirs, are similarly installed.* On

* The lower part of the hut is made of a framework of willow sticks, which, when pulled out and fixed, covers a diameter of about 14 feet. These constitute the outer

the Taghdumbash, Lennard and I devoted four days to stalking *Ovis Poli* in the neighbouring *nullahs*. Of these the favourite one for European sportsmen, and the spot where the bulk of the large heads have so far been obtained, is the Kukturuk *nullah*, which runs for a distance of between 4 or 5 miles between lofty mountains in a north and north-westerly direction from the Pamir. A stream courses along a stony bed in the bottom of the valley, which is not more than a quarter to half a mile wide. At its upper end stands a curious mountain with a pointed summit like a tooth, to the right and left of which the valley splits into two smaller *nullahs*, which are presently blocked with snow. I



AKOI, OR YOUT.

was lucky enough, in the course of only two days' stalking in the Kukturuk, to get two heads, though the dimensions of the larger of these, 54 inches along the outer rim of the horns from the base to the tip, could not be compared with the big heads of 60 inches and upwards that have been shot by Littledale, Lennard, and other sportsmen. The fact is, that so circumscribed is the area, not in which the *Ovis*

walls, and are covered outside with reed mats and felts, which are sometimes kept in place by richly embroidered needlework belts. On to the top of this framework, which is 5 feet in height, are tied curving willow rods, which converge upwards towards the roof, where a circular aperture is left nearly 5 feet across, further transverse oziars forming an open dome, over which the roof-felts are pulled by outside cords. The total height from floor to apex is from 10 to 12 feet.

Peli exists, but in which it has hitherto been procurable by British sportsmen, and so serious have been the depredations made by recent visitors upon the accessible herds within this area, that there is already a sensible diminution in the number of first-class heads that are seen; and unless some measures are adopted to regulate the exuberant zeal of the hunters who take advantage of passports to Chinese Turkestan to decimate the resources of the Taghdumbash Pamir, the time cannot be far distant when the finest of these magnificent animals, instead of peering from their native retreats in the *Kukturak sullak*, will only be visible behind a glass case in European museums. It is nothing less than an absurdity that, while English officers and travellers are prohibited by the Indian Government from crossing the Hindu Kush for fear of exciting Russian susceptibilities on the Pamirs, they should be able to arrive at exactly the same destination and to inspire the self-same alarms, whether real or hypothetical, at the same time that they render such an ill service to genuine sport, by adopting the circuitous route of the Karakoram and Yarkand. If some sensible restriction, however, be placed both upon the facilities afforded to travellers, and upon the number of heads that they are permitted to kill, there is no reason why the famous ram of the Pamirs should not remain the supreme and legitimate object of the sportsman's desire for many years to come. I should add that we were on the ground at the wrong time of the year for sport. All the big bags have been made in the late spring and early summer, when there is still plenty of snow, and the rams come down to feed upon the young grass that is then springing by the streams. No severe climbing is at that season required in their pursuit; the animals furnish very easy shots, and their retreat is frequently impeded by the depth of the snow. In the late autumn, on the other hand, they spend the greater part of the day above the snow-line and on the topmost peaks. In my own case I had to climb after them through the snow to an elevation of approximately 17,000 feet, at which the difficulty of respiration was very great.

From the Taghdumbash we crossed the Wakh-jir Pass to the watershed of the Oxus and the Wakhan Pamir. The Wakh-jir valley opens out at the extreme westerly end of the Taghdumbash. It has two forks, over the pass that closes the more southerly of which Captain Younghusband made his way with yaks in October, 1891, to the Upper Oxus valley. The right fork is that which leads to the Wakh-jir Pass. This appeared to be the name by which it is known to the Kirghiz; Khujrui, I was told, being the title given to it by the people of Sarhad and Wakhan. The name Wakhjruui, which I see printed upon many maps, I take, therefore, to be a confusion of the two names.* The

* The pass is called Karanchunkar in the report of Mohammed Amin of Yarkand, Adolph Schlagintweit's guide. *Vide* Davies' 'Trade Report of N.W. Frontier,' 1862, Appendix iv. B. This is the same name as Karachukur, the name given by

ascent is gradual, but there is a steep rise in the latter part towards a lake about 1000 yards long by 250 yards broad, which is fed by a small stream at its westerly end, and itself discharges the Wakh-jir tributary to the Danga-bash or Taghdumbash river from its eastern extremity. A short sharp rise conducts to a flat stony plateau which is the summit of the pass. I broke my last remaining thermometer while taking the altitude by boiling-point on the summit. The Russian map gives it as 15,070 feet, M. Dauvergne by aneroid as 15,600 feet, Colonel Woodthorpe by hypsometer as 16,150 feet, the Indian Intelligence map as 17,000 feet, and Lord Dunmore by aneroid as 17,200 feet. All purely aneroid measurements are to be distrusted. My own aneroid, as soon as I got above 13,000 feet, performed the most ridiculous freaks, which their intrinsic absurdity compels me to suppress.

From the top of the Wakh-jir Pass the descent is rather steep and stony towards the Oxus valley, which is visible far down below, a blue line of shingle-bed winding away between lofty ridges crowned with snow, particularly on the south bank. As this is the stream which I believe, and shall here argue to be the true and indisputable source of the Oxus, I will first describe my visit to the actual spot, and will then deploy the line of reasoning by which its claims are sustained. Though the former involves but a divergence of a few miles from the track, and though the glacier or glaciers from which the river springs are visible at the head of the valley, no traveller that I am aware of has taken the trouble to ride up to the place itself. M. Dauvergne, who camped at a little distance in 1889, and who, as Colonel Woodthorpe had already done in 1886, rightly concluded that this was the parent stream, drew a picture of three great glaciers.* They also appear as such in the Russian military map, which coolly calls them the Baron Vrevski glacier, from the name of the present Governor-General of Russian Turkestan. The Indian and English Intelligence maps represent quite a number of parallel glaciers. The only map in which their position and shape are at all accurately rendered is that of the native surveyor who accompanied the mission of Lockhart and Woodthorpe in 1886, but of which there is not a copy in England. I will describe what are the actual facts.

From far above, the main glacier can be seen winding round from the north or left hand to the head of the gorge, in which, however, its point of discharge is not visible. Descending to the shingle-bed, which varies from 100 to 350 yards in width, the channel being divided into

Grombchevski and the Russians to the upper course of the Taghdumbash stream. As applied to a pass, it appears more strictly to belong to a *nullah* leading from the Taghdumbash to the Little Pamir, to the east of the Kukuruk.

* *Vide* his paper published in the Bulletin of the French Geog. Soc. for 1892, and condensed in *Proceedings of the R.G.S.*, vol. xiv., 1892, p. 779, and in the *Scottish Geog. Mag.*, 1892, p. 362. He gave the elevation of his camp as 14,700 feet, and the position as lat. 37° 10', long. 75° E.

several branches of from 6 to 18 inches deep, I rode up it to the source. There the river issues from two ice-caverns in a rushing stream. The cavern on the right has a low overhanging roof, from which the water gushes tumultuously out. The cavern on the left was sufficiently high to admit of my looking into the interior, and within for some distance I could follow the river, which was blocked with great slabs of ice, while there was a ceaseless noise of grinding, crunching, and falling in. Above the ice-caves is the precipitous front wall or broken snout of the glacier, from 60 to 80 feet in height, composed of moraine ice, covered with stones and black dust. I clambered up this to the level of the top



HEAD OF OVIS POLI.

of the moraine, and from there could see the big glacier, with its jagged ice-towers and pinnacles and crevasses coming down from a valley on the left. A lofty mountain crowned with snow blocked up the end of the main valley, and from a *nullak* on the right of this, another ice-field contributed its volume to the main glacier, whose terminal moraine was jammed up and contracted in the narrow outlet of the two valleys. The source of the river is, therefore, not in three great glaciers, but in one great glacier, to which smaller glaciers contribute. At a short distance below the source, a small but incomplete glacier comes to the edge of the cliff on the southern bank, and no doubt frequently adds to the volume of the stream. When I saw it, no water was issuing from its base. When Captain Younghusband, in 1891, crossed over the more southerly

fork of the Wakh-jir Pass, as before mentioned, and was on the Oxus slope of the watershed, he came upon a small lake, from which issued a tricklet of water.* This, no doubt, was one of the feeders of the big glacier which I have described.

Now, before I proceed to state why this is the chief source of the Oxus, let me name, in order of their occurrence, the names of all the claimants to the title. The stream whose source I have depicted is called the Wakh-jir, from the pass which I had crossed, and from the west end of which three rills trickle down the mountain-side and fall into its bed a few miles below the glacier. This name erroneously appears as Varjer in Mr. Littledale's paper and map.† Lord Dunmore calls this the Ak Bilis, or White Pass or *col*, but I know not on what authority. The name appears on no map, and, so far as I know, has never previously been heard of or mentioned by any traveller. None of the Kirghiz or other people with me had ever heard of such a title. Some maps, including both the Indian and English Intelligence maps, call this branch the Aimagon or Almaghan; and M. Capus, perhaps from such a map, spoke of the pass as the Akdjir (obviously Wakh-jir) or Almaiane. The same name appears as Almaghan in the published report of Ivanoff and Benderski's great expedition in 1883, and as Almayan-saya in Grombochevski's report in 1889. What this word may mean has always been to me a mystery. I could gather nothing about it on the spot. It has been suggested that it may have arisen from the blunder of some careless copyist or compositor, who mistook the letters of the name Ab-i-Wakhan, which the river undoubtedly bears lower down. M. Capus also mentions the name Ab-i-Chipri, but this again is quite without confirmation, unless, perhaps, it be a perversion of Ab-i-Chap, i.e. the left-hand stream.

The next claimant is the stream, perhaps best called the Sarhad or Little Pamir stream, which flows into the Wakh-jir at Bozai Gumbaz, about 25 miles below the glacier source, and which itself rises in the low *col* or plateau that lies at the south-westerly end of Lake Chakmak, on the Little Pamir. It was first introduced to English knowledge by Major Montgomerie's Mirza in 1868-9, who, however, erroneously reported that it flowed out of the west end of Chakmak Lake. This stream, from its start to its junction with the main river, has a course of less than 10 miles, and is narrow, shallow, and quite without significance. It would be unworthy of mention in this context had not some travellers, such as M. Capus, regarded it as one of the parent streams, and had not the claim been also put forward to Lord Dunmore by some of the Russian officers whom he met. There is not a single argument in its favour. In the Russian map, the river or its valley figures, I know not why, as Kuntei-sai.

* Vide *Proceedings of the R.G.S.*, vol. xiv., 1892, p. 231.

† *Ibid.*, January, 1892.

Third in order as we descend the main river, which below Bozai Gumbaz is variously called Wakhan-su, Wakhan-daria, Ab-i-Wakhan, and the Sarhad river, we come to the branch that flows in, also on the right bank, from the Great Pamir, where it rises in Wood's or Victoria Lake. This is the river which was assumed by Wood, and by every one else in consequence of his discovery in 1838, to be the true parent stream of the Oxus, a mistake which, though natural enough on his part, it has taken fifty years to rectify, and which has given rise to at least one-half of the political confusion and diplomatic controversy arising out of the Boundary Agreement concluded by Lord Granville with Russia in 1872-3. The geographical basis of that agreement was the assumption that this branch was the head stream of the Oxus; and when it was found out not to be so, it is not surprising that great uncertainty and confusion should have ensued. This river is commonly marked on maps as the Pamir river, although the title Panja or Ab-i-Panj, which the main stream commonly bears below Kila Panja, is by some applied also to this upper branch. Neither in length, volume, nor any of the requisite characteristics, can it base any claim to be really accounted the parent stream, and we may therefore dismiss it from consideration.

It is not till a point some 160 miles below the confluence at Kala Panja, after the main river, now known indisputably as the Panja or Ab-i-panj, has made the great bend to the north at Ishkashim, after it has received from the east the united streams of the Shakh and Ghund Daras, after it has passed on its left bank Kala Bar Panja, the capital of Shighnan, and is approaching Kala Wamar, the capital of Roshan, on its right bank,—that there comes in from the east the only affluent that can attempt to seriously dispute the validity of the Panja's title. This is the river which, known above its confluence as Bartang (*i.e.* "narrow passage"), higher up as Murghab (*i.e.* "water-fowl"), and higher again as Aksu, originally emerges from the eastern end of Lake Chakmak on the Little Pamir, and throws a great loop round the middle Pamirs on the north, just as the Panja similarly encircles them on the south. The claim of the Murghab or Aksu to be the parent stream—first suggested some thirty years ago by the Russian geographer Veninkoff, and temporarily entertained, on political, perhaps, rather than on geographical grounds, by Sir H. Rawlinson and some other writers—has from time to time been revived, and has found favour with some who were unacquainted with the full geographical details. Although this hypothesis is not, I believe, now entertained by any one who can pretend to such knowledge, it may be well to state the reasons for which it cannot possibly be accepted.

The arguments which have been used in its support are as follows. Firstly, it has been suggested that the Greek name Oxus, by which the river in and above Bactria has been known since the days of Alexander,

is a corruption of the Turkish name Ak-su (*i. e.* "white water") by which the Murghab is known in its upper course. Secondly, it has been stated that the entire length of the Aksu-Murghab-Bartang is greater than that of the Panja. And, thirdly, it has been suggested that it receives a larger number of confluent in its passage. None of these contentions, however, can be established.

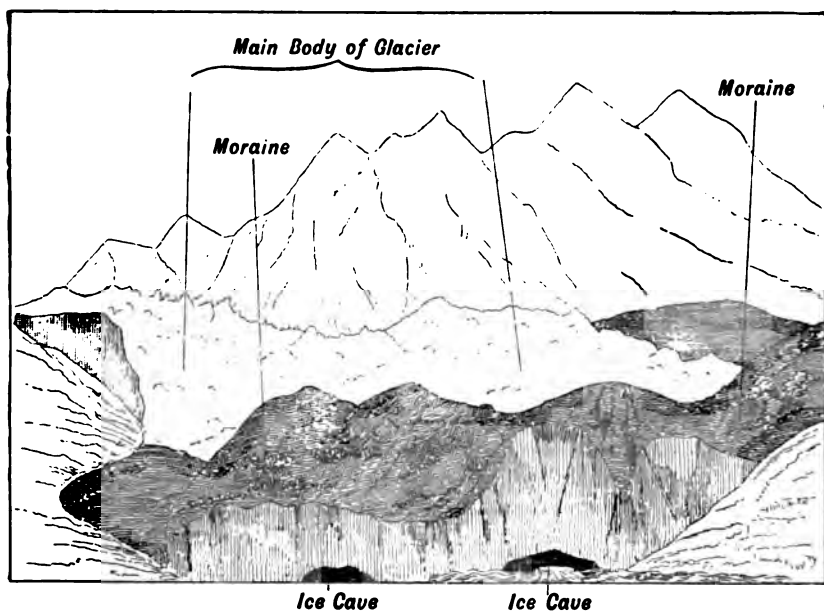
The theory that Oxus is merely a Greek transliteration of Aksu, is one of those purely fanciful identifications to which amateur etymology is particularly prone. In the first place, Aksu is the name only of a limited, and that the most insignificant, section of the Murghab or Bartang river, of whose existence it is scarcely possible that the Greeks can ever have been aware. When they came to Bactria, and asked the name of the great river, it is in the highest degree unlikely that the inhabitants would have given to them the name of a remote stream many hundred miles distant, of which not one of themselves had probably even so much as heard. Secondly, as a Turkish name, it is doubtful whether the name Aksu can have sprung into existence until long after the Hellenic form Oxus had been coined. Thirdly, that the name Oxus was the Greek transcription of some very early form appears to be certain. As to what this may have been authorities differ. Sir H. Rawlinson regarded it as the Hellenic version of Wakhsh, the name of the principal northern confluent of the great river, which, under the modern Persian title of Surkh-ab (identical with Kizil-su, or Red river), flows into it from the direction of the Alai, between Karategin and Darwaz, while he regarded the Persian form Wakhsh as identical with the Vakhshu of Sanskrit literature, which, in the Puranas, and in the traditions and travels of the early Buddhist pilgrims, is described as third of the four rivers of the Aryan paradise; and, with the Mongolian Bakhshu, the Tibetan Pakshu, and the Chinese Fotsu, all of them being names given to the same river—*i. e.* the Oxus—from very remote times. What may have been the original root of the Sanskrit Vakhshu is uncertain. *Vah* ("pure"), *vah* ("to flow"), and *vaksh* ("angry"), have been suggested. They may have been strengthened into it, or it may have been contracted into them.* With reference to his suggestion, I may observe that it appears to me unlikely that the Greeks would have named the main river from what was obviously only a tributary, even though a considerable tributary, in a part of its course with which they must have been perfectly familiar, and far above which they were thoroughly acquainted with the main stream.

Sir H. Yule sought the origin of the name in the same Sanskrit root, *vah* or *vah*, which he regarded as appearing in the various forms Wakh-an and Wakhsh, from the former of which he supposed the Ochus,

* *Vide* Sir H. Rawlinson's 'Monograph on the Oxus,' in the *Journal of the B.G.S.*, vol. xlii., 1872, pp. 489, 496, 501.

mentioned as a Central Asian river in Strabo and Pliny, to have been derived, and from the later Oxus, Oxii, Oxiani.*

Professor Vambéry, however, scouts these derivations, and says that Oxus was merely the Hellenized form of Oghuz or Okhuz, which was the old Turkish denomination of a big water or river. He cites the Sheibani-nameh, written at the end of the fifteenth century, where the Oxus is often called Oghuz, and he says that the Uz-boi or Turkoman name for the ancient bed of the same river existing in the desert south of Khiva, is a contraction of the same title. It seems to me, however, most unlikely that Turkish names should have prevailed in Bactria and Sogdiana at the time of Alexander, before the Turks had been so much



GLACIER SOURCE OF THE OXUS.

as heard of; and it is noteworthy that in all the Mussulman chronicles and geographers, from the first appearance of the Arab conquerors in those regions, the name applied to the river is not Oxus, but Jaihun. If Oghuz was, and had been, its admitted title for centuries, why is it always designated by another?

To me it appears more likely that the Greeks of Alexander's day should have heard a Tajik or Iranian name, *i.e.* a word of Aryan descent;

* *Vide* Introduction to Wood's 'Oxus,' p. xxiii. He thinks, with plausibility, that the first of these forms reappears in the name Oech—undoubtedly the River Oxus—to which the Byzantine ambassadors from the Emperor Justinian to Dizabulus, Khan of the Turks, in 568 A.D., came on their return journey to Europe (*Ibid.*, p. xlii).

and whether this now unknown word was allied or not to the root-forms cited by Rawlinson and Yule, it may conceivably in its origin have sprung from that primordial form signifying water, which is variously supposed to reappear in the Latin *aqua*, French *Aix*, Erse *uisge*, Gaelic *usque-baugh*, English *whisky*, and in the river names Usk, Axe, Exe, Esk, Ox-ford, and Ouse.

The second argument in favour of the Aksu-Murghab is its alleged superiority of length. The Russians say that from its source in the Chakmak Lake to Kala Wamar it is 252 miles in length; while the Panja from the glacier-source to the same point has been roughly estimated as 240 miles. I do not myself regard the test of mileage, particularly when the figures are so evenly balanced, as of any conclusive value. But I may say, from a double calculation of compass-reckoning, and ascertained length of marches, that I believe the course of the Panja to Kala Wamar to be not 240 but 270 miles, or nearly 20 miles in excess of the asserted length of the Aksu. So that even on the score of length the advantage is not, as claimed, to the Aksu, but to the Panja.

The third argument, viz. that the Aksu-Murghab receives a larger number of tributaries, can, of course, only mean that it contains a larger volume of water. Now, it is obvious that the sole method of applying this test is not by counting upon the fingers the respective number of confluent, but by measurement of the volume of the two streams at the point of junction. Not one of the advocates of the Aksu-Murghab theory, however, has ever visited Kala Wamar. On the other hand, Mr. Ney Elias, the only Englishman who has ever been there (in November, 1885), has recorded that from careful inspection and personal fording of both rivers, and from minute local inquiries as to their respective fluctuations, he was able to satisfy himself that the Panja is, at every season of the year but one, a very much more voluminous stream than the Murghab. That exception is in the summer months of June and July, when, owing to the much greater proximity of the main glacier feeders of the Murghab (viz. the Kashala Yakh at the head of the Kudara tributary, south-west of the Great Kara Kul) and to its more compressed channel and steeper bed (involving a greater fall per mile) between the Kudara junction and Kala Wamar, there is probably more water in the Murghab at the latter place than in the Panja; a view which was borne out by the native surveyor, despatched by Colonel Trotter, of the Forsyth Commission, to this spot in June, 1873. He reported that both the volume and velocity of the Murghab were greater at that season, but he made no attempt to ascertain their relative depth. As soon as this brief spate, due to the summer melting of the glacier surfaces, is over, the Murghab dwindles rapidly, and when Mr. Ney Elias saw it in the season of low water in 1885, it had somewhat less than half the volume of the Panja. He

summed up by saying that of the three elements of which a river consists—breadth, velocity, and depth—the first is greater in the Murghab in summer and in the Panja in winter; the second is always greater in the Murghab; but the third, and most important, is always greater in the Panja; whilst, roughly speaking, the duration of winter to summer is as three to one.

I hope, therefore, I have shown incontestably that, upon each of the grounds put forward by the advocates of the Aksu-Murghab theory, their case breaks down. I may add that there are certain subsidiary criteria of the headwaters of a river, the application of which will be attended in each case with precisely the same result. If elevation of source be considered, then the Panja is easily the superior; for whereas the height of Lake Chakmak was registered by Colonel Trotter as 13,200 feet, by Captain Younghusband as 13,850 feet, and by the Boundary Commission of 1895 as 13,100 feet, that of the glacier source of the Wakhjir was given by M. Dauvergne as 14,700 feet. If, on the other hand, total drainage area be taken into account, though, in the absence of more accurate surveys than we at present possess, I hesitate to dogmatize, yet a glance at the map will show that, to all appearances, the advantage is greatly on the side of the Panja.

There remain two other arguments, one based upon physical, the other upon historical grounds, which should not be without weight. To some extent the structure of a valley containing a river may be said to bear upon the question of its identity. That any one who had followed up the valley of the Panja to Kala Panja in the first place, or to Bozai Gumbaz in the second, and had at either of those places seen the main valley, with no physical interruption, continuing to pierce the mountains, should ever have entertained any doubt as to its containing the principal stream, seems to me very strange.*

* And yet an almost unbroken succession of travellers and authorities, from Wood downwards, have been guilty of the error. Wood himself had serious qualms; for when he came to the junction above Kala Panja, and had to make up his mind which branch to pursue—whether the Pamir confluent from Victoria Lake, or the Sirhad or Mastuj branch, as he called the Ab-i-Wakhan, from a mistaken idea that it somehow conducted into Mastuj and Chitral—Le said, "To my eye the stream of Sirhad, as the river from Mastuch is frequently called, appeared the larger, but the Wakhanis held a different opinion." Had he followed his eye instead of his guides, the true source of the Oxus might have been determined half a century earlier, and the two governments of Great Britain and Russia might have been spared the long controversy over the ignorant agreement. Yule, following Wood, expressed some doubts as to whether the Pamir or the Sarhad were the real parent stream; but writing as late as 1872, he entertained not the slightest suspicion of the existence of the real Wakhan source (which is not even indicated in his map to the new edition of Wood in that year), but accepted the account of Major Montgomerie's Mirza in 1869, who said that the Sarhad branch rose in the Little Pamir or Chakmak Lake. More remarkable is it, that even after the falsity of the latter hypothesis had been discovered, the subsequent travellers who came to Bozai Gumbaz, at the junction of the Sarhad and the Wakhjir stream,

The final argument is that of historical authority and popular acceptance. In the first place, it is noteworthy that, from as far back as records extend, the identity of the river below Kala Wamar with the Panja (and not with the Murghab) above has been assumed by the inhabitants of the district, indicating that, in their opinion, this was the parent stream. Like the Greek Oxus, so the Persian name Panja is applied to the river both below and above Kala Wamar—in fact, over the whole distance from Kala Panja to Kolab. Secondly, if we consult the best-known Arab geographers—nay, even if we come down to the present century, and study the writings of a countryman of our own—we shall discover indications of the real truth so unmistakable that it is surprising they should have been so completely overlooked. It is a common consensus among the Arab writers that the Jaihun, as they uniformly call it, rises in or near to Badakshan, a description which can only refer to the southern or Wakhan branch, and not possibly to the Murghab or Aksu. Istakhri, however, who wrote in the tenth century, was even more precise. "The Jaihun rises under the name of Jariab (or Khariab) in the land of Wakhan, which belongs to Badakshan. In Khotl and Wakhsh it receives several tributaries, which swell it to a great river. The first of these is called Akhas or Halbak; the next is the river Bartang; the third is the river Faraghi; the fourth is the river Andijara; the fifth is the Wakhshab, which is the greatest of all these rivers." Edrisi, in the twelfth century, almost textually reproduced this description, which, however we may identify the remaining four confluents, at any rate expressly includes the Bartang or Murghab among their number. Finally, if it be said that in none of these accounts is the precise source indicated, but only the more southerly or Panja branch, let me cite a memoir by Lieutenant Macartney, printed as an appendix to Mountstuart Elphinstone's "Kingdom of Caubul" (published in 1815), in which, quoting from some native informant whose name is not given, he supplies an almost absolutely correct description of the Wakh-jir source, as I have already depicted it, and concludes, with a prescience which for seventy years only one person was found to imitate, and none to detect, that it was the true parent stream. These are his words:

"The river Ammu, or Oxus, has its source from the high lands of Pamer. It issues from a narrow valley 200 or 300 yards broad in Wakhan, the southern boundary of Pamer. This valley is enclosed on three sides by the high snowy

should have all but ignored the latter. Gordon in 1874, upon arriving at Bozai Gumbaz, merely remarked, "A stream from the eastern Taghdumbash Pamir joins here." Capus, in 1887, said nothing about it at all. Littledale, in 1890, said, "At Bozai Gumbaz another stream joined the Wakhan called Varjer" (i.e. Wakh-jir). Had any of these travellers, from Wood downwards, ever read the description of Macartney, which was written in 1809 and published in 1815, and which I shall quote presently, he could hardly have committed such an oversight.

mountain called Poohtukhur * to the south, east, and west. The stream is seen coming from under the ice, which is stated to be at least 40 spears in depth. The spring itself could not be seen in consequence of the great mass of ice formed over it; but there can be no doubt of the spring's being on this hill under the ice, for it does not appear that there was any opening or break in any of the three sides mentioned, by which it could come from a more distant place. I therefore conclude that this is the true head of the Oxus; at all events the greatest body of water, though there are others which may have a more distant source. It is carried north † in this narrow valley for 5 coss; ‡ at 4 coss it is 20 yards broad, and breast deep; and on leaving the valley, after having been joined by many other springs from the same hill, it is 50 yards, and middle deep. The Shiber, or Adum Kosh, § joins it 5 coss above Kilia Shah Jehan; 25 coss below Poohtukhur. In this distance seven or eight streams, from knee to middle deep, and from 10 to 30 yards broad, join it from the left bank. ¶

I submit that Lieutenant Macartney's native informant, whoever he may have been, was a better-informed and a more competent geographer than the host of big names who have succeeded him, and I gladly disinter this forgotten passage, in order to lay a tardy wreath upon its author's grave. I am the more ready to offer this compliment, since the only competitor for its award, in the person of the single follower to whom I have alluded, was also a native. Mohammed Amin of Yarkand, the guide of the murdered Adolph Schlagintweit, supplied to Pundit Manphul a geographical description of Chinese Turkestan and the neighbouring regions, to the accuracy of which modern geographical research lends ever-increasing testimony. In this report, which is printed as an appendix to Davies' 'Trade Report of the N.W. Frontier,' in 1862, occurs a passage which I have never seen quoted, but which, though fifty years later than Macartney, must share with him the credit of perfectly faithful presentment. He says, "Another stream from the Pamer Khurd lake (*i.e.* the Sarhad stream from Lake Chakmak) falls into the *headwaters of the Daria-i-Panj* near Karwan balasi ** (*i.e.* at

* Pooht-i-Khur means literally, "Ass's Back," presumably from the shape of some crest or summit of the mountain. Major Raverty ('Notes on Afghanistan,' p. 160) thinks this is a fictitious title, which he supposes to have arisen from a confusion with the Bushkar Darah, a valley on the western border of Chitral, over 150 miles away. At the same time (p. 302) he accuses Macartney of having confounded the glacier source of the Oxus with the glacier source of the Yarkhun or Chitral river, whereas Macartney was quite right in distinguishing the sources of the two rivers as rising on opposite sides of the central Hindu Kush watershed.

† The real direction is north-west.

‡ A coss, or kos, varies from 1 mile 4 furlongs to 1 mile 6 furlongs. It is the Hindu equivalent of the *karok*, also a term of variable quantity, which prevails in Afghanistan.

§ This is clearly the Sarhad, or Little Pamir confluent. The distance as given is almost exactly correct.

] This must have been one of the forts whose ruins are still visible below Bozai Gumbaz.

¶ This also is correct.

** Karwan or Caravan balasi is a name still applied to a piece of good grazing-ground on the right bank of the Oxus, opposite to the junction of the Baikara stream.

Bozai Gumbaz), which have their source on the western side of the Karachunkur pass in the Pamer range (i.e. the Wakhjir Pass), below the Piryakh peak in the Karakoram range."* The Piryakh peak is, apparently, that which is elsewhere called Pirkhar,† and was described by Macartney as Pusht-i-Khur. Had the scientific geographers who made the careful Yarkandi's report the basis of speculations as ingenious as they were mistaken, only paid attention to his written words, again might the discovery of the true source of the Oxus have been anticipated by thirty years.

It is worthy of mention, and was pointed out to me by the late General J. T. Walker, that the source of the Oxus, thus described, does not spring from the higher range of the Hindu Kush. It is a well-known fact that most of the principal rivers of the Himalayas do not rise in those ranges, but in the country behind them to the north, afterwards breaking through them on their way to the south. Thus their sources are really several thousand feet lower than the sources of the smaller rivers which rise in the southern fall of the Himalayas. The same phenomenon also occurs in the Hindu Kush. The Hunza river rises considerably to the north of the anial range of the Hindu Kush, and breaks through on its way to the south. Thus the water-parting is thrown considerably to the north, and is very much lower than the anial range. It is on the reverse side of this water-parting that the Oxus has its source.

(To be continued.)

ADMIRALTY SURVEYS DURING THE YEAR 1895.

UNDER the orders of the Lords Commissioners of the Admiralty, hydrographical surveys have been in progress on the shores of the United Kingdom, the west coast of Newfoundland, Mediterranean, west coast of Africa, east coast of North America, Bermuda, Australia, Solomon and Tonga islands, and the Fiji group.

These surveys have been carried on by seven steam-vessels of war and three small hired steam-vessels, manned by 69 officers and 676 men.

Naval officers have also been employed, with the sanction of the Admiralty, under the Indian Government. The results of their labours are also mentioned herein.

A detailed report of the labours performed by each surveying vessel has been prepared, and, in accordance with custom, has been presented to Parliament. The following is a brief summary:—

Reports of the discovery of rocks and shoals are still very numerous; during the past year no less than 199 of these dangers to navigation were reported to the Hydrographic Department, and notified to the public by Notices to Mariners.

On the shores of the United Kingdom, a large area around the Shetland islands,

* p. cccxxliii.

† Pirkhar is a name now applied to the valley and stream that open out on the left bank of the Oxus, immediately opposite to and south of Sarhad, and up which the road goes to the Baroghil Pass. Piryakh or Piriokh, on the other hand, is the name of a range of mountains on the 39th parallel between Karategin and Darwas.

where the soundings had been left incomplete for many years, was taken in hand and completed; Bressay sound was thoroughly surveyed, and a commencement made in the survey of Kirkwall and its approaches.

Along the East Coast, a re-survey was made of the great line of sandbanks which stretches along the shores of Norfolk and Suffolk, and rendered necessary by their constant movement. The changes which this survey revealed are great, and it is difficult to recognize the banks as now depicted when compared with the last survey of 1885. The most important feature is that, while the anchorage ground in Yarmouth Roads is somewhat narrowed by the closing of the banks on the shore, there is more protection to vessels, due to the banks being much higher than before. Plans were also made of Lowestoft harbour and the entrance to Yarmouth haven.

In the estuary of the Thames, Sea reach was re-sounded, the result showing generally that this part of the river is in a more favourable condition for navigation than when last sounded in 1883. Farther up the river, Lower Hope reach and Gravesend reach were also re-surveyed.

Portland harbour was re-sounded on a large scale, and the result of this work was very satisfactory, as it proved that in this very important harbour of refuge there has been absolutely no silting during the last twenty-five years.

At Plymouth, various areas in the Sound, Cattewater, and Hamoaze, where dredgers had been working since the close of last season's work, were closely examined to ascertain if any shoal heads had been left.

In Milford Haven, the southern shore from the dockyard to the westward of Angle point, including the narrows south of Weare point, was re-sounded on a large scale. Holyhead harbour was also re-surveyed, and the soundings between Menai Strait and Little Orme's Head resumed in continuation of the work of the previous season.

In Bantry and Tralee bays, re-surveys were made of parts that required amendment.

On foreign and colonial shores—on the west coast of Newfoundland the survey was continued from the point at which it had been discontinued the previous year, and completed from Bluff head at the entrance to Port-au-Port across the Bay of Islands to the northern side of Bonne bay, a distance of about 57 miles, the soundings being carried out to a distance of from 8 to 10 miles from the land. Bonne bay was also surveyed on a somewhat larger scale, and plans made of some of the anchorages.

In the Mediterranean, the anchorage waters on the west side of the rock of Gibraltar were re-sounded on a large scale, in order that the breakwaters now in contemplation might be so planned as to include the greatest available anchorage space.

The survey of Port Argostoli, in Cephalonia, which had been commenced in 1894, was completed, and a detailed survey of the Gulf of Corinth commenced.

On the west coast of Africa, a survey was made of the approaches and entrance to the Sherbro' river, and completed up to Bonthe, the residence of the commissioner of the district. This thorough survey was rendered necessary to meet the requirements of largely increasing trade.

At Bermuda, the Crawl and Bailey flats were re-sounded, and an exhaustive examination of the Narrows commenced and nearly completed.

Numerous reports tend to show that the off-shore soundings off the coast of Nova Scotia, in the approach to Halifax, as at present shown on the charts, are unreliable. Accurate soundings are especially required here to assist vessels in determining their positions during the fogs which are so prevalent on this coast. Work was commenced in this area, and about 1900 square miles sounded out on a scale of half an inch to the mile.

In the South Pacific, the survey in progress among the Solomon islands was continued along the north coast of New Georgia, and a plan was also made of Gavutu harbour, Florida island. Lines of soundings were also obtained between this group of islands and the Queensland coast.

Among the Tonga islands, a survey was made of the Namuka group, and a plan of Lifuka anchorage, Hapai group, was completed; the relative positions of the majority of the islands forming the latter group were also determined.

In the Fiji islands, the intricate coral waters off the north coast of Vanua Levu, from Mathuata island to Mount Thuku near the eastern extremity, were surveyed in the interests of growing trade; a triangulation was also completed of the unsurveyed part of the north coast of Viti Levu, ready for continuing the survey in 1896.

Several of the surveying vessels were employed in obtaining lines of deep-sea soundings in the south-west Pacific, some of which were obtained with a view of the possible laying of a Trans-Pacific submarine telegraph cable. From Sydney two lines were taken across to New Zealand, and from Auckland a line of soundings was run to the Tonga group. From Tongatábu another line was carried to Suva, Fiji, and from thence to Upolu, Samoan group. On this passage an unsuccessful search was made for the Zephyr shoal, but a bank with 11 fathoms over it was discovered about 20 miles east-north-east of the position assigned to it.

A visit was paid to Niuafoú, and a party of officers landed for the day to examine and report on this interesting island, the central part of which is occupied by a large and deep lagoon, some 90 feet above the level of the sea, with a ring of high fertile land sloping on all sides to the sea.

From Upolu the line of soundings was continued to Vavua and Falcon islands, and from thence to Tongatábu.

Falcon island, which is entirely of volcanic origin, was found to have altered considerably since last reported on, and is now only 40 feet high, and about 700 yards in diameter; it is composed of light cinders and ashes, with no abnormal heat in the ground. This examination disproved the report that this island had been washed to the level of the sea and then raised again, as some coconuts, planted by a Tongan chief shortly after the island was first upraised in 1885, were found growing.

Proceeding to the southward, another line of soundings was taken from the Tonga group to New Zealand, passing to the eastward of the Kermadec islands. Very deep water was found on this line, no less than three soundings exceeding 5000 fathoms. The first of these, 5022 fathoms, is in latitude $23^{\circ} 39' 4''$ S., longitude $175^{\circ} 4' 2''$ W. The other two soundings in 5147 and 5155 fathoms, red clay, were obtained in latitude $28^{\circ} 44' 4''$ S., longitude $176^{\circ} 4' 4''$ W.; and latitude $30^{\circ} 27' 7''$ S., longitude $176^{\circ} 39' 4''$ W. respectively. Good specimens of the bottom were brought up on both these occasions.

These deep soundings are remarkable, as they are deeper by 500 fathoms, or half a mile, than anything before obtained. The deepest place in the ocean before known is to the north-east of Japan, where, in 1875, the United States s. *Tuscarora*, found 4655 fathoms. They also show the great inequalities of depth that exist in the Pacific Ocean, as the deep soundings now obtained are all separated from one another by shallower ridges. They furthermore confirm the fact, before observed, that the deepest parts of the sea are not far from land.

Another series of deep sea-soundings was obtained from the North Cape, New Zealand, to Suva, and from thence to the north-east of the Fiji group for 400 miles towards the Phœnix islands, and back to Fiji. The Isabella bank, lying 90 miles to the north-west of Wallis island, was examined, and two other banks of

considerable extent, of sunken atoll character with a least depth of 12 fathoms over their rims, were discovered in the same vicinity.

From the Fiji group deep sea-soundings were obtained every 50 miles to Norfolk island, and from thence to Cape Byron on the Australian coast.

The detailed survey of the Inner route along the Queensland coast, inside the Great Barrier reef, was continued, and completed from Chapman island, near Cape Direction, to Night island.

In India, the survey of Palk strait, north of Ceylon, was continued and completed as far to the westward as Deift island. This survey demonstrated that no passage exists across the banks that skirt the northern shores of Ceylon deep enough for heavy-draught vessels to approach the passage leading to Adam's Bridge during the north-east monsoon in safety.

On the west coast, the survey in the vicinity of the mouths of the Indus was taken up at the Hajamro mouth, and completed to the southward and eastward as far as Kori river, off which the soundings were carried out to from 15 to 20 miles from the coast. Considerable alterations were found to have taken place since the last survey.

During the year the Hydrographic Department has published 114 new charts and plans, and improved 34 charts by the addition of 43 new plans; while 5463 corrections have been made to the chart plates. The number of charts printed for the requirements of the Royal navy, for Government Departments, and to meet the demand of the general public has, during 1895, amounted to 312,668.

THE INDIAN SURVEYS, 1894-95.

By C. E. D. BLACK.

THE aggregate area on all scales surveyed during the year by the various parties of this department amounted to 125,384 square miles, and the operations consisted, as usual, of triangulation, topography, forest surveys, cadastral surveys, traverse surveys, electro-telegraphic determinations of longitude, tidal observations and spirit-levelling, geographical surveys, and the normal work of the headquarters' offices.

The trigonometrical operations were rather interesting, as they consisted in part of measures for connecting the old Cachar triangles, which were left uncompleted in 1862, owing to the wildness of the country eastward, with the most northerly points of the new Mandalay series. This involved carrying the survey across the mountains east and west of Manipur, where the connecting series will consequently bear the name of the Manipur Longitudinal Series. The country proved exceedingly difficult to work in, owing to dense jungle, the want of suitable hills for Grand Trigonometrical stations, and the almost entire absence of villages. But unattractive though it may be, the region is one of importance, lying as it does intermediately between Cachar and Manipur on the one hand, and the Chindwin and Irawady valleys and the town of Bhamo on the other. The general opinion seems to be that the most feasible route for railway communication between Assam and Burma is further north, by way of the Patkoi pass; but nevertheless

the line taken by the present triangulation may prove of some commercial use in the future, and it is a pity we are not told more about it in this report. Surveyors often penetrate into regions closed to other people, and the narratives of the members of the Indian Survey Department have contained so much useful statistical and general information in the past, that we regret they should have been so trenchantly cut down on the present occasion. There is, however, a brief extract dealing with the other portion of the trigonometrical work, which consisted of fixing the positions of beacons along the Sind coast between Karachi and Kuch. The tract is designed by Mr. Prunty as an inhospitable waste of sea-water and pestilential mangrove swamp. Supplies were very difficult to procure, and sickness and fever were so rife, that had it not been for large daily doses of quinine not a man would have been fit for duty. It is satisfactory, therefore, to learn that this gruesome piece of work has at last been brought to a conclusion.

With regard to topography, a total area of 21,588 square miles was surveyed, the bulk of this out-turn being on the $\frac{1}{4}$ -inch scale. It is noticeable that the surveys in Upper Burma, previously classed as geographical, are now assigned a more appropriate place in the topographical section. Captain Renny-Tailyour rendered a fair out-turn of work in a mountainous tract of the Shan States north-west of Fort Stedman. In Baluchistan, Colonel Holdich's party was divided into nine detachments, three of which were detached for service with the Afghan Boundary Commission. The Asmar section, under Colonel Holdich himself, accompanied by Lieutenant Coldstream and three surveyors, mapped about 1200 square miles in the Kunar and Asmar valleys; the Baluch-Afghan section, under Captain Mackenzie, with five surveyors, continued its work throughout the winter; and the Kurram section, under Lieutenant Macaulay, completed its work by the end of December, 1894. Unfortunately, Lieutenant Macaulay, who during the progress of the operations had been ordered to join the Waziristan Delimitation Commission, was killed in the fight which occurred at Wano on November 3, 1894. In Southern Persia, between Bandar Abbas and Jask, about 19,000 square miles of new country were mapped on the $\frac{1}{8}$ -inch scale; and Jamaluddin surveyed the summit of the Ginas range, a plateau-like expanse which stands about 6000 feet above sea-level, and would answer admirably for a sanitarium in this exceptionally trying region. Yusuf Sharif was also successful in connecting the different triangulations executed during previous seasons at Charbar, Jask, and Bandar Abbas, and the whole of this work now forms a continuous series from Charbar to Jask. Khan Bahadur Imam Sharif, as our readers are aware, again accompanied Mr. Theodore Bent on an exploring tour in the Hadramaut country of Southern Arabia, where he managed to map about 3000 square miles in the Dhofar district. Another native surveyor, Sheik Mohiuddin, distinguished himself, not

for the first time, in mapping out 40,000 square miles in Western Baluchistan and Persia, and in revising about 5000 square miles of imperfectly surveyed ground in the neighbourhood of Kharan. For his various services he has been awarded the title of Khan Bahadur. A special examination of the Baluch triangulation in its entirety has been made by the Surveyor-General of India, and the conclusion arrived at is that it sorely needs a more reliable foundation, so as to admit of the detached portions being tied together on a firm basis. Early attention will be given to this requirement, and a first-class series is to be commenced this year, and carried through Mekran into Persia, by which means correct bases will be furnished for all Southern Baluchistan. In Upper Burma, Major F. B. Longe's party (No. 21) continued the 1-inch topographical survey of the Southern Shan States, and completed the geographical $\frac{1}{4}$ -inch survey of the Northern Shan States and the Upper Chindwin district. A native surveyor carried out, in concert with some Siamese commissioners, a good portion of the boundary survey between Amherst and Siam, while Major Longe himself and assistants accomplished a survey of the Kokang State, which was to be ceded to China under the Anglo-Chinese convention.

Passing by the electro-telegraphic determinations of the difference of longitude between Karachi and Greenwich, which were reviewed a few months ago in this *Journal*, we note that tidal observations for the compilation of tide-tables for navigation were carried on at thirteen stations on the coasts of India, and at Trincomali, Minicoy, Port Blair, Bushire, Maskat, and Aden. Spirit-levelling operations were also extended in various directions, especially along the east coast to Vizagapatam, where a junction was effected with the previous series brought up from the south in 1888, and the entire chain of levels between the tidal stations along the western shore of the Bay of Bengal are thus linked together.

A survey detachment was organized to accompany the Anglo-French mission of inquiry into the feasibility and limits of the proposed buffer state on the Mekong river. Colonel R. G. Woodthorpe, C.B., was in charge of the party, and Lieutenant Ryder, Mr. J. G. Scott, C.I.E., and Mr. G. C. Sterling were also attached thereto. Most of the French officers were met on January 1, 1895, and by the end of April the whole of the buffer state was covered with triangulated points, connected with those laid down in the previous season, while others were thrown out to the north and north-east, beyond Keng-Hung—an extension of the triangulation which will no doubt prove useful in the future. A very satisfactory junction was also made with Mr. McCarthy's elaborate triangulation in Siam. No special fair map is being prepared to illustrate the labours of the mission, but the results are being incorporated into the two sheets, 13 N.W. and 13 S.W., of the Burma Geographical Survey.

The very interesting operations of the Pamir Boundary Delimitation Commission have been already briefly referred to in these pages. Colonel Holdich and Major Wahab were the principal moving spirits in the survey, and they successfully achieved the objects sought in making topographical maps of the country adjoining the boundary, so as to assist the Commissioners in defining it, and in effecting such a junction with the Russian survey system as to ensure a common basis for the mapping on both sides. The weather was most inclement and unfavourable, but at last a sudden and fortunate break put an unexpected end to the difficulties. From a commanding peak near the Benderski pass Major Wahab obtained a magnificent view of the whole line of the Himalayas to the south, while at the same time he was enabled to gain a panoramic view northward to the Sarikul and Trans-Alai ranges, which stand within view of Osh in Ferghana. On two subsequent occasions he was equally fortunate, and it is certain thus that the basis of the geodetic measurements is sound and reliable. While Major Wahab carried on the triangulation, the topography was managed by Khan Sahib Abdul Ghafur with praiseworthy determination. His difficulties were largely due to the nature of the ranges which intersect the Pamirs and their approaches, partitioning the country into narrow valleys at most a mile or two wide, while they themselves form broad intervening flat-backed ridges of width varying from 10 to 30 miles, with a watershed obscured and well-nigh lost amidst eternal snows and glaciers, offering no marked and distinct peaks for recognition. The general results were found to be in close agreement, the difference in latitude being 20" at the starting point and 10" at the closing point, and in longitude only 4" and 6" respectively. As regards altitude also the difference was remarkably slight. Altogether about forty well-marked points and peaks have been fixed by triangulation, which will serve for junction with the Russian system. The area surveyed in detail on the $\frac{1}{4}$ -inch scale amounted to about 4800 square miles, and about 250 square miles were specially surveyed on the $\frac{1}{2}$ -inch scale to illustrate doubtful or disputed points.

In April, 1895, a small detachment was organized under Captain W. J. Bythell, R.E., to accompany the Chitral relief force. Large scale plans of the Malakand and Khar camps were made, and from the latter place Captain Bythell, assisted by Hira Singh, carried a $\frac{1}{4}$ -inch detail survey through Dir, which was continued as a theodolite traverse from the Laorai pass to Chitral. Early in August Captain Bythell continued the traverse along the Arnawai nullah, but was obliged to abandon it owing to the difficult nature of the country. The results of the reconnaissance were—

(1) Continuation of the Chitral river traverse from Mirkanni to Arnawai, thus completing an unbroken traverse from Mirkanni to Arnawai.

(2) An accurate traverse of the Arnawai nullah from 9½ miles from its junction with the Chitral river; and

(3) Fairly accurate fixings of the following villages:—Arnawai, Lambabat, and Mirkanni on the Chitral river, Damer or Gud in the Gud Gol, and Ramram and Kamsai in the Arnawai stream. Also fixings of points on the Bashgol nullah watershed, mouth of Bashgol stream, and of points on both watersheds of the Arnawai stream.

Altogether a considerable topographical knowledge has been gained of some 3600 square miles of hitherto unknown country, and when we are in possession of the detailed maps and reports, light will no doubt be shed on the revision of the Anglo-Afghan boundary agreement which has attracted some attention in this country.

At the headquarters' offices a vast amount of geographical compilation and drawing, engraving and photographic and lithographic work, has been accomplished, the latter branch being under the very efficient superintendence of Colonel Waterhouse. As, however, the maps themselves are duly noticed in this *Journal*, it is perhaps unnecessary to mention them here again. From a British point of view the most important productions are the general maps illustrating whole provinces, such as Burma and Baluchistan; and if new compilations showing the latest surveys in these parts could be made available with greater promptitude, there is no doubt that they would excite considerable interest and command a ready sale in England. The work of actual survey is carried on with an energy that is deserving of all praise, but, so far as English geographers and others interested in India and adjacent countries are concerned, there appears to be a congestion of the material at headquarters which prevents some of the results of these remarkable surveys being utilized as promptly as could be wished.

A notable retirement during the year was that of Colonel Sir H. R. Thuillier, K.C.I.E., R.E., who quitted the department after a long and useful career of thirty-six years, nine of which had been passed as Surveyor-General. The name of Thuillier is one deservedly honoured in the annals of the Indian Survey, and it will be gratifying to our readers to learn that the Government of India have placed specially on record their appreciation of the excellent service rendered by this distinguished son of a distinguished father.

GEOGRAPHY AT THE UNIVERSITIES.

THE following report on geography during the past year at Oxford has been sent by Mr. H. J. Mackinder:—

“During the past academic year I have lectured, as usual, twice a week in each of the three terms. In Michaelmas Term I dealt with

Continental Europe, in Lent Term with Britain, and in the Summer Term with America. The class in the first-mentioned term consisted of 56 undergraduates from 11 colleges, and 3 lady students from 2 halls; in the second term there were 74 men from 10 colleges, and 9 ladies from 4 halls; while the third term produced 21 men from 7 colleges, and one lady.

“Mr. Gunther, the geographical student for 1895, has worked in the Phlegrean Fields of Naples, and will shortly present a report to you.

“In conjunction with Mr. Chisholm and Mr. Dickson, I took part, as usual, in the geographical examinations of the Oxford and Cambridge Joint Board. I also helped Mr. George, of New College, to draft a syllabus in geography for the Oxford Higher Local Examinations.

“The University has recently passed decrees providing for the continuance of the readership after the expiry of the present arrangement with the Society. There will consequently be no break in the continuity of the work initiated by the Society and assisted by it during the past nine years.

“In London, I have delivered at Gresham College a course of twenty lectures on ‘The Principles of Geography as illustrated by the Atlantic and Britain.’ This course was dependent on the co-operation of your Society and of the London University Extension. The attendance numbered nearly 300, mostly teachers and pupil teachers. At the conclusion, just before Easter, 174 candidates presented themselves for examination, and the examiner, Mr. Chisholm, reported that 16 per cent. merited “distinction,” that 48 per cent. obtained half marks or more, and that 12 per cent. failed to pass. Mr. de Burgh gave me much assistance in the supervision of the large number of weekly essays. Since Easter, Dr. Mill has delivered a supplementary course of five lectures at the same place and to the same class.

“During the past winter I have also held a weekly class on economic geography in the rooms of the London Chamber of Commerce. This class was in connection with the London School of Economics and the London Technical Education Board. It was attended by some 20 City men of various ages and callings.

“Once more I must report that several of my students, both at Oxford and in London, have urged the importance of establishing some more complete system of higher geographical instruction than at present exists in this country, and have expressed their desire to avail themselves of such a system were it created.”

Mr. Yule Oldham sends the following report of work at Cambridge during the past year:—

“During the past academic year I have lectured on physical geography. The attendance at the first part of the course, which

appealed to students of the Geological Tripos, was good, twenty men and some ladies being present. The more advanced portion naturally attracted fewer.

"In addition, I have given some forty lectures outside the University, principally in connection with the Extension movement, at Bishop Auckland, Burton-on-Trent, Scarborough, and York. These lectures were attended by large audiences, ranging from one to several hundreds, while the paper work done by students was of a high class.

"Last year I lectured at the summer assembly of the National Home Reading Union at Leamington, and have been invited to lecture again this year at the assembly to be held next month at Chester, as well as at the summer meeting of Extension students here in August.

"A year ago I was able to report that some useful modifications in the geography papers of the University Local Examinations had been made on my advice. These have met with considerable approval, and as in December last more than 13,000 boys and girls, of all school ages in this country and our colonies, entered, the influence has been widespread. In the Higher Local examinations, however, which appeal to a more advanced class of students, geography has hitherto only been regarded as a subsidiary branch of other subjects.

"I am glad to be able to report a very important advance. A scheme has just been approved of, by the syndicate which regulates the examinations, by which geography will be included henceforth as a special division, on the same footing as languages, history, or natural science. This will enable teachers, for the first time, to obtain a certificate of a competent knowledge of geography, and should have important results.

"I understand, also, that at least one of the colleges here will make physical geography a subject for future scholarship examinations.

"Next year, by request, I shall again lecture on physical geography, and in addition have arranged to give a course of lectures on political geography for students of the Historical Tripos."

The following report has been sent by Mr. A. J. Herbertson, the Lecturer in Geography in the Owens College, Manchester:—

"The ordinary classes in geography at the Owens College are attended almost exclusively by first-year students of the Day Training College Department. This class was a small one in 1895-96, and the Education Department's regulation, exempting excellent geographical students, was again effective in making the numbers fewer than they might have been. Two courses of lectures were delivered—one on 'British Possessions in America' and one on 'Cartography.' The lecturer proposed to give a third course of practical geography, but this was not sanctioned on the ground of lack of time. A few students, who had one spare hour during the week, were induced to devote it to map-drawing under the lecturer's supervision.

“ By the courtesy of the Manchester Geographical Society, the Owens College evening classes in geography were held in the rooms of the Society, and their valuable collections of maps and lantern-slides were placed at the lecturer’s disposal, as well as the use of their lantern. The subject of the course delivered before Christmas was ‘The Commercial Geography of Eastern Asia,’ and in 1896 two short courses of five lectures each were given: (1) ‘The Highways of Commerce;’ (2) ‘The Commerce of Africa.’

“ Two courses of University Extension Lectures were also delivered—one of twelve lectures on ‘The General Geography of Greater Britain,’ to the students of the Warrington Training College; the other of ten lectures on the ‘Far East,’ in conjunction with the Yorkshire College and the Young Men’s Christian Association at Leeds. In addition to these courses, a number of single lectures on geographical subjects were delivered in the vicinity of Manchester, in connection with the ‘Victorian’ lecture scheme of the Manchester Geographical Association.

“ The lecturer has to thank the Royal Geographical Society, the Manchester Geographical Society, and the Royal Scottish Geographical Society for lending maps, books, and lantern-slides needed to supplement the small resources of the Geographical Department at the Owens College in the preparation and illustration of lectures.

“ During the last year considerable progress has been made in forming the nucleus of a geographical collection at Owens College. A better room, well lighted and furnished with cases, has been provisionally set apart for the use of the Geographical Department, and a grant of £30 voted by the College Council to buy materials. Part of this sum has been spent on apparatus for practical work, part in buying maps and books. Something has been done towards forming a small library of standard geographical works, which are constantly being referred to, and also in collecting geographical school text-books to enable intending teachers to form an opinion as to the books suitable for their future work in schools. The Department is indebted to the Council of the Royal Geographical Society, who have very generously presented a complete set of the last series of the *Proceedings* of the Society and the four volumes of ‘Supplementary Papers,’ and to Professor Meiklejohn, Messrs. Longmans and Co., Messrs. Macmillan and Co., and Messrs. Philip, Son and Nephew, who have kindly presented copies of their geographical school-books.

“ Nevertheless, under existing conditions, the work of the geographical lecturer is not very encouraging, and the pecuniary sacrifice he is called on to make is considerable. He gets only the poorer material to work upon, owing to the Education Department’s regulations and the lack of any University recognition of the subject. Even then he labours at a disadvantage. The students are well aware that their geographical work is somewhat of the nature of a humiliating necessity, a penalty for not doing well enough in the subject of the Queen’s Scholarship

examination. They naturally feel it would be a pity to spend more time over it than the bare minimum necessary to satisfy the Education Department, and for this the College authorities allow about a score of hours in the year. The University authorities are being memorialized on this point, and also with reference to other modifications of existing regulations, which, without in any way interfering with existing interests, would place the Geographical Department in a much better position to do good work."

PROFESSOR DE LAPPARENT ON PHYSICAL GEOGRAPHY.

By HUGH ROBERT MILL. D.Sc.

THE importance given to purely geographical questions by the geologists of all countries is one of the most promising features of the present revival in geographical science, for geologists bring to the work eyes trained in observation and minds habituated to theory. The long succession of British investigators who may be said to have created the science of geology, and for many years sustained it almost alone, have never failed to recognize the important bearings of physical geography upon geology; but it has been reserved for the geologists of other countries to give prominence to the value of geology in the study of physical geography. And the recent work of three geologists has brought this aspect of the relation between geology and geography boldly to the front. Professor Penck in Austria, in his great 'Morphologie der Erdoberfläche'; Professor W. M. Davis of Harvard, in his papers on geographical problems (an admirable example being his "Development of Certain English Rivers" in this *Journal*, vol. v. p. 127); and Professor de Lapparent, in the book* which is the subject of this notice, all deal with geography from its geological side, and they all deal with the subject according to the scientific method, employing special terms for each conception, and working out mutual relations by the aid of hypothesis in the hope of arriving at a theory of geography.

Professor de Lapparent acknowledges his great indebtedness to Professor Davis for the clear and definite formulation of geographical processes and their results, and his book is the first attempt on so large a scale to apply these methods. The book is not a treatise on physical geography so much as an exposition of one aspect, the origin of geographical forms, or "Geomorphogeny." It contains, first, a statement of the general principles of the genesis of land-forms, and then a consideration of their occurrence in different parts of the world. The book contains twenty-five "lessons," and if we recapitulate these here, giving prominence to the statement of general principles, it may prove more

* 'Leçons de Géographie Physique.' Par Albert de Lapparent. Paris: Masson et Co. 1896.

useful to our readers, and give a truer idea of the nature of the book, than if the main heads were elaborated with greater regard to literary form.

1. *The great lines of geography.*—Definition of physical geography; form and dimensions of the Earth; terrestrial relief; watersheds; comparisons of land-surfaces and ocean-beds; general plan of the Earth.

2. *The relief of the Earth's crust.*—Profile of land-surfaces and of sea-beds; the hypsographic curve; regional peculiarities of the continents; dissymmetry of the lines of relief.

3. *General conditions of land-modelling.*—Conception of land-modelling; agents of land-modelling and their dependence on meteorological conditions; sketch of meteorology and the control of atmospheric by geographical conditions; rainfall and deserts.

4. *Normal conditions of land-modelling by running water.*—Effect of running water on a homogeneous land-surface; conception of base-level; torrential river-track; changes of stream-lines and stream-capture; change of slope along a river-bed; flatness of the land at the mouth.

5. *Influence of genetic conditions on the process of land-modelling.*—Conditions which modify the process of land-modelling; fissured limestones, soft limestones, sandstones; heterogeneous districts; division of streams into sections; waterfalls; engulfing of rivers; rock-basin lakes; modelling of heterogeneous slopes; varieties of landscapes.

6. (i.) *Genetic conditions of modelling in eruptive and glacial formations.*—Cones and craters; lava-flows; intrusive rocks; granite; glacial deposits.

(ii.) *Passive tectonic influences.*—Definition; effect of dip of strata; development of step-structure; evolution of a river system; phenomena of river-capture; domes; monoclinical valleys.

7. *Passive tectonic influences in regions of folded and dislocated rocks.*—Regularly folded regions; anticlinal valleys; unequal folding; tectonic lakes; dislocated rock-masses; consequences of high dip; superimposed watercourses; influence of faults; valleys due to fractures; glens, fjords, and cirques; isolated rocks; depressions and the peculiar conditions of such territories.

8. *Cycle of erosion.*—Infancy, youth, and maturity of a river-system; torrential, middle, and lower course; alluvial plains and deltas; signs of maturity; old age of a system; peneplains, and examples of these forms; rate of base-levelling.

9. *Modifications of land-modelling by active tectonic agencies.*—Change of base-level and commencement of a new cycle; negative movements; formation of gorges and cañons; sinuous gorges; movements as a whole; plateaux properly so-called; positive movements; deformation of valleys; orogenic movements; transverse valleys; bordering lakes; volcanic phenomena; laccolites.

10. *Successive cycles of erosion. Analysis of some hydrographic systems.*

—Conception of cycles of erosion; instances from the United States; variety of hydrographic systems; rivers of rapid and discontinuous slope; instances from France; the Paris basin; the Rhine.

11. *Glacial land-modelling*.—Action of frost on rocks; action of glaciers; glacial valleys and amphitheatres; glacial lakes; changes in river-beds; post-glacial lake-sills; glacial and morainic topography; loess; eskars; geographical changes due to glacier action; tundras.

12. (i.) *Land-modelling by subterranean agencies*.—Landslips consequent on percolation of water; underground circulation; Karst phenomena; varieties of subterranean erosion.

(ii.) *Land-modelling by aerial agencies*.—The effects of wind and of insolation; effect of rain; dunes; the loess question; deserts and steppes.

13. *The sculpture of coasts*.—Power of waves; cliffs; shore-flats; erosion islands; estuaries; submerged valleys and gulleys; rias; fjords; glacial action on shores; deltas and lagoons.

14. *General summary of geological periods*.—Sedimentation and formation of stratified rocks; complications of geological history; archæan regions; chief divisions of geological time; metamorphic rocks; variation of physical conditions with time.

15. (i.) *Principles of palæogeography*.^{*}—The value of palæontology; meaning of archæan land-masses; search for ancient shore-lines; reconstruction of original relief; ancient mountains.

(ii.) *General outline of geographical evolution*.—Pre-Cambrian continents; Carboniferous continents; Jurassic continents; changes in the latest geological periods; the great depressions and folds of the Earth's surface.

16. *Europe in general; the British Isles*.

17. *The Scandinavian peninsula; the Russian platform; the low countries of Northern Europe*.

18. *Zone of ancient land-masses; the Paris basin*.

19. *Southern France, the Pyrenees, Iberian peninsula, Germany*.

20. *The chain of the Alps and the Carpathians*.

21. *The Mediterranean region*.

22. *Asia*.

23. *The Indo-African platform*.

24. *North America*.

25. *Central and South America; the polar regions*.

Such is the plan of Professor de Lapparent's work. Its execution leaves little to be desired, except perhaps more precise instructions in the difficult but not unattainable art of interpreting the indications of

* The word *Palæogeography*, adopted by Professor de Lapparent to signify the reading of the records of the rocks, is already in use to denote the decipherment of ancient manuscripts; it would be better to use another word for the geological meaning.

maps, so as to see in them more than the ordinary observer can detect in the country itself. This, however, is a preliminary part of the work which can be better taught by the practical study of individual mapsheets than by trying to follow rules of general application. The study of land-forms in the light of their origin, and the phase of the cycle of development in which they are, opens a magnificent field of geographical work, demanding qualities which were not necessary to the earlier explorer, and dispensing with many which were indispensable to him. It is a method of working up acquired information which reveals many gaps in our knowledge of the Earth's surface, points out new directions in which explorations may advantageously be made, and demands more systematic scientific training on the part of travellers than was necessary before, if their observations are to take a place in advancing the science of geography.

Professor de Lapparent aims to make geography *rational*, a reasoned-out description of the Earth. "Thus understood," he says, "the scope of this science is very great. On one side it includes the precise definition of all the homogeneous unities into which the surface of the Earth may be divided, from the double point of view of their form and their origin. On the other side, it includes the investigation of how these unities react on the distribution of physical conditions which originate beyond our planet, and on which all the changes which take place on the surface of the Earth depend, whether in the mineral or the organic world. Then geography completes its work in tracing the picture of the definite results which this combination of diverse elements produces, and in which human activity takes its large and legitimate share."

LORD KELVIN'S SERVICES TO GEOGRAPHY.

THE University of Glasgow celebrated last month the jubilee of the professorship of Lord Kelvin (Sir William Thomson), who was elected to the chair of Natural Philosophy in June, 1846. The occasion was made an opportunity for presenting the congratulations of the scientific world to the first British man of science of the day, and an imposing array of delegates from the universities and scientific institutions of all countries assembled in Glasgow on June 15, for this purpose. The Royal Geographical Society was represented on the occasion by Dr. John Murray, of the *Challenger*, one of the Council of the Society; and it may be interesting, in a few lines, to indicate the reasons which made it proper that a Geographical Society should join with other scientific bodies in doing honour to a great physicist.

Lord Kelvin's services to science have lain mainly in the region of pure physics, where he has excelled both as a mathematical and an experimental investigator; but his researches, whether on dynamic, or

thermal, or electrical phenomena, touched constantly on the actual conditions of the Earth. They also found expression to an extent never before shown, in practical mechanical contrivances which have indirectly led to some of the great modern developments in physical geography. Out of the 262 scientific papers credited to Lord Kelvin in the Royal Society's catalogue (up to 1883) more than fifty relate to the physical conditions of the Earth. His application of practical recording apparatus to submarine cables led directly to the vast extension of cable-laying in which Lord Kelvin personally took part, and this probably induced him to devise those unequalled navigational instruments with which all well-found vessels are now equipped—the Thomson compass, and the navigational sounding machine. The development of the use of wire for deep-sea soundings is also directly due to Lord Kelvin. Without cable-laying and the exact deep-sea soundings required for determining the form and physical condition of the ocean bed, the modern science of oceanography would have been impossible.

Another direction in which Lord Kelvin has rendered important services to physical geography is in his treatment of tidal observations, and the invention of his harmonic analyzer for the curve-records of tide-gauges. His early study of the conditions of ice-melting under pressure led to theories of glacier movement; and also to the investigation of the theoretical influence of polar ice-caps in changing sea-level. The internal temperature of the Earth, its rate of secular cooling, and the character of the crust as influenced by its form, rigidity, rotation, and tidal retardation, occupied a number of papers the publication of which extended over half a century. Waves in water produced by wind or by the movement of solid bodies through the water, also formed a favourite subject for observation and mathematical analysis. In recent years two papers of remarkable interest showed how the more superficial geographical problems suggested applications to other sciences—one an address to the Royal Institution in 1893 on "Isoperimetrical problems," the other on the construction of "Mercator charts" of any continuous closed surface.

The volumes of Lord Kelvin's "Popular Lectures and Addresses," dealing with navigational affairs and with geology and general physics, exhibit to perfection the clear grasp of principles, the quaint and luminous exposition, often playing on the verge of humour, which forms the unique charm of his popular, and often, indeed, of his abstruser writing. But Lord Kelvin's greatest claim to the gratitude of the student of Earth-science is his masterly enunciation of the principles of energy which bind together the whole life-history of the solar system, and give the clue to the interrelations of all the various forms of physical activity which surge upon the surface of the world. The theory of the dissipation of energy might almost be viewed as the basis for a theory of physiography, if that somewhat vaguely defined word were taken in

the sense of the description of the running-down of the energy of the solar system, or even of the universe, from its initial condition of diffused matter at high and unequal temperature to its final condition of aggregated matter at lower uniform temperature.

THE MONTHLY RECORD.

AFRICA.

Herodotus in Egypt.*—Professor Sayce has lately published a short sketch of Egyptian history, with especial reference to the relations of Egypt with the Jews from the time of Abraham down to the age of the Roman Empire, and also to the visit of Herodotus to the country. It is intended to supply travellers and students with a concise summary of information only obtainable elsewhere in more cumbrous works, and to put before them the general results of recent excavations and discoveries in their bearing on the subjects dealt with. To geographers the chief interest centres in the chapters which relate to the visit of Herodotus, for although, as might be anticipated, the views of Professor Sayce as to the character of the information given by the Greek historian differ considerably from those generally accepted, the systematic attempt to follow his travels in the light of recent discoveries cannot fail to be of value. Professor Sayce, as is well known, considers that many passages, in which at first sight the historian appears to be giving the result of his own observations, are, in fact, embodied from the writings of his predecessors (especially Hecataeus, who had visited Upper Egypt), largely mingled with stories which he heard from his guides in Memphis and Sais. The quotations were quite justifiable, but—quotation marks not having been invented in those days—are somewhat liable to mislead. From internal evidence, he considers that Herodotus saw the delta only while flooded, his journey thus falling between the beginning of July and the end of October. This period would be fully occupied with his tour through Lower Egypt, and in spite of the statement in Book II. chap. xxix., as to Elephantine being the limit of personal observation, Professor Sayce (presumably assigning this statement to a quotation) holds that he never passed south of the Fayum. Many instances are given of the incorrectness of the information relating to Upper Egypt, which is only mentioned incidentally in the narrative, while of the monarchs whose memorials were to be found chiefly in the south—at Thebes, Abydos, and Assuan—Herodotus had never heard, the Fayyum being the southern limit of his historical no less than of his geographical knowledge. The evidence of the monuments is also called in to show that after the age of Hecataeus Upper Egypt was long closed to Greek sightseers, owing probably to the disturbed state of the country following on the revolt against the Persians. Having thus fixed the limits of the journey, Professor Sayce attempts to follow the Greek traveller step by step through the delta, by Naukratis to Memphis and Heliopolis, and back to Pelusium, devoting a separate chapter to the route through Memphis itself and the Fayum. Here all is clear and determined, the order in which the kings are given showing even the order in which the various monuments must have been visited. The Fayum was inundated at the time of the visit of Herodotus, and a great part of his Lake Mœris, which he thought the creation of the Pharaohs, was in reality due to neglect of the dykes which should have held back the water. Useful tables of the Egyptian dynasties, nomes, etc., are given in appendices.

* 'The Egypt of the Hebrews and Herodotus.' By the Rev. A. H. Sayce, Professor of Assyriology at Oxford. London: Rivington, Percival & Co. 1895.

Mayeur's Journeys in Madagascar in the Eighteenth Century.—In the *Revue Scientifique* (1896, No. 18) there is the report of a lecture by M. Grandidier before the French Congress of Learned Societies, in which the well-known authority on Madagascar gives some account of the journeys of Mayeur in the island during the latter part of last century. While other less conscientious writers have attracted notice, and have been consulted as authorities down to our own day, the writings of Mayeur, the geographical and ethnographical importance and strict truth of which are evident, says M. Grandidier, at the first reading, have neither been published* nor consulted by those who have written on the island. His accounts not only tell us of the state of affairs which existed a hundred years ago in the north and centre of the island, but really hold good at the present day, and it is quite time that they were rescued from the oblivion into which they have fallen. Mayeur lived thirty years in Madagascar, from 1758 to 1787, acting as government interpreter at the French establishments on the north-east coast, and during this time he was entrusted with various missions into the interior, by which he became well acquainted with the physical features of the country as well as the characteristics of the chief tribes of the north and centre of the island. Among other journeys, we may mention in particular: one from the bay of Antongil across the bare interior uplands to the Sakalava country on the west coast, in which he found the Sakalavas as rude and difficult to deal with as they have since proved themselves: one to the extreme north of the island, during which he visited Nosy Bé, and remarked on its suitability as a station for French shipping; and in particular one to the province of Imerina, in which he became acquainted with the Hovas, and established friendly relations with their king. Here too he speaks of the general bare and arid nature of the interior plateau, a fact which has only been grasped by geographers within recent years. He was much struck with the industry and social organization of the Hovas, and the high level at which they stood in comparison with the coast tribes, although recognizing their propensity to cheat, and some other remarkable qualities.

Exploration of the Senega River, Cameroons.—In December, January, and February last a reconnaissance of the course of the Senega above the Edea falls was made by Lieut. v. Braunstein with a view to testing the navigability of the river (see *Geograph. Anzeiger*, May 1, 1896). Although the result was unfavourable as regards the special object in view, the journey has somewhat enlarged our knowledge of the country and its inhabitants. Willem Carl Remy, in his journey in 1892 had travelled chiefly on the north side of the river after sweeping from its banks, Lieut. v. Braunstein kept entirely to the south side, remaining near the stream throughout. The examination of the waterway began at the crossing place at Sakerayeme, after a seven days' march from the Edea station, through thick forest. Its course, as far as followed, was a constant succession of rapids, with only short stretches of calm water between. The Legatum falls which were met with seem to be the most important after those at Edea. After remaining narrow for some distance, the bed of the stream became immensely wide and was filled with a chaotic sea of rocks among which the stream appeared from the hills in various gullies. The advance was finally stopped by the bursting of the Kingoona tribe, but at the highest point reached it seemed that the stream was becoming narrower as the banks became low and sandbanks appeared. By keeping close to the river the explorer saw few of the inhabitants.

* Mayeur's manuscripts were however already met in the compilation of the "Histoire de Madagascar," published at the Ile de France in 1787 by the Chevalier de Finkler-Beck. See *Madagascar*, i. p. 221.

The Bajop tribe on the south bank proved shy but friendly, but the Babimbi on the north shouted defiance across the stream. European salt, which at Edea has become an important article of trade, had not reached the Bajops, who gave the impression of great poverty, and had not before seen a white man. Elephants and gorillas abounded in the forests. A chart of the stream, here known as "Lom" only, accompanies Lieut. v. Brauchitsch's report.

The Marine Forms of Life in Lake Tanganyika.—It is to be noted that Mr. Moore, who has been assisted by a money grant from the Royal Society, is now engaged in a study on the spot of the fish and fresh-water Medusæ of Lake Tanganyika (*Journal*, vol. vii. p. 663). The existence of a marine type of shells in the lake was first made known by Captain E. C. Hore; while the Medusæ, which it is Mr. Moore's chief object to study, were discovered by Mr. Swann, now Deputy-Commissioner in Nyasaland.

French Expedition to the Middle Niger.—News has been received in Paris (*Comptes Rendus*, Paris Geogr. Soc., 1896, p. 133) that the expedition under Lieut. Hourst, originally planned when Captain Toutée was starting for the Middle Niger from the south, finally set out from Kabara, the port of Timbuktu, on January 21 last. Several officers accompany M. Hourst, including M. Bluzet, already known for his work in the neighbourhood of Timbuktu; and the intention is to thoroughly explore the course of the Niger as far as Say, including the almost unknown section above Captain Toutée's furthest point. The expedition is well supplied with scientific instruments, and a novel item in the outfit is a phonograph for the recording of native music. It is also announced that a geographical reconnaissance has lately been made by Commandant Réjou in the neighbourhood of the lakes connected with the Niger south-west of Timbuktu, in the course of which the position of Lake Dauna, south of Lake Faguibini, was fixed.

AMERICA.

Tidal and Current Surveys in Canada.—A "Report of Progress—Survey of Tides and Currents in Canadian Waters" has recently been published by the Canadian Department of Marine and Fisheries, giving an account of the work done up to October 31, 1895, by Mr. W. Bell Dawson, the engineer in charge of the special survey. Seven of Lord Kelvin's recording tide-gauges have been erected, special precautions being taken to guard against the freezing of the tide-tubes in winter, and the disturbance by wave-motion during gales. The tide-gauges are all in the St. Lawrence or on the Atlantic coast, their situations being St. John, New Brunswick; Halifax, Nova Scotia; St. Paul island (north of Cape Breton island); Forteau bay, strait of Belleisle; Anticosti; Father point (near Rimouski); and Quebec. By the aid of records from these stations new tide-tables are being compiled, which will supersede the imperfect tables at present in use. The datum levels of the Admiralty and Geodetic surveys will also, by the new observations, be fixed with regard to true mean sea-level. The result of two seasons' investigations of the currents in the Gulf of St. Lawrence has been of practical value. The current in the strait of Belleisle, instead of being a steady in-draught from the Atlantic, as formerly supposed, was found to be fundamentally tidal, but a continuance of steady wind either from the east or from the west gradually overcomes the opposite tidal flow, and causes the current to run eastward or westward regardless of the tidal phase as long as the wind lasts. The average rate of the current is about 2 knots, the fastest observed was a little over 3 knots. The observations of the southern part of the gulf and Cabot strait undertaken during 1895 had not been sufficiently worked up to admit of conclusions being given in the Report. But the distribution of temperature and salinity was

found to be curious and interesting. A cold layer of comparatively fresh water appeared to lie between the deep layer of warmer and saltier water and the surface layer of warmer water of similar salinity. The cold layer in all parts of the gulf was found to lie between 30 and 50 fathoms.

Navigation of the Magdalena.—A report on this subject, dated January 23, 1896, from Mr. E. MacGregor, acting British Vice-Consul at Barranquilla, has been kindly placed at our disposal by the Foreign Office. The navigation of the river is divided into two sections—one from Barranquilla nominally to Honda (lower river), and the other above Honda (upper river). Though Honda, 603 miles above Barranquilla, is the chief commercial centre between the upper and lower river, it is no longer a river-port. Between Arrancaplumas, a short distance above Honda, and Yeguas, 15 miles below Honda, the fall in the bed of the river is so great as to produce a series of rapids difficult to surmount, and accordingly the traffic between these two points is carried on by means of a railway belonging to a British company. This railway it is proposed to continue to Conejo, a point on the river 12 miles lower down, but there appears to be great delay in carrying out this intention, as the railway had reached the point where it still ends at the date of the report mentioned in the note below, at which date the whole railway then contemplated to La Dorada, $7\frac{1}{2}$ miles below Conejo, was expected to be finished the following year. The upper river navigation usually extends to Girardot, 718 miles above Barranquilla, sometimes in high water as far as Purificacion (754 * miles), or even to Neiva (830 miles). From Girardot a short railway runs north-east at present to Juntas de Apulo, but it is intended to continue this railway ultimately to Facativá in the north-west of the plain of Bogotá. About forty steamers belonging to various companies now ply on the Magdalena; all stern-wheelers burning wood for fuel, their capacity varying from 30 to 300 tons. Seven to eight days are required for the up journey in the lower river, four days for the down journey; but the length of the journey is due to the fact that for most of the way it is not safe to proceed by night. When the water in the river is at a moderate height, one can proceed by night and day as high as La Gloria, 282 miles above Barranquilla. For the further development of the river traffic the chief requirement is the opening of a safe passage for sea-going vessels from Barranquilla by the Boca de Cenizas, the main mouth of the Magdalena, to Savanilla. Between 1876 and 1884 a cattle-trade with Cuba was carried on by this mouth in steamers of the Royal Mail, Atlas, and other companies, without serious accident, but now this route is abandoned in favour of the railway to that seaport.

The Mexican Drainage Canal.—The following notes regarding the drainage canal of the plain of Mexico, which is now nearly completed, are taken from a recent paper on the subject by Mr. F. H. Cheesewright, read before the Society of Arts. The completion of this great work has solved a problem that has occupied the attention of all interested in the city of Mexico for the past 600 years. The city of Mexico is built in the centre of a vast basin of an oval form, about 200 miles in circumference, and is surrounded by mountains, one or two being amongst the highest in the world. The soil was at one time thickly wooded, but is now mostly bare, and, in many places, white with the incrustation of salts left by the receding waters. Five lakes, occupying about one-tenth of the surface of the valley, receive the fairly heavy rainfall and the drainage of the mountains. These lakes have different levels, some being higher and some lower than the city, consequently the drainage of such a vast area is a matter of great difficulty and costliness. The canal

* These distances are taken from a U.S. Consular Report, dated November 10, 1884, published in No. 47 of the series of Consular Reports of the U.S.

starts from the San Lazaro station of the Hidalgo Railway, runs on the east side of the Guadalupe mountain range, between this range and Lake Texcoco. It then changes its direction to the north-west, diagonally traversing San Christobal lake, a part of Jaltocan and another of Lake Tampango, where it finishes at the mouth of the tunnel, having a total length of 67½ kilometres, or 43 miles. The beneficial effect that the canal will have on the climate of Mexico city cannot be over-estimated.

POLAR REGIONS.

Arctic Regions.—The Arctic campaign for the present year has now fairly begun, three separate expeditions being now on their way northward, in addition to Sir W. M. Conway's expedition to Spitzbergen. From Tromsø telegraphic news has been received that the *Virgo*, conveying Herr André's balloon expedition, sailed from that port on June 15. The ice-conditions to the northward were considered to be good, though this opinion was not based on positive information. According to Herr André's plans, the final start in the balloon is to be made from one of the Norskøarne islands, situated near the north-west corner of Spitzbergen. On June 9 the *Windward* left St. Katherine's docks on her second voyage to Franz Josef Land, carrying large quantities of supplies for Mr. Jackson, as well as a reinforcement to his land party. The ship is commanded by Mr. James Brown, whose experience as a Peterhead whaler in Arctic voyages dates back more than thirty-six years; and the ice-master is Mr. John Crowther, who has already made three voyages to Franz Josef Land. Mr. W. S. Bruce, already known for his voyage to the Antarctic with the Dundee whalers in 1892-93, goes out to join Mr. Jackson as a scientific member of his staff. Sheep, coal, and live reindeer will be embarked at Vardö, and it is hoped that communication will be opened with the explorers at Cape Flora, Franz Josef Land, before the end of July. The *Windward* may be expected back in England by the end of September, but Mr. Jackson and his party will probably stay out another winter. The third expedition is that of Lieut. Peary, who is now at St. John's, Newfoundland, making the final preparations for his new expedition to Northern Greenland. He hopes to start for Bowdoin bay, Inglefield gulf, on July 8, in the steamer *Hope*, which he has chartered for the voyage. His object is to complete his ethnological studies, and he means, if possible, to bring home the great mass of ironstone at Cape York, which is believed to be the largest meteorite in existence. Mr. Jeafferson, accompanied by Mr. Farnham, proceeds to the north-east island of Spitzbergen, his main object being to visit the islands which lie to the north and north-east of that land.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Glacier Movements.—Professor I. C. Russell, in the *Journal of Geology* (vol. iii. p. 823), gives a discussion of the part played by rock-débris in the movement of glaciers. He starts with the proposition that "the rate of flow of glacier ice, under given conditions, will depend on the percentage of débris commingled with it, and be least when the percentage is greatest. The nature of the débris, whether coarse or fine, smooth or angular, etc., will modify the result, but this need not be considered at present." Applying this proposition to the action of glaciers, many apparent anomalies are readily explained. For example, the same glacier may be a powerful agent of erosion in its upper course, where the proportion of débris is too small to check the rate of flow, and great enough to supply material for abrasion, while in its lower course the ice may be so heavily charged with débris as to be deprived of plasticity, rendered stagnant, and so enabled to act as a preservative against erosion or as a means of deposit. The periodical variations in the lengths

of glaciers, the origin of moraines, and of drumlins may also be explained by application of the principle. The instances adduced are intended as a guide to glacier students rather than as dogmatic statements, and they seem well worthy of being carefully tested.

Topography and Hypothesis.—In the first number of the current volume of *Science* (vol. iii. n.s., p. 1) there is published an address by Mr. G. K. Gilbert, which may be looked on as a philosophic sermon preached from a topographic text. He speaks of the scientific method of investigation by means of hypothesis, and shows how the method was actually employed in the endeavour to account for one of the most singular land-forms which has ever been observed. This is a hollow of crater-like appearance, a few thousand feet in diameter, a few hundred feet in depth, roughly circular in outline, and surrounded by a raised rim. It is situated in Arizona, near Canyon Diablo, and is called Coon Butte. The plain is composed of horizontally stratified limestone, overlying horizontally stratified sandstone, but the edges of the crater show that the strata have been bent up all round, and now dip away from the hollow. In the immediate neighbourhood of the depression, large quantities of meteoric iron have been discovered. The object of the paper is to discuss the hypotheses which have been brought forward to account for two such unusual phenomena as a crater in sedimentary rocks with no trace of a volcanic outburst, and the occurrence of large masses of meteoric iron. Mr. Gilbert formed a comprehensive theory to account for both. He supposed that a meteorite of great size, about 1500 feet in diameter, had struck the Earth at this point, and so produced the hollow, the main mass becoming embedded in the rock, while broken-off fragments supplied the meteoric masses which were found. If this were so, the volume of the hollow should be less than that of the rim by the volume of the buried asteroid. Mr. Gilbert and Mr. Marcus Baker visited the place, made an exact topographical and magnetic survey, and found the volume of the hollow substantially the same as that of the rim, while no indication of a buried mass of iron was to be found. The crucial test having pronounced against the impact theory, the hypothesis of a steam-explosion was next applied, and was not apparently contradicted by any of the appearances, the meteoric iron being supposed to be merely an accidental occurrence at that particular place. But it was then suggested that the asteroid might have been of rocky substance, with only a few masses of iron embedded in it "like plums in an astral pudding," and that the impact compressed the rocks at the bottom so as to occupy less volume. Another hypothesis connecting all the observations was, that a relatively small meteorite determined by its impact an explosion of steam, which was ready to go off when the "volcanic button" was touched. But so far no crucial tests have been devised to eliminate either hypothesis, and Coon Butte must still be viewed as of doubtful origin.

Ocean and Atmospheric Currents and the Variation of Latitude.—In the *Astronomical Journal* for April 6, Professor Simon Newcomb points out a possibly physical reason for the displacement of the position of the terrestrial pole, which observation has shown to amount to a total range of about 10 feet. The reason suggested is the circulation of the atmosphere and ocean through permanent winds and currents. A movement of the central parts of the Pacific Ocean towards the pole of about 150 feet per day, with a correspondingly greater flow of the Atlantic in the opposite direction, and with the whole movement successively reversed in direction every six months, would account for the whole observed displacement. It is, of course, still to be ascertained whether the mass movements of the ocean really are directed in this way, and at present it would appear that our knowledge of under-currents is not sufficient to enable a definite conclusion to be arrived at.

International Earthquake Observatories.—Dr. G. Gerland, of Strassburg, sends us an excerpt from the *Beiträge zur Geophysik*, of which he is editor. It relates to the establishment of an international system for the observation and recording of earthquakes. That there should be some system by which the records of earthquakes, which, in some portion or other of the world, occur several times per day, could be collected together for purposes of analysis, is a proposition that has long agitated the minds of seismologists. In January, 1895, Prof. John Milne, of Japan, issued a suggestion that the *unfelt* earthquakes of the world should be systematically recorded. The present proposition, which comes, we believe, from the pen of that indefatigable worker, the late Dr. E. von Robeur-Paschwitz, embraces the suggestions from Japan, and, in addition, proposes the establishment of a centre at which notices of all earthquakes are to be published. However advisable this might be, when we remember that Japan alone, with nearly 1000 observing stations, cannot keep pace with the records of its own country, and see the monthly lists issued by Tacchini, Cancani, and Agamennone, we fancy that the practical realization of the proposal now before us would be surrounded by many difficulties. From what this Society recently heard from Prof. Milne (*Geog. Jour.*, March, 1895), it seems that certain seismologists are inclined to the belief that the movement of *large* earthquakes is propagated, not simply round, but *through* the Earth, and by studying the velocity of this propagation, new light will be thrown upon the nature of the interior of our planet. A primary consideration is to determine the best form of instrument to be used in making a seismic survey of the world, and, chiefly with this object, a committee, in which we see the names of Lord Kelvin, Prof. G. H. Darwin, and others, who have given great attention to the solution of problems connected with geophysics, was appointed by the British Association. The report which they will shortly issue we trust may be of value to those who are interested in the scheme now so ably advocated by Dr. G. Gerland.

The Thermophone.—In a recent number of *Science*, Mr. George C. Whipple describes a very ingenious form of telethermometer invented by Mr. H. E. Warren and himself, which should prove exceedingly useful in meteorological and oceanographical research. The instrument, which has been named the thermophone, consists of a modified form of Wheatstone bridge, in which two arms are composed of copper and German-silver wire respectively. The change of resistance of these metals with temperature being different, the balance can be restored by altering the resistances of coils placed at the near end of the system, the precise point being ascertained by the use of either a galvanometer or a telephone. The thermophone has already been used in making temperature observations in Lake Champlain at depths up to 370 feet, and has been found to give results trustworthy to within 0.1° Fahr. We see no reason why it should not be employed at much greater depths, and it is, perhaps, not too much to hope that it may bring us within reach of the time when reversing and self-registering thermometers, and all their encumbrances, may be fully done away with.

GENERAL.

The Church Missionary Atlas, Eighth Edition, 1896.—This volume of 230 pages of printed matter, and thirty-two coloured maps, from the geographical establishment of Messrs. Stanford and Co., has reached its eighth edition. With the object which the Society which publishes it has in view the Geographical Society has nothing whatever to do, but a worthy contribution to geographical Science deserves a brief notice for its own intrinsic merits. It represents "applied geography." The art of the cartographer is utilized to bring home the local features of regions in

many parts of the world, and the printed matter specially illustrates each region from the point of view of the object of the publication. Among the thirty-two maps is one (the frontispiece) to illustrate the distribution of the human race under the different religious conceptions; two maps illustrate the varieties of languages spoken in British India and the continent of Africa. The remaining twenty-nine represent regions in Africa, east, west, and south; in Southern Asia, from Syria on the west to Japan in the extreme orient; the islands of New Zealand in Oceania; the Dominion of Canada in North America. An atlas "pure and simple" resembles a dictionary of a language, and presents dull and disconnected reading; but this work resembles rather an encyclopædia of a particular branch of knowledge, illustrated by carefully drawn maps, representing certain special facts in different colours; in fact, it presents to the eye and understanding a basis of the knowledge essential for grasping a particular subject of study. The matter contained in the printed pages is accurate, interesting, and instructive. Admitting that the main features of geographical Science are (1) physical, (2) political, and (3) ethnological, pure geography may be deemed to end there. Still, the student of the world and its population is led to inquire (1) what language the inhabitants speak; (2) what religious conception they have adopted; (3) to what degree of culture they have attained; and (4), lastly, what are the more fortunate and more highly gifted races of Europe and North America doing at the present moment for the benefit of the so-called inferior races? Such information is supplied by this book in a fresh and engaging manner for certain portions of the globe, and no Englishman, who takes the trouble to read the particular portion of the volume, to which local predilections attract him, can fail to derive instruction and advantage.

R. N. C.

Map-Reading and Map-Interpretation.—M. de Lapparent, in a lecture to the French Association for the Advancement of Science, in February last (*Revue Scientifique*, vol. 5 (1896), p. 385), lays stress on the value of map-reading as an educational exercise in geography. He does not limit the term to the mere recognition of conventional symbols as representing rivers, roads, hills, forests, etc., but includes the interpretation of these so as to present to the mind's eye, not only the appearance of the country represented, but also something of its structure and the harmony of its various parts. M. de Lapparent compares this kind of map-reading to that of a musician reading a score, and able, without the intervention of an instrument, to appreciate the harmonies of sound. The training to give this power of geographical interpretation is not to be looked on as very severe; it is less the acquisition of a fresh burden of knowledge than the better orientation of ordinary geographical studies. The paper is mainly devoted to the exposition of cases in which the ordinary maps of a region may be made to tell a great part of the history of its geographical evolution, and even of its geological structure.

OBITUARY.

William Chandless, M.A.

By Colonel GEORGE EARL CHURCH.

ON the 5th ultimo, Mr. William Chandless, M.A., one of the Gold Medallists of this Society, died of inflammation of the lungs, in London, where he was born November 7, 1829. He was the son of Mr. Thomas Chandless, q.c., and his mother was the daughter of Sir William Long, of Bedfordshire. He graduated at Trinity

College, Cambridge, where he took high honours, being third in the classical tripos. He afterwards studied law for two years; but, finding that he had no taste for the legal profession, and being possessed of ample fortune, he abandoned the law. Apart from his classical attainments, he was a good mathematician and a keen observer. Generous, quiet, unassuming, and entirely regardless of self, his hand was ever open to unostentatiously assist others. To these qualities he added great courage, caution, patience, tact, and love of adventure—just the man for an explorer.

The year 1854 found him on the banks of the river Missouri, where, seeing many waggon-trains and cattle *en route* for Utah, he engaged as a teamster at \$25 per month, not being allowed to accompany them in any other way. To this early journey we are indebted for his agreeable work, 'A visit to Salt Lake, and a Residence in the Mormon Settlements of Utah.' Thence he wandered across the Rocky mountains to Los Angeles and San Francisco—a dangerous venture in those early days. From the latter city, he went to Acapulco, the Spanish emporium of trade with India in colonial times, and, crossing Mexico, returned home. In 1858 he went to Brazil; but the following year was in the Argentine Republic, arriving at Mendoza during the series of great earthquakes which for over a month shook that city. Thence he crossed the Andes to Chile, and from Valparaiso probably went to Peru and Ecuador, although the few scraps of information obtainable make his route uncertain; but in 1861 he passed the Ecuador boundary-line into Colombia, then indulging in one of its revolutionary outbreaks. Here travelling was perilous, and he suffered many detentions from the contending factions.

Soon afterwards, we find him at Manaus, the central city of the Amazon valley, where he took up his residence for a long period of time, and devoted himself to the study of the grand network of rivers which there invited his examination. In May, 1862, a paper was read at the Society giving an account of his exploration of the Tapajos, which he ascended to its source, 1200 miles above Santarem; but his attention was especially attracted to the mysterious and little-known Purus, the headwaters of which were then supposed to be within easy reach of the ancient capital of the Inca empire. The Madeira river, which runs parallel to the Purus, had been descended by Gibbon, in 1851, after visiting the slope of the Andes east of Cuzco; and he supposed that the Mayu-tata—which afterwards proved to be an affluent of the Beni branch of the Madeira—flowed into the Purus. Markham, after descending to the sources of the Mayu-tata in 1853, also believed them to empty into the Purus, and, with glowing pen, added to the glamour and romance which even now surround these regions formerly dominated by the Incas. Like Gibbon, he justly called attention to the vast benefits which might accrue to commerce if it were found that they were accessible from the Amazon by steamer. Diplomatic pressure was soon after put upon Brazil to open its giant river-system to trade.

It was not within the nature of such an adventurous traveller as Mr. Chandless to resist the temptation to explore and define the doubtful source of the then least-known of the tributaries of the Amazon. The incentives were more than sufficient. He commenced the task in June, 1864, and terminated it in February, 1865, entirely at his own expense. During this interval of time, he ascended the highly tortuous course of the Purus 1866 miles, until stopped for want of sufficient water for his canoe. The accuracy of his work, his description of the river, his observations upon its value as a commercial artery, the products of the region traversed, his numerous and careful observations for latitude and longitude, all stamp his survey as one of the most useful thus far made in the Amazon valley; while the extraordinary

tact and courage which characterized his relations with the numerous savage tribes he met throughout the course of the river, marked him as a man of rare qualifications for such a venturesome exploration. His paper on "The Ascent of the River Purus," read before the Geographical Society February 26, 1866, showed how well he had earned the honour of "Gold Medallist" which the Society conferred upon him.

In 1868, Mr. Chandless accomplished another interesting and useful task—the thorough exploration of the Juruá, published in the Society's proceedings for 1869. He ascended this wild, crooked, and forest-enveloped stream to its extreme source, 1133 miles. These surveys, aggregating over 5000 miles of main streams and branches, and representing three of the main southern tributaries of the river Amazon, have been of great value to geographical science, and have served as bases to correct the mistakes made in the location of many rivers which had previously been examined and mapped only in the rudest manner.

It is probable that Mr. Chandless' explorations of the Tapajos and Purus, and the attention which the Society called to them, largely influenced the issue of the decree of the Brazilian Government (December 7, 1866), opening a great part of the Amazon river to all flags.

Mr. Chandless left a legacy of £500 to the Society, free of duty.

John Buchanan, C.M.G.

We regret to have to announce the death of Mr. John Buchanan, who, with his brother Robert, has done so much to develop the resources of Nyasaland. A warm tribute to the value of his services was paid by the late Mr. Joseph Thomson, who during his last expedition had the opportunity of himself seeing the work he had accomplished. Mr. Thomson placed him among the four men who might be considered the founders of British Central Africa, and the person who above all others had practically shown (by his agricultural enterprises) the direction in which the country must look for its future development. An account by Mr. Buchanan of a journey in Nyasaland was published in the *Proceedings*, vol. 13, and a paper on the "Industrial Development of Nyasaland" was read by him before the British Association in 1892, and printed in the first volume of the *Journal*. He had been acting British Consul at Nyasa since 1888, and was made a c.m.g. in 1890. At the time of his death he was on his way to Europe, but succumbed in March last, at the mouth of the Zambesi, to a severe attack of fever contracted during the river journey. His loss will be keenly felt in the Nyasa colony.

OBITUARY OF THE YEAR.

The following is a list of the Fellows of the Society who have died during the year 1895-96 (May 11):—

Captain CARL ALEXANDERSON; GEORGE BENTLEY; JAMES BRAND; Captain T. H. BUTTERWORTH; H. H. BROWNE; DR. ROBERT BROWN; DAWSON BOBBEE; JOHN BUCHANAN; CHARLES CLAUSON; H. H. SOMERS COCKS; DR. HUGH CLEGHORN; DAVID CHADWICK; SIR C. C. CLIFFORD; HUMPHREY CHAMBERLAIN; WILLIAM CHANDLESS; Captain H. G. DUNNING; H. J. DORE; WM. ALEX. DUNCAN; Admiral the Hon. F. EGBERTON; Colonel W. E. EVANS; ALEXANDER EWING; HENRY FOWLER; JAMES FORREST; THOMAS FULLER; Rev. F. P. FLEMYNG; General Sir W. A. FYERS; Admiral R. O'B. FITZROY; Viscount GOUGH; T. M. GISBORNE; Rev. W. T. GILES; Sir JULIAN GOLDSMID; Rev. J. H. S. GRAHAM; M. W. GEARY;

Professor HUXLEY; W. A. HIGGS; the SULTAN OF JOHORE; General H. CAMPBELL JOHNSTONE; Major-General G. W. KNOX; General J. A. V. KIRKLAND; JOSEPH LEWIS; WILLIAM LAWSON; PHILIP H. LAWRENCE; WILLIAM LOCKHART; Captain S. LONG; Rev. CHAUNCEY MAPLES; Sir WILLIAM MACKENZIE; Sir P. M. MELVILL; A. F. MUMMERY; Colonel J. P. O. MITFORD; T. B. MUGGERIDGE; ALEXANDER MACMILLAN; JAMES MEDWIN; ALVAN MILLSON; DUNCAN MACNEILL; C. G. NOTTAGE; H. NESBIT; PERCY NIGHTINGALE; CRISTOFORO NEGRI; W. E. OATES; A. J. PRICE; the Earl of PEMBROKE; Admiral RUXTON; Colonel Sir JOHN ROBINSON; Colonel C. J. CRAMER ROBERTS; Dr. H. RINK; E. M. R. S. EMMOTT RAWDON; Lieut.-Colonel T. R. STEWART; Captain S. S. SMITH; J. B. SEDGWICK; A. J. SCOTT; Major HENRY SHUCKBURGH; Sir R. MACDONALD STEPHENSON; HENRY SEEBOHM; CHARLES SOPPITT; F. H. SMILES; WILLIAM SQUARE; J. GIBB SHAW; JOSEPH THOMSON; the Earl of VERULAM; BRYCE M. WRIGHT; Sir THOMAS WADE; JOHN WHITFORD; Sir SAMUEL WILSON; G. T. WICKENDEN; J. W. WALTON; Rev. HORACE WALLER; General J. T. WALKER.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-96.

Fourteenth Ordinary Meeting, June 1, 1896.—Sir GEORGE D. TAUBMAN GOLDIE, K.C.M.G., Vice-President, in the Chair.

ELECTIONS.—*William Chubb Meredith, M.A.; Captain S. F. W. St. John; Thomas Simpson; George Frederick Vernon.*

SIR CLEMENTS MARKHAM, K.C.B.

The CHAIRMAN, Sir GEORGE GOLDIE, said: Before calling on Mr. Bent to read his paper, I will utilize the moment or two at the disposal of the Chairman by referring to an incident which has occurred since our last meeting, of no little interest to the Royal Geographical Society. I allude to the distinction which her Majesty has been pleased to grant to our President. Sir Clements Markham is not able to be present to-night, as he has had to seek a short but much-needed change and rest, and is, I believe, at this moment with the Channel Squadron off the west coast of Scotland; but I have no doubt he will be back in plenty of time to preside at our annual meeting two weeks hence, and I feel sure that the Fellows will then express their satisfaction at the honour bestowed on him. I do not propose to go at length into his public services, which have extended over so many years, but I may be permitted to refer to one point of special interest to all those connected with the development of Africa—I mean his introduction of the cultivation of the cinchona plant into India. I think it will be agreed that, in the present state of medical knowledge, the possibility of settling the vast regions of tropical Africa and of civilizing the scores of millions of inhabitants of these regions largely depends on the cheapness of the production of quinine. That particular point in our President's record is, therefore, a very interesting one at this moment; but I do not propose, as I said, to dwell upon Sir Clements Markham's personal record. I would remind you that, in the *Gazette* which conferred his K.C.B., he was entered as the President of the Royal Geographical Society, and I think every Fellow of this Society will feel that the Society and he share in the honour which Sir Clements Markham has received.

The Paper read was:—

“Journey in North-Eastern Sudan.” By J. Theodore Bent, Esq.

Anniversary Meeting, June 15, 1896.—SIR CLEMENTS MARKHAM,
K.C.B., F.R.S., President, in the Chair.

At the commencement of the proceedings, the Honorary Secretary, Major Darwin, read the rules which govern the business of the Meeting.

The President next appointed Mr. S. W. Silver and Mr. H. Rassam scrutineers for the ballot about to take place.

ELECTIONS.—*Lieut. Edward G. Alston; F. Bisenbuger; Adolphus N. Cohen; George J. Aitchison Danford; Lieut. William Elliott, R.N.R.; Rev. Walter K. Firminger, B.A.; Henry Flemming Hibbert; Cecil R. Livingstone Learmonth; J. C. E. Parke; Captain W. Sharpe (Inspector Frontier Police); Lieut. A. H. Tyler, R.E.*

The Annual Report of the Council was then read.

REPORT OF THE COUNCIL.

The Council have the pleasure of submitting to the Fellows the following Report on the general and financial condition of the Society:—

Membership.—The number of Fellows elected during the year ending May 11, 1896, was 230, and nine Honorary Corresponding Members. In the previous year, 1894-95, the total elections amounted to 210, and in 1893-94 the number was 240. Our losses have been, by death 84 (besides 2 Honorary Corresponding Members), by resignation 49, and by removal on account of arrears of subscription 57; making a total increase of membership for the year of 47. In the year 1894-95 there was an increase of 12, in 1893-94 an increase of 29. The total number of Fellows on the list (which does not include those (46) who have been elected but have not yet paid the fees, and exclusive of Honorary and Honorary Corresponding Members) on May 13 was 3744.*

Finance.—As will be seen by the annexed Balance Sheet, the total net income for the financial year ending December 31, 1895 (*i.e.* exclusive of balance in hand) was 10,209*l.* 11*s.* 8*d.*, of which 7458*l.* consisted of entrance fees and subscriptions of Fellows. In the previous year, 1894, the total net income was 9853*l.* 4*s.* 6*d.*, and the amount of subscriptions, etc., 6852*l.* 10*s.*; in 1893, the two totals were 11,050*l.* 2*s.* 1*d.* and 7458*l.* 10*s.* respectively.

The net expenditure for the past year (*i.e.* exclusive of balance in hand) was 10,057*l.* 10*s.* 6*d.* The net expenditure in 1894 was 9583*l.* 0*s.* 5*d.*; in 1893, 11,584*l.* 2*s.* 3*d.*

The Finance Committee of the Council have held, as usual, meetings during the year, supervising the accounts of the Society. The Annual Audit was held on April 21 last, the Auditors being, on behalf of the Council, G. S. Mackenzie, Esq., and W. M. Beaufort, Esq., and on behalf of the Fellows at large, Sir Rawson Rawson and J. Duncan Thomson, Esq. The cordial thanks of the Council and Fellows are due to these gentlemen for having freely devoted their valuable time to this important task. At the end of their labours the Auditors drew up the following Report to the Council:—

Auditors' Report.—“We have examined the Balance Sheet, and certify that in our opinion it is a full and correct statement, properly drawn up, so as to exhibit a true view of the Receipts and Expenditure of the Royal Geographical Society, as shown by the books of the Society, which have been checked with the Vouchers.

* It will be observed that the elections are given for the year ending May 11, the accounts for the year ending December 31.

"The total receipts in 1895, 10,209*l.*, show an increase of 357*l.* over those of 1894; they exceeded the estimate by 369*l.* The Expenditure, 10,057*l.*, compared with the expenditure of 1894, shows an increase of 474*l.*, but it fell short of the receipts by 152*l.*

"Comparing the details with those of the previous year, the only noteworthy change on the Receipts side is that of Life Compositions, which show an increase of 426*l.* There had been a large falling off under this head in 1894. The only material changes on the expenditure side were a new disbursement of 723*l.* upon printing the Library Catalogue, an increase of 363*l.* on account of special meetings and annual soirées, and a decrease of 231*l.* in the cost of the *Journal*.

"The balance in hand at the commencement of the year was 295*l.* 10*s.*, and at the close, 447*l.* 3*s.* 2*d.*, with a decrease of ordinary arrears.

"The following statement shows the ordinary net Receipts and Expenditure of each of the last five years, exclusive of Balances, Investments, and the cost of altering the premises:—

					Net Receipts.	Net Expenditure.	Difference.
1891	...	...	...	...	8,823	8,171	152 +
1892	...	...	...	...	9,300	9,012	288 +
1893	...	...	...	...	11,051*	11,584†	533 -
1894	...	...	...	...	9,853	9,583	270 +
1895	...	...	...	...	10,209	10,057‡	152 +

"The Arrears of Subscriptions have fallen from 1418*l.* to 1308*l.*

"The par value of the Investments, certified by the Society's Bankers and the Bank of England to be in their possession, which stood at 20,148*l.* 0*s.* 5*d.* at the close of 1894, stand at 20,481*l.* 0*s.* 5*d.* at the close of 1895, the increase arising out of the conversion of North-Eastern Debenture Stock.

"The market value of the stocks held has increased from 26,424*l.* 17*s.* 6*d.*, in April, 1895, to 28,309*l.* 10*s.* 4*d.* on April 16, 1896.

"The Total Assets of the Society, estimated in 1894 at 47,287*l.* 7*s.* 6*d.* (exclusive of the Library and the Society's Publications in Stock), may now be estimated at 49,279*l.* 13*s.* 6*d.*

(Signed) "GEORGE S. MACKENZIE,
"W. M. BEAUFORT,
"J. D. THOMPSON,
"RAWSON W. RAWSON, } *Auditors.*

"April 21st, 1896."

* Including Lord Derby's Legacy of £1000. † Chief excess on Publications.

‡ Chief increase on Library Catalogue.

Receipts.

BALANCE SHEET FOR THE YEAR 1895.

Expenditure.

1895.		£ s. d.	£ s. d.	1895.—		£ s. d.	£ s. d.
Balances in Bankers' hands, Dec. 31, 1894 ..		275 8 6		House:—			
Accountant's		20 1 6		Taxes and Insurance ..		114 17 10	
			293 10 0	Coals, Light and Water ..		105 10 7	
Subscriptions:—				Repairs		90 7 4	
Arrears		434 0 0		Office Keeper		130 0 0	
For the current year ..		4192 0 0		Miscellaneous		57 5 7	498 1 4
Paid in advance		814 0 0		Office:—			
			5146 0 0	Salaries		1008 0 0	
Entrance Fees		1040 0 0		Stationery		122 11 3	
Life Compositions		978 0 0		Miscellaneous Printing ..		181 12 4	
Parliamentary Grant ..		500 0 0		Miscellaneous		225 8 8	1837 12 3
Royal Premium		52 10 0		Library:—			
Rent of Shop		86 0 0		Salaries		418 12 6	
			1174 17 9	Books and Binding		134 8 6	
Publications:—				Library Catalogues		340 0 0	
Advertisements in Journal		495 15 0		Printing Library Catalogues ..		623 5 6	
Sale of Journal and Proceedings		547 6 11		Gratuity to Librarian (Library Catalogue) ..		100 0 0	
Sale of 'Hints to Travellers'		54 7 0		Miscellaneous		48 15 8	
Other Publications		77 8 10		Map-room:—			1565 1 8
			50 0 0	Salaries		552 0 0	
Payments for Scientific Instruction .. .. .		.. .. .	20 4 6	Purchase of Maps, etc. ..		32 5 9	
Educational Lectures ..		.. .. .	35 5 0	Repairs to Instruments ..		55 9 6	
Sale of Society Tickets ..		.. .. .	3 7 0	Miscellaneous		64 7 3½	704 2 6½
Loan of Diagrams and Slides .. .. .		.. .. .	38 16 2	Map-Drawing Room:—			
Payments in error .. ..		.. .. .	50 0 0	Salaries		450 0 0	
			20 4 6	Miscellaneous		7 4 9	457 4 9
Dividends:—			35 5 0	Meetings:—			
North-Eastern Railway 3 per Cent. Debenture Stock		38 13 4		Evening Meetings		182 18 1	
Great Indian Peninsula Railway 5 per Cent. Stock		273 14 1		Anniversary Dinner and Soirée		299 0 0	
Great Western Railway 4½ per Cent. Stock [Davis bequest] 1800£.		73 19 0		Hand Maps		44 4 10	
London and North-Western Railway 3 per Cent. Stock [Murchison bequest] 1334£.		38 13 8		Miscellaneous		266 9 6	792 12 6
Caledonian Railway 4 per Cent. Preference Stock		77 6 8		Medals and other Awards Engraving New Diploma for Honorary Members)		.. .. .	231 17 0
Norwegian 3½ per Cent. Bonds		33 16 8		Education:—			19 0 0
New Zealand 4 per Cent. Stock 1000£.		38 13 4		Scientific Instruction ..		118 10 6	
New South Wales 3½ per Cent. Stock [Gill Memorial] 1023£. 5s. 6d.		34 15 10		Oxford and Cambridge Universities		375 0 0	
India Stock .. 1000£.		31 8 4		Oxford Studentship		50 0 0	
India 3½ per Cent. Debentures .. 1000£.		32 0 5		Owens College		50 0 0	
Consols .. 1064£. 10s. 3d.		28 6 4		Educational Prizes		116 5 0	
" [Peck Fund] 1000£.		28 7 11		Educational Lectures ..		126 2 0	835 17 0
" [Beck bequest] 561£. 0s. 8d.		14 18 4		Publications:—			
" [Trevelyan bequest] 510£. 4s. 0d.		13 10 8		Printing Journal		945 16 11	
Metropolitan 3½ Consols [Derby Legacy] 1000£.		3 16 8		Postage and Addressing ..		495 17 11	
			791 1 3	Separate copies		39 7 0	
£20,481 0 5				Maps		531 2 7	
				Illustrations		136 17 9	
				Payments to Contributors ..		300 0 0	
				Editor of Publications ..		200 0 0	
				Index to Proceedings		50 0 0	
				Miscellaneous		149 2 8	2851 4 10
				'Supplementary Papers'—Printing		53 15 3	
				Maps, Illustrations & Binding		119 10 10	173 6 1
				Expeditions:—			
				Grant to Mr. J. T. Bent ..		100 0 0	
				Instruments		136 15 3	236 15 3
				Alterations to House ..		.. .. .	33 3 4
				Messrs. Fox & Bosfield (fees in connection with search for new premises) .. .. .		.. .. .	105 0 0
				Payments in error returned .. .. .		.. .. .	17 0 0
				Balance in Bankers' hands, Dec. 31, 1895 ..		441 11 11	
				Do. Accountant's do. ..		5 11 3½	447 3 2½
							£10,505 1 8
							£10,505 1 8

E. L. S. COOKS,
Treasurer.

Audited and found correct, April 25, 1896.

W. M. BEAUFORT,
GEORGE S. MACKENZIE,
RAWSON W. RAWSON,
J. D. THOMSON. } Auditors.

84 MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-96.

STATEMENT showing the RECEIPTS and EXPENDITURE of the Society from the Year 1848 to December 31, 1895.

	Year.	Cash Receipts within the Year.			Cash Amounts Invested in Funds.			Deducting Amounts invested in Funds; actual Expenditure.			
		£	s.	d.	£	s.	d.	£	s.	d.	
^a Includes Treasury Grant of 1000 <i>l.</i> for the East African Expedition.	1848	696	10	5	..	..	..	755	6	1
	1849	778	3	0	..	..	..	1098	7	6
^a Includes Treasury Grant of 2500 <i>l.</i> for the East African Expedition.	1850	1636	10	5	..	..	..	877	2	10
	1851	1656	11	8	..	..	..	906	14	7
	1852	1220	3	4	..	..	..	996	13	1
^a Includes Legacy of Mr. Benjamin Oliveira, 1500 <i>l.</i> 17 <i>s.</i> 1 <i>d.</i>	1853	1917	2	6	..	..	..	1675	6	0
	1854	2646	7	8	..	..	..	3197	19	3
^a Includes Legacy of Mr. Alfred Davis, 1800 <i>l.</i>	1855	2584	7	0	..	..	..	2636	3	1
	1856	3372	5	1	532	10	0	2814	8	1	
	1857	3142	13	4	378	0	0	2490	19	9	
^a Includes Legacy of Sir Roderick Murchison, 1000 <i>l.</i>	1858	3089	15	1	..	..	..	3442	13	6
	1859	3471	11	8	960	0	0	3423	3	9	
^a Includes Mr. James Young's Grant for Congo Expedition, 2000 <i>l.</i>	1860	6449	12	1	466	17	6	5406	3	7	
	1861	4792	12	9	1358	2	6	3074	7	4	
	1862	4659	7	9	1389	7	6	3095	19	4	
^a Includes 1000 <i>l.</i> 14 <i>s.</i> 6 <i>d.</i> , sale of Exchange Bills.	1863	5256	9	3	1837	10	0	3655	4	0	
	1864	4977	8	6	1796	5	0	3647	7	10	
^a Includes Mr. James Young's Grant for the Congo Expedition, 1041 <i>l.</i> 14 <i>s.</i>	1865	4905	8	3	1041	5	0	4307	4	5	
	1866	5085	8	3	1028	15	0	4052	15	0	
	1867	5462	7	11	1029	0	6	3943	17	4	
	1868	5991	4	0	1857	3	9	4156	17	10	
^a Includes Parliamentary Grant of 3000 <i>l.</i> to Cameron Expedition.	1869	6859	16	0	2131	5	0	4646	0	8	
	1870	8042	6	1	2802	6	0	3845	10	6	
^a Includes Donation of 500 <i>l.</i> by Mr. C. J. Lambert.	1871	6637	3	7	1000	0	0	3726	4	4	
	1872	8119	7	9	1999	4	6	5871	13	2	
	1873	7761	18	10	2015	1	8	6697	12	6	
^a Includes Legacy of Admiral Sir George Back, 540 <i>l.</i>	1874	8753	5	10	499	0	0	7876	2	3	
	1875	7934	15	10	2002	7	6	5883	4	10	
	1876	11611	11	8	..	..	..	6870	13	1
^a Includes Legacy of Sir W. C. Trevelyan, 500 <i>l.</i>	1877	7950	1	11	2538	2	0	5940	17	11 ^a	
	1878	8124	10	0	3000	0	0	6361	9	6	
^a Includes 1005 <i>l.</i> 8 <i>s.</i> 2 <i>d.</i> , sale of Exchange Bills.	1879	8979	14	10	1551	10	10	6990	14	2	
	1880	8599	18	4	1567	5	1	5454	1	10 [†]	
	1881	8809	19	5	..	..	..	5362	5	5 [‡]
^a Includes 1000 <i>l.</i> received from Mr. B. Leigh Smith.	1882	8942	15	0	..	..	..	8779	10	7
	1883	9699	9	0	1001	5	0	8624	2	11	
^a Includes 500 <i>l.</i> on loan from Bankers.	1884	8964	11	7 [†]	9286	0	5	
	1885	8738	12	3	..	..	..	8555	3	10 [‡]
^a Includes 998 <i>l.</i> 0 <i>s.</i> 10 <i>d.</i> , sale of India Debentures.	1886	7968	9	0	1000	0	0	7767	18	0 [‡]	
	1887	8007	16	3	..	..	..	8493	10	3
^a Includes Donation of 1000 <i>l.</i> from Miss Gill.	1888	8063	5	0	..	..	..	7908	18	6
	1889	8224	7	7	1000	0	0	7025	16	10	
^a Includes Legacy of the Earl of Derby, 1000 <i>l.</i>	1890	9631	16	2	On deposit.	850	0	0	8218	5	10
	1891	8322	16	8	1000	0	0	8171	3	9	
	1894	9299	18	7	..	..	..	9012	7	5 [‡]
	1893	11050	2	1	1150	0	6	11594	2	3	
	1894	9853	4	6	..	..	..	9583	0	5
	1895	10209	11	8	..	..	..	10067	18	6

^a This sum includes the Special Parliamentary Grant transferred to the Cameron Expedition Fund in February, 1877.

[†] This amount includes the payment of two sums of 500*l.* each, contributed to the African Exploration Fund in this and the previous year.

[‡] This sum includes the payment of 102*l.* 8*s.* to the African Exploration Fund; also 714*l.* 9*s.* 1*d.*, the final payment for Cameron Expedition Fund.

STATEMENT OF ASSETS.—December 31, 1895.

	£	s.	d.
Freehold House, Fittings, and Furniture, estimated (exclusive of Map Collections and Library insured for 10,000 <i>l.</i>)	..	..	20,000 0 0
Investments (amount of Stock), as detailed in the above Report of the Auditors, valued April last at	..	..	28,309 10 4
Arrears due on December 31, 1895, 1308 <i>l.</i> Estimated at	..	..	523 0 0
Balance at Bank	£441	11	11
„ in Accountant's hands	5	11	3
			<u>447 3 2</u>
Total	£49,279	13	6

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-96. 85

ESTIMATE FOR THE YEAR 1896.

RECEIPTS.						£	s.	d.
Balance in Bankers' hands (less liabilities)..	..	..	..	..	..	356	11	11
Subscriptions .. .. .	..	..	..	..	..	5400	0	0
Entrance Fees .. .. .	..	..	..	..	..	950	0	0
Life Compositions .. .. .	..	..	..	..	..	700	0	0
Parliamentary Grant .. .. .	..	..	..	..	..	500	0	0
Royal Premium .. .. .	..	..	..	..	..	52	10	0
Rent of Shop .. .. .	..	..	..	..	..	86	0	0
Publications .. .. .	..	..	..	..	..	1200	0	0
Payments for Scientific Instruction .. .. .	..	..	..	..	..	50	0	0
Payments made in error .. .. .	..	..	..	..	..	40	0	0
Loan of Diagrams and Slides .. .. .	..	..	..	..	..	5	0	0
Sale of Soirée Tickets .. .. .	..	..	..	..	..	35	0	0
Sale of <i>Proceedings</i> (Old Series) .. .. .	..	..	..	..	..	24	0	0
Dividends .. .. .	..	..	..	..	..	800	0	0
Total						£10,199	1	11

EXPENDITURE.						£	s.	d.
House .. .. .	..	..	..	..	..	470	0	0
Office .. .. .	..	..	..	..	..	1458	0	0
Library .. .. .	..	..	..	..	..	808	0	0
Map Room .. .. .	..	..	..	..	..	708	0	0
Map-Drawing Room .. .. .	..	..	..	..	..	458	0	0
Meetings .. .. .	..	..	..	..	..	727	10	0
Medals and other Awards .. .. .	..	..	..	..	..	200	0	0
Education .. .. .	..	..	..	..	..	770	0	0
Publications :								
<i>Journal</i> .. .. .	..	..	..	..	..	8040	0	0
'Supplementary Papers' .. .. .	..	..	..	..	..	350	0	0
Index to <i>Proceedings</i> .. .. .	..	..	..	..	..	25	0	0
Expeditions .. .. .	..	..	..	..	..	350	0	0
Purchase of the late Captain Parker Snow's papers .. .. .	..	..	..	..	..	100	0	0
Payment towards the International Geographical Congress .. .. .	..	..	..	..	..	400	0	0
Payments in error returned .. .. .	..	..	..	..	..	25	0	0
Balance available for contingencies .. .. .	..	..	..	..	..	818	19	11
Total						£10,199	1	11

Publications.—The monthly *Journal* has been issued with regularity throughout the year; the twelve numbers for 1895 forming two volumes of 1276 pages, illustrated by 56 maps and 114 illustrations. The total cost of the edition of 5500 copies (including 498*l.* 17*s.* 11*d.* for free delivery to Fellows and Institutions) was 2801*l.* 4*s.* 10*d.* From this is to be deducted the amount of 1043*l.* 1*s.* 11*d.* received from sale of copies to the public and from advertisements. The sum of 173*l.* 6*s.* 1*d.* was expended on 'Supplementary Papers.'

Library.—During the past year 980 books and pamphlets, in addition to serial publications, have been added to the Library—833 by donation, 147 by purchase; 566 pamphlets have been put in boards by the Society's map-mounter, and 433 volumes have been bound. The sum of 64*l.* 14*s.* 1*d.* has been expended on books, and 69*l.* 9*s.* on binding.

The accessions of new books and the titles of articles in geographical publications are published monthly in the *Geographical Journal*. A large number of

works was presented to the Society by members of the Sixth International Geographical Congress which met in 1895. The Society purchased the collection of Arctic MSS. accumulated by the late Captain Parker Snow, including an extensive chronology and bibliography of Arctic travel. These works are now being arranged in the Library.

The experiment of keeping the Library open on Saturday afternoons has been discontinued on account of the small number of Fellows who availed themselves of the opportunity; but, during the session, the Library has been kept open on meeting-nights until 8.15 p.m.

The *Subject Catalogue* has been steadily proceeded with. The titles of all books and pamphlets mentioned in the *Authors Catalogue* (down to 1893), and the titles of all geographical books or articles in periodicals since 1892 to the present date, have been cut out and pasted on slips, which are partially arranged as a nucleus for the *Subject Catalogue*. In addition a large number of volumes of old periodicals has been gone through, and the titles written on cards. These include all the Russian and most of the Scandinavian and Hungarian works. In the systematic plan now adopted, the series of *Transactions* and periodicals are being worked through in the order in which they are enumerated in Appendix III. of the *Authors Catalogue*, those published in Africa and America being now completed. The total number of title-slips for the *Subject Catalogue*—accumulated up to May 20—was 38,878.

Press-marking.—The greater part of the Library has been rearranged, the books press-marked, and the press-marks entered in a copy of the *Catalogue* for convenient reference.

Scientific Purposes Grant.—During the past year 30 intending travellers have received instruction from Mr. Coles, in Practical Astronomy, in the Society's Observatory, and in surveying with the theodolite, prismatic compass, and plane-table, in the country, and 401 hours have been devoted to teaching.

Instruments to the value of 324*l.* 17*s.* 6*d.* have been lent during the past year to the following travellers:—Mr. R. T. Günther (Italy), 13*l.* 10*s.*; Mr. F. W. W. Howell (Iceland), 21*l.* 16*s.*; Prof. J. Milne (Seismographic work in England), 39*l.* 15*s.*; Captain L. R. Arthur (Congo Region), 4*l.* 10*s.*; Captain H. H. P. Deasy (Central Asia), 76*l.* 10*s.*; Captain F. D. Lugard, D.S.O. (South Central Africa), 87*l.*; Mr. W. S. Bruce (for practice in Scotland), 8*l.* 8*s.*; Mr. R. T. Günther (for use in England), 3*l.* 13*s.* 6*d.*; Mr. H. C. Robinson (New Guinea), 65*l.* 3*s.*; Sir W. M. Conway (Spitzbergen), 69*l.* 15*s.*

The instruments lent to the following gentlemen have been returned during the past year, with the exception of those which have been lost:—Captain Cayley Webster (New Guinea), 1893; Mr. J. T. Last (Madagascar), 1894; Sir C. M. Macdonald (Niger Region), 1891; Mr. F. W. W. Howell (Iceland), 1895; Rev. C. H. Robinson (West Africa), 1893; Lieut. F. W. Green, B.A. (Asia Minor), 1894; Lieut. Coningham (Persia), 1893; Dr. Donaldson Smith (East Central Africa), 1894; Mr. St. George R. Littledale (Central Asia), 1894; Prof. J. Milne (Seismographic work in England), 1895; Mr. R. T. Günther (Italy), 1895.

The following is a list of travellers who still have instruments lent to them in their possession:—Mr. E. Douglas Archibald (for cloud observations in England), 1885; Mr. T. Bevan (New Guinea), 1887; Sir H. H. Johnston (British Central Africa), 1889 and 1894; Rev. A. Hetherwick (South-East Africa), 1891; Dr. D. Kerr Cross (South-East Africa), 1891; Mr. C. W. Campbell (Korea), 1893; Mr. J. C. White (Sikkim), 1893; Mr. R. M. W. Swan (South-East Africa), 1893; Mrs. Bishop (Korea), 1893; Mr. R. T. Coryndon (Mashonaland), 1894; Dr. Forsyth Major (Madagascar), 1894; Mr. S. Vandeleur, Scots-

Guards (Uganda), 1894; Mr. O. M. Woodford (Pacific Islands), 1894; Captain A. St. H. Gibbons (South Central Africa), 1895; Mr. F. C. Selous (South Central Africa), 1895; Sir William Macgregor (British New Guinea), 1895; Captain L. R. Arthur (Congo Region), 1895; Captain H. H. P. Deasy (Central Asia), 1896; Captain F. D. Lugard, D.S.O. (South Central Africa), 1896; Mr. R. T. Günther (for plotting work in England), 1896; Mr. W. S. Bruce (for practice in Scotland), 1896; Mr. H. C. Robinson (New Guinea), 1896; Sir W. M. Conway (Spitzbergen), 1896.

Map Room.—The accessions to the Map Room Collection during the past year comprise 826 Maps on 2002 sheets; 49 Atlases (including continuations) containing 1166 sheets of Maps, 1212 Photographs, 6 Sketches, and 415 Lantern Slides. Of these, 46 Maps on 98 sheets, 17 Atlases, 74 Photographs, and 175 Lantern Slides have been purchased.

Most of the important donations to the Map Room Collection during the past year have been mentioned in the *Geographical Journal*, but in addition to these, Mr. H. Yates Thompson has presented the following atlases: French edition of Mercator's Atlas, published at Amsterdam, 1613; Ortelius' *Theatrum Orbis Terrarum*, 1579; and Sr. Ayrouard's 'Rectiel de plusieurs Plans des Ports et Rades et de quelques Cartes Particulieres de la Mer Mediterranee,' 1732 to 1746. Several of the collections of maps sent for exhibition at the meeting of the International Geographical Congress last year have also been presented by the exhibitors.

PRESENTATION OF THE ROYAL MEDALS AND OTHER AWARDS.

The PRESIDENT: Sir Henry Norman has kindly undertaken to receive the Founders' Medal, in Sir William MacGregor's absence. The Founders' Medal has been adjudicated to Sir William MacGregor, Lieutenant-Governor of New Guinea, for his long-continued services to geography, both in the interior and along the coast-line of that dependency. He has not only examined every inlet and bay, and every island, explored all the rivers of his government, and ascended the Owen Stanley range; but he has fixed his positions astronomically, and has mapped the details with so much assiduity and ability, and with such extraordinary zeal under very trying circumstances, that the Council has had no hesitation whatever in awarding to him the highest honour the Society has in its power to bestow. Sir William is still actively engaged in the same useful work, and perhaps this recognition ought to have come earlier; but I trust that it will give him satisfaction, and that he will rejoice to be assured of the sympathy of his brother geographers in England at a moment when he is still in the midst of his arduous labour. No one can be better acquainted, Sir Henry Norman, with the usefulness and importance of Sir William MacGregor's work than yourself, who was Governor of Queensland at the time; it is, therefore, appropriate that I should ask you to receive the medal for Sir William MacGregor, which I now have the pleasure of placing in your hands.

General Sir HENRY NORMAN: It is with very great pleasure indeed that I have received the Gold Medal of the Royal Geographical Society on behalf of Sir William MacGregor, and I am quite sure he will be very gratified at its receipt. As most of you are aware, the government of British New Guinea is immediately subordinate to the government of Queensland, and, having been governor of Queensland from within a few months of Sir William's arrival until the end of last year, I am in a position to thoroughly endorse all that your President has said. I am well aware of the very great services rendered to geography and to his country by Sir William MacGregor. It would have been quite impossible for these explorations to be carried out, or the many reports which have been made to be prepared, by any one who did not possess a most robust constitution, absolute fearlessness, entire disregard of hardships, great tact in the management of natives, and most

extensive scientific knowledge. Sir William MacGregor possesses all these qualifications. He has made numerous reports, all of which are published as they come in by the government of Queensland as parliamentary papers, but I am afraid most of them are not very readily accessible at present to the public. I trust at some no very distant date Sir William MacGregor will have the leisure to put all these reports into one book, which I am sure will be of great interest to the public, because they seem interested in the great territory of British New Guinea, which he has administered, and it will show them what a very great public service Sir William MacGregor has rendered during the last eight years.

The PRESIDENT: Mr. Littledale, the Council has awarded to you the Patron's Medal, not only as the traveller who has done the most important piece of geographical work during the last year, but as one who has worked for the objects of this Society with remarkable success and zeal during a very much longer period. You did valuable work and brought fresh information to us after your journey across the Pamirs in 1890. In 1893, your memorable journey from Kokhan to Peking included the examination of a considerable area of previously unknown country. Last year I consider that you surpassed all your previous efforts by crossing the Kuenlun, and traversing the whole of the great plateau of Tibet from north to south under difficulties of no ordinary character. It was not only as an intrepid traveller that the grant was made to you, but it was for having so diligently fixed your positions under great difficulties day by day, and for having mapped your routes with great care, that the Council was so unanimous when your name came before them for recognition. You have proved yourself to be not only a traveller, but a scientific geographer, and as such I have the very greatest pleasure in placing in your hands the Patron's Medal of this Society.

Mr. ST. GEORGE LITLEDALE: I must thank you for the great honour you have done me in presenting this medal and the flattering manner you have spoken of my map. The merits of that map, if merits there be, are owing, in the first place, to the careful instruction I received from Mr. Coles, who taught me how to use the instruments kindly lent by this Society; also, in the second place, to my wife and Mr. Fletcher, who, no matter how bad the weather, or how hard the march had been, were always ready to sit up and take the times of the observations. How correctly they took them, Mr. Coles and Mr. Scharbau have given evidence. I must again thank you for the compliment you have paid me.

The PRESIDENT: Sir Henry Thuillier, your hereditary interest in the Indian surveys, and your own long distinguished service in connection with them, makes it especially appropriate that you should receive the Murchison Grant from me, for transmission to its recipient. Yusuf Sharif, of whom Colonel Holdich speaks in the highest terms, has been selected for the Murchison Grant, because he is the first native surveyor who acted entirely on his own resources and his own responsibility. He has conducted a scientific survey through a most difficult and dangerous country with success, from Makran to Bandar Abbas; and that is not the only useful work he has done for geography. He thus takes a place among those distinguished Indian surveyors whose valuable work has been from time to time recognized by this Society. I now have great pleasure in handing the Murchison Grant to Sir Henry Thuillier. The Gill Memorial and the Back Grant have been awarded to two very active and energetic officers connected with the Canadian Survey, Mr. Low and Mr. Tyrrell, the former for his five exploring journeys in Labrador, and the latter for two interesting expeditions into the Barren Grounds of North-East Canada. The form which the memorials will take has been, at their request, a gold watch and a silver cup. The Cuthbert Peek Grant has been awarded to Mr. Alfred Sharpe. After an examination of all his work and of the

services he has rendered to geography, the Council unanimously decided he was deserving of it, and their examination was undertaken at the request and recommendation of Sir John Kirk. Mr. Alfred Sharpe has made several very interesting journeys in Central Africa, and has always forwarded to our *Journal* valuable and full reports.

THE BALLOT FOR THE NEW COUNCIL.

The President then announced that, according to the report of the scrutineers, the list as prepared by the Council had been duly elected.

The list is as follows, the names of new members, or those who change office, being printed in *italics* :—

President :—Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents* : Hon. George C. Brodrick; Right Hon. Geo. N. Curzon, M.P.; Sir George D. Taubman Goldie, K.C.M.G.; *Sir Rawson W. Rawson*, K.C.M.G., C.B.; General R. Straohey, R.E., C.S.I., F.R.S.; Rear-Admiral W. J. L. Wharton, F.R.S. *Treasurer* : Edward L. Somers Cocks. *Trustees* : Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; Cuthbert E. Peek. *Secretaries* : Major Leonard Darwin, R.E.; *James F. Hughes*. *Foreign Secretary* : Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors* : W. M. Beaufort; *Lord Belhaven and Stenton*; George Cawston; *Colonel J. Farquharson*; Wilfred Hudleston, F.R.S., F.G.S.; J. K. Laughton; *Right Hon. Lord Loch*, G.C.B., G.C.M.G., etc.; G. Sutherland Mackenzie; Rear-Admiral Albert Hastings Markham; A. P. Maudslay; *John Murray*, LL.D., F.R.S.; *General Sir Henry W. Norman*, G.C.B., G.C.M.G.; Howard Saunders; The Earl of Scarbrough; *P. L. Sclater*, F.R.S.; Rear-Admiral E. H. Seymour, C.B.; Major the Hon. M. G. Talbot; *Colonel Sir Henry R. Thuillier*, R.E., K.C.L.E.; Lieut.-Colonel J. K. Trotter, R.A.; Admiral Hon. W. J. Ward; Lieut.-Colonel C. M. Watson, R.E., G.M.G.

The President then delivered his annual address (see p. 1), after which General Sir HENRY NORMAN said : I have great pleasure in proposing a vote of thanks to Sir Clements Markham for his able and comprehensive Presidential address, from which we feel assured that a great deal has been done during the year to advance geographical science and geographical exploration, to all of which Sir Clements Markham has lent most valuable aid and assistance. I will only make one remark in reference to what we hope will take place, and which is, I think, a very general hope among the more enlightened part of the community in Australia—that an Antarctic expedition should be fitted out by her Majesty's Government. As Sir Clements Markham has shown, not only to-day, but in the paper previously printed, it is almost impossible to expect satisfactory results from such an expedition unless it is a Government expedition, and I hope by this time next year that the Government will have acceded to the wish, which I believe almost all geographers will express in favour of the expedition. In moving this vote of thanks, I think you will all desire that I should, on your behalf, congratulate Sir Clements Markham on the distinction her Majesty has been pleased to confer upon him for the very great services which he has rendered, and which have been beneficial to the empire, and which have not altogether been confined to those undertaken in support of geographical science. I beg to propose a vote of thanks to Sir Clements Markham.

Mr. S. W. SILVER : I have the pleasure to second the vote of thanks. In doing so, I think we may say that we have listened to one of the most interesting addresses we have had for twenty-five years. It gives me very great pleasure, therefore, to second the motion which has been made, and I cannot do so without making reference to that well-earned recognition on the part of the Government to our President of his interest in the welfare of the nation during a long life of utility and advantage.

He has been the active instrument in transferring the invaluable Cinchona plant from South America to India, a circumstance with which all interested, directly or indirectly, with commerce must have identified his name. I beg, sir, to second the vote of thanks.

The PRESIDENT: I have to thank Sir Henry Norman and Mr. Silver for their kindness, and the meeting for the way their proposal was received. I think I may, without breach of confidence, say that I have been informed why this honour was conferred, and why our patron, her Majesty the Queen, has thought fit to bestow it upon me. I may tell you that it was, at all events, not wholly unconnected with the interest her Majesty, as patron, has always taken in the welfare of this Society.

THE ANNUAL DINNER.

The annual dinner of the Society took place on the evening of June 15, in the Whitehall Rooms of the Hôtel Métropole. Sir Clements Markham, K.C.B., F.R.S. (the President), was in the chair, and among those present were the Danish Minister, Lord Wenlock, Lord Monkswell, General Sir Francis Scott, Comte Henri de Bizemont, the Belgian Minister, Sir G. Taubman-Goldie, Admiral Sir F. Bedford, General Sir H. W. Norman, the Swedish Minister, Admiral the Hon. W. J. Ward, Sir Stuart Bayley, Sir T. Sanderson, Sir Montagu F. Ommanney, Sir Graham Bower, Mr. Moberly Bell, Admiral A. H. Markham, Lord Belhaven and Stanton, Sir Courtenay Boyle, Sir E. Maunde Thompson, Mr. Thiselton-Dyer, General Sir J. Hills-Johnes, the Hon. G. C. Brodrick, General Markham, Colonel Penny-quick, Mr. Gosch, Mr. Littledale, Mr. Preston of Moreby, Sir Rawson W. Rawson, Mr. W. J. Courthope, Mr. Richmond, B.A., Mr. Rollins, Sir W. H. Flower, Mr. J. Bramston, Sir A. Adderley, Mr. Clement Royds, M.P., Mr. E. G. Ravenstein, Mr. C. E. Borchgrevink, General Lees, General Sir H. Havelock-Allan, Major L. Darwin, Mr. J. F. Hughes, Sir G. S. Meason, Sir Whitaker Ellis, Mr. Foster (Secretary of the Hakluyt Society), Dr. H. Woodward, Mr. Bosworth Smith, Sir Juland Danvers, Sir W. de Souza, and Sir W. L. Booker.

The PRESIDENT, having proposed the usual loyal toasts, next gave that of "The Navy and Army," responded to by Admiral Sir F. Bedford and General Sir F. Scott.

The PRESIDENT next proposed the toast of "The Medallists," which was acknowledged by Mr. ST. GEORGE LITTLEDALE.

The PRESIDENT, in proposing the toast of "The Guests," referred to the services which had been rendered to science and civilization by Lord Wenlock and Colonel Pennyquick. He also spoke of Mr. Borchgrevink's forthcoming Antarctic expedition. Mr. Borchgrevink was about to go out in an English whaling vessel with the object of being landed at Cape Adare, on Victoria Land. He would be accompanied by a party of friends, and would be left in the Antarctic regions for the winter, to do all the exploration in his power. It was hoped that he would be taken off in the next season, and that valuable results would attend his pluck, his perseverance, and his energy. The Society would follow his proceedings with the utmost interest.

Lord WENLOCK and Comte HENRI DE BIZEMONT responded to the toast; and

Sir G. TAUBMAN-GOLDIE proposed the health of the President. In doing so he expressed the gratification which they all felt at the honour which the Queen had been pleased to confer on Sir Clements Markham.

The PRESIDENT acknowledged the compliment, and gave the toast of "The Officers of the Society."

Mr. KELTIE responded, and the proceedings then ended.

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce, Commercial.
 C. Rd. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 J. = Journal.
 M. = Mittheilungen.

Mag. = Magazine.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue, Revista.
 S. = Society, Société, Selakab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

ASIA.

- Asia.** *B.S. Khediviale G. 4 s.* (1896): 545-568. Fukushima.
 M. le Comte Charles Zaluski. Communication sur le voyage à cheval de Berlin à Wladivostok accompli par le Colonel Foukou-Shima, de l'armée japonaise.
- Ceylon.** *J.B. Colonial I. 27* (1896): 436-471. Clarence.
 One Hundred Years of British Rule in Ceylon. By L. B. Clarence.
- India—Vijayanagar.** *J.S. Arts 44* (1896): 529-540. Rolleston.
 The Deserted City of Vijayanagar. By Captain Charles Rolleston.
- Indo-China.** *C. Rd. S.G. Paris* (1896): 42-66. Henri d'Orléans.
 Du Yunnan à l'Assam. Par le Prince Henri d'Orléans. *With Map.*
- Indo-China.** *Rev. Française et Exploration 21* (1896): 129-135, 193-201. Henri d'Orléans.
 Du Tonkin aux Indes par le Yunnan: Exploration du Prince Henri d'Orléans. *With Maps.*
- Indo-China—Laos.** *B.S.G. Commerc. Paris 18* (1896): 263-281. Malglaive.
 La pénétration au Laos par la brèche d'Ai-Lao, à propos d'une récente tentative. Par M. le capitaine de Malglaive. *With Map.*
- Korea.** *J. Anthropol. I. 25* (1896): 340-361. Landis.
 Mourning and Burial Rites of Korea. By E. B. Landis, M.D.
- Korea—Atlas.** Cordier.
 Description d'un Atlas Sino-Coréen, Manuscrit du British Museum. (Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e jusqu'à la fin du XVI^e siècle, publié sous la direction de MM. Ch. Schefer et Henri Cordier, Section Cartographique.) Par Henri Cordier. Paris: E. Leroux, 1896. Size 20½ × 13, pp. 14. *Facsimile Maps. Presented by the Author.*
 Professor Cordier gives a full description with reproductions of several plates of a manuscript Chinese atlas of Korea dating from the eighteenth century, and now in the British Museum, discussing the names which occur on the maps.
- Malay Archipelago.** *Rev. G. 38* (1896): 337-342. d'Estrey.
 Todjo, Poso, Saouson et Moceton, quatre petits États de l'Archipel Indien, explorés par le baron van Hoevell. Par le Dr. Comte A. Meyners d'Estrey.
- Malay Archipelago—Borneo.** Young.
Tijds. Indische Taal-, Land- en Volkenkunde 38 (1895): 499-550.
 Bijdrage tot de geschiedenis van Borneos Westerafdeeling. Door J. W. Young.
- Malay Archipelago—Sumatra.** Klerka.
Tijds. Indische Taal-, Land- en Volkenkunde 39 (1895): 1-117.
 Geographisch en Ethnographisch opstel over de Landschappen Korintji, Sérampas en Soengai ténang. Door E. A. Klerka. *With Map.*

- Malay States.** *J.R. Colonial I.* 27 (1896): 420-438. Swettenham.
Discussion on "British Rule in Malaya." By F. A. Swettenham, C.M.G.
- Mongolia—Buddhism.** Huth.
Geschichte des Buddhismus in der Mongolei, Mit einer Einleitung: Politische Geschichte der Mongolen. Aus dem Tibetischen des Jiga-med nammk'a, herausgegeben, übersetzt und erläutert, von Dr. Georg Huth. Zweiter Teil: Nachträge zum ersten Teil, Uebersetzung. Straassburg: K. J. Trübner, 1896. Size 10½ × 7, pp. xxxii. and 456. Price 30 mark. Presented by the Publisher.
The German translation of the Tibetan text published by the author in 1892, with critical notes.
- New Siberian Islands.** *Ymer* 16 (1896): 79-100. Nathorst.
De Nyaibiriska öarne. Öfversikt af där utförda forskningar och dessas resultat. Af A. G. Nathorst. With Map and Plate.
- Northern and Eastern Asia.** Keane.
Stanford's Compendium of Geography and Travel (New Issue). Asia. Vol. i. Northern and Eastern Asia. By A. H. Keane. London: E. Stanford, 1896. Size 8 × 5½, pp. xxiv. and 528. Maps and Illustrations. Price 15s. Presented by the Publisher.
Like the other volumes of the present issue of this Compendium, the changes have been of the most radical kind; the work, in fact, is a new one, giving an account of the geography of Asia at once accurate and up to date.
- Persia.** *J. Tyne-side G.S.* 3 (1896): 220-227. Goldsmid.
Persia and Her Neighbours. By Major-General Sir Frederick J. Goldsmid, K.C.B., etc. With Portrait.
- Siam.** *J. Manchester G.S.* 11 (1895), (1896): 141-158. Unsworth.
An English Lady in Siam. By Mrs. (Captain) Unsworth. With Map.
- Tibet.** Littledale.
A Journey across Tibet, from North to South, and West to Ladak. By St. George R. Littledale. From the *Geographical Journal* for May, 1896. Size 10 × 6½, pp. 32. Maps and Illustrations.
- Turkey in Asia.** *Scottish G. Mag.* 13 (1896): 225-241. Maunsell.
Eastern Turkey in Asia and Armenia. By Captain F. R. Maunsell.
- Western Asia.** *Petermanns M.* 42 (1896): 49-58, 73-88. Oppenheim.
Zur Routenkarte meiner Reise von Damaakus nach Bardäd im Jahre 1893. Von Dr. Max Freiherrn v. Oppenheim. With Map.
- Western Asia—Anthropological Researches.** Chantre.
Recherches Anthropologiques dans l'Asie Occidentale. Missions Scientifiques en Transcaucasie, Asie Mineure et Syrie, 1890-1894. Par Ernest Chantre. Extrait des Archives du Museum d'Histoire Naturelle de Lyon, t. vi. Lyon: H. Georg, 1895. Size 15 × 11, pp. xviii. and 250. Plates. Presented by the Author.
- Western Asia and Egypt.** Hogarth.
A Wandering Scholar in the Levant. By David G. Hogarth. Second Edition. London: John Murray, 1896. Size 8 × 5½, pp. xvi. and 206. Map and Illustrations. Price 7s. 6d. Presented by the Author.
This will be separately noticed.

AFRICA.

- Abyssinia.** Vanderheym.
J.-G. Vanderheym. Une Expédition avec le Négous Ménélik; vingt mois en Abyssinie. Paris: Hachette & Cie., 1896. Size 7½ × 5, pp. vi. and 206. Map and Illustrations.
- Africa Pilot—Revised Supplement.**
Revised Supplement, 1895, relating to the Africa Pilot, Part iii., third edition, 1889. London: J. D. Potter, 1895. Size 10 × 6, pp. 160. Price 1s. 6d. Presented by the Hydrographic Office, Admiralty.
This gives an account of the navigation of the ports on the African coast which have acquired new importance during the last few years.

- Cape Colony—Hex River Mountains.** Marloth.
Trans. South African Philosoph. S. S. 8 (1892-95), (1896): 86-92.
 Some Scientific Results of an Excursion to the Hex River Mountains. By R. Marloth, F.R.D., etc.
- Cape Colony—Kimberley.** *Trans. Geolog. S. South Africa* 1 (1896): 76-89. Atherstone.
 Kimberley and its Diamonds. By W. Guybon Atherstone, M.D.
- East Africa—Pangani River.** *Petermanns M.* 43 (1896): 59-62. Baumann.
 Der Unterlauf des Pangani-Flusses. Von Dr. Oscar Baumann. *With Map.*
- Egypt.** Fircks.
 Aegypten, 1894. Von A. Freiherr v. Fircks. Zweiter Theil. Berlin: D. Reimer, 1896. Size 8½ x 6, pp. iv. and 290. *Presented by the Publisher.*
 This volume deals with the land-laws, administration of justice, public health, religion (giving an account of the various religions and sects), finance, trade, commerce, and communications, and the work concludes with a bibliography in two parts, dealing respectively with ancient and modern Egypt.
- Egypt and Western Asia.** *Mem. S.G. Italiana* 5 (1896): 435. ———
 Gli itinerari Frediani, Belzoni e Drovetti. *With Map.*
- French Congo—Closel's Mission.** *Ann. G.* 5 (1896): 309-321. Herr, Barrat, Angot.
 Mission Closel dans le Nord du Congo français (1894-95). Par M. le Dr. Herr. *With Map and Illustrations.*
 Note sur les échantillons géologiques recueillis par M. le Dr. Herr au cours de la mission Closel. Par M.M. Barrat.
 Observations météorologiques recueillies par M. le Dr. Herr, . . . Par M. Angot.
- Madagascar.** *Rev. Scientifique (4 s.)* 5 (1896): 552-557. Grandidier.
 Madagascar il y a cent ans; les voyages de Mayeur. Par M. Alfred Grandidier.
 This is noticed on p. 71.
- Natal.** *Contemporary Rev.* (1896): 846-859. M'Master.
 The Highlands of Natal. By Emile M'Master.
- Nile Valley.** *Quarterly J. Geolog. S.* 52 (1896): 308-319. Hull.
 Observations on the Geology of the Nile Valley, and on the Evidence of the Greater Volume of the River at a Former Period. By Prof. Edward Hull.
 Also a separate copy. *Presented by the Author.*
- Somali Coast.** *Mem. S.G. Italiana* 5 (1896): 351-362. Cecchi.
 Notizie geografiche e commerciali sul protettorato britannico della costa somala nel Golfo di Aden, nota del cap. Antonio Cecchi.
- Somali Land.** *Mem. S.G. Italiana* 5 (1896): 436-448. ———
 La prima Spedizione Bôttego nella Somalia. *With Map.*
 The map of Somaliland is reproduced on the scale of 1 to 4,000,000.
- South Africa.** *Petermanns M.* 42 (1896): 88-91. Supan.
 Die politische Einteilung Südafrikas. Von Prof. Dr. A. Supan. *With Map.*
- South Africa—Glacial Phenomena.** Schenck.
Trans. Geolog. S. South Africa 1 (1896): 129-141.
 On Glacial Phenomena in South Africa. By Dr. Adolph Schenck. Translated by Dr. Kieckhaefer.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

ARCTIC REGIONS.

Arctic Exploration.

U.S. Hydrographic Office.

The Arctic Regions, with the Tracks of Search Parties and the Progress of Discovery. Compiled from the latest information, 1896. U.S. Department of the Navy, Bureau of Navigation. Published at Washington, D.C., April, 1896, at the

Hydrographic Office, Charles D. Sigbee, Commander U.S. Navy, Hydrographer.
2 sheets. Price \$1.00. Presented by the U.S. Hydrographic Office.

This is an exploration chart of the Arctic Regions, showing the progress of discovery. In some respects it is not complete, as, for instance, the discoveries of Davis and Frobisher are not indicated; neither are those of Richardson and Kendal to the east of the Mackenzie river shown. The discoveries of Franklin in 1826, to the west of the Mackenzie river, are attributed to Pullen in 1849. These are some of the inaccuracies; others could be pointed out, but for general purpose of reference it will doubtless be found useful.

EUROPE.

England and Wales.

Ordnance Survey.

Publications issued since May 7, 1896.

1-inch—General Maps:—

ENGLAND AND WALES:—(revision), 217, 221, 236, engraved in outline; 330, 331, 332, 333, 334, 344, 345, hills engraved in black or brown, 1s. each.

6-inch—County Maps:—

ENGLAND AND WALES:—Yorkshire, 7a s.e., 184 n.w., n.e., 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—Berkshire (revised), XLIV. 15; XLV. 10, 11, 12, 13, 14, 3s. each. Durham (revised), IV. 6, 10, 11, 14, 15; VI. 16; XI. 7, 8; XII. 1, 2, 5, 8s. each. Essex (revised), XLI. 14, 16; XLII. 13; L. 2, 4, 8, 12, 16; LL. 1, 5, 13; LVIII. 15; LXVI. 3, 8s. each. Hampshire (revised), IV. 15; V. 10, 11, 12, 13, 14, 15, 16; XI. 3, 4, 5, 6, 7, 8, 9, 10, 11, 14; XIX. 2, 6, 10, 16; XXII. 11, 15, 16; XXIII. 12, 16; XXX. 7, 12, 15, 16; XXXI. 1, 2, 3, 4, 5, 6, 7, 9, 8s. each. Hertfordshire (revised), XLV. 10, 3s. Kent (revised), XVI. 12, 3s. Middlesex (revised), VI. 10; VII. 3, 4; XIX. 14, 3s. each. Surrey (revised), X. 7; XI. 6, 15; XIII. 11; XVII. 3, 7, 9, 11, 13, 14, 15, 16, 3s. each. Wiltshire (revised), LV. 11; LXI. 7, 15, 16, 3s. each.

Town Plans—10-foot scale:—

ENGLAND AND WALES:—Newcastle, Gateshead and Environs (revised), 60, 61, 62, 63, 64, 65, 72, 73, 74, 75, 87, 88, 92, 98, 100, 102, 107, 109, 112, 143, 144, 145. Tynemouth, North and South Shields (revised), 24, 72. Wallsend, Jarrow and Environs, 24, 2s. 6d. each.

5-foot scale:—

London—Re-survey, VIII. 88; XV. 84, 86, 96; XVII. 4, 14, 15, 25, 2s. 6d. each.

(E. Stanford, Agent.)

Germany.

Kgl. Preuss. Landes-Aufnahme.

Karte des Deutschen Reiches. Scale 1: 100,000 or 13 geo. mile to an inch. Herausgegeben von der Kartogr. Abteilung der Kgl. Preuss. Landes-Aufnahme, 1895. Sheets: 272, Landsberg, a. d. W.; 274, Birnbaum; 352, Geldern. Price 1.50 marks each sheet.

West Prussia and Posen.

Langhans.

Die Thätigkeit der Ansiedelungs-Kommission für die Provinzen Westpreussen und Posen, 1896-1896. Auf Grund amtlicher Angaben entworfen von Paul Langhans. Auf Vogels Karte des Deutschen Reiches in 1: 500,000 or 7.9 stat. miles to an inch. Gotha: Justus Perthes, 1896. Petermann's 'Geographische Mitteilungen,' Jahrgang, 1896, Tafel 9. Presented by the Publishers.

AFRICA.

South Africa.

Struben.

A Geological Sketch-Map of Africa South of the Zambesi, 1896. Accompanied by Sections and Notes in Letterpress. By F. P. T. Struben, F.R.G.S. Discoverer of the Witwatersrand Gold Fields. On four sheets. Scale 1: 2,531,400 or 40 stat. miles to an inch. London: E. Stanford. Price £1 1s. Presented by E. Stanford, Esq.

The geological features of Africa south of the Zambesi, so far as they are known, are shown on this map, and sections along certain lines, which are indicated, are given. The map is accompanied by a pamphlet containing descriptive letterpress, in addition to which there are various notes on the map itself, and an explanation of the system of colouring employed.

AMERICA.

Mexico.

Comision Geografico-Exploradora.

Carta General del Estado de S. Luis Potosi. Levantada por iniciativa du su Actual Gobernador, Gral. Carlos Diez Gutierrez, por la Comision Geografico-Exploradora. Mexico, 1894. Scale 1 : 250,000 or 4 stat. miles to an inch. 12 sheets. Presented by *Señor Don Enrique L. Gonzales*

The scale on which this map is drawn is sufficiently large to admit of a considerable amount of detail being shown. The altitudes are given in metres, and all means of communication are laid down. On the different sheets of the map some useful statistical and geographical information is given in tabular form, together with insets showing the political divisions and geographical positions. The hill shading employed is effective, the rivers and streams are printed in blue, and the lettering clear.

AUSTRALIA.

Queensland

Pugh's Almanac.

1. Map of Queensland, compiled and lithographed from official maps. Scale 1 : 3,066,000 or 48.5 stat. miles to an inch. Brisbane: Gordon & Gotch.
2. Brisbane and Suburbs.

Issued with Pugh's Almanac. Published for the proprietors by Gordon and Gotch, 1896. Presented by the Queensland Government.

South Australia.

Horn.

Plan showing the Route of the Horn Scientific Expedition, 1894. Scale 1 : 846,800 or 13.5 stat. miles to an inch. Stanford's Geographical Establishment, London.

The most remarkable feature in this map is the parallel lines of sand-hills which occupy all the central portion of the map, and which have been drawn with regularity but seldom to be found in nature. The region explored by the Horn Scientific Expedition is situated nearly in the centre of the Australian continent, to the west of Alice Springs station and the telegraph line.

GENERAL.

Facsimile Maps

Marcel.

Choix de Cartes et de Mappemondes des XIV^e et XV^e Siècles. Publié par Gabriel Marcel. Paris: Ernest Leroux, 1896.

This portfolio contains reproductions of the following maps: the Pisanì map, Dulcort mappemonde, Mercia de Viladestes mappemonde, Soleri mappemonde. The Pisanì has been reproduced by Jomard in his atlas, and others. The Dulcort map was purchased in Venice by M. Loesef, who has had eighty copies of it made, and from one of these the present facsimile has been taken. The Mercia Viladestes map has been known since 1806. It was purchased in 1857 by the Bibliothèque National for the sum of 800 francs. It is, however, not known how the map came into the possession of the person from whom it was purchased. The Soleri map bears the date of 1385, and has been very carefully described by MM. Amat di San Filippo and by Fernandez Duro, and also by M. Gabriel Marcel. These copies have been produced by a photographic process, the results being very satisfactory.

CHARTS.

Admiralty Charts.

Hydrographic Department.

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1896. Presented by the Hydrographic Department, Admiralty.

No. Inches.

2050 m = 2.75 England, south coast:—Approaches to Spithead. 2s. 6d.

368 m = 1.0 Wales:—Barmouth to South Stack, including Carnarvon and Tremadoc bays. 3s.

1557 m = 3.6 Ionian sea:—Port Argostoli. 2s. 6d.

886 m = various Plans in the Canary islands:—Rio strait, Port Cabras, Bocayna strait, Ports Naos and Arrocefe. 2s. 6d.

421 m = 3.0 Harbours and anchorages on the east coast of Newfoundland:—Pillely island harbour and approaches. 1s. 6d.

424 m = 3.5 Cuba, north coast:—Port Matanzas. 1s. 6d.

538 $\left. \begin{array}{l} (m = 2.0) \\ (m = 8.0) \end{array} \right\}$ Vancouver island:—Seymour narrows, Menzies bay. 1s. 6d.

425 m = 2.0 Africa, east coast:—Birikau river (part Durnford). 1s. 6d.

795 m = 0.25 Malacca strait:—Cape Rachado to Singapore. 3s.

1830 m = 0.04 Pacific ocean:—Ellice islands to Phoenix islands. 2s. 6d.

1107 Anchorages in the Society islands:—Plan added, Mopehá anchorage and Lagoon entrance.

186 Mazzara to Palma:—Plan added, Port Pantellaria.

193 Linosa island, Lampedusa island:—Plan added, Lampedusa harbour.

J. D. Potter, agent.

No.	Charts Cancelled.	Cancelled by	No.
2050	Spithead, and approach from the eastward.	New Chart.	
192	Lampedusa harbour.	Approaches to Spithead	2050
1557	Port Argostoli.	New plan, on chart	193
886	Port Naos and Arrecife.	New Chart.	
1852	Plan of Rio strait on this sheet.	Port Argostoli	1557
411	Plans of Port Matanzas and Matanzas anchorage on this sheet.	New Chart.	
580	Plan of Menzies bay on this sheet.	Plans in the Canary islands	886
538	Seymour narrows.	New Chart.	
671	Plan of Port Durnford on this sheet.	Port Matanzas	411
795 a, b,	Cape Rachado to Mount Formosa.	New Chart.	
796	Mount Formosa to Tanjong Bolus.	Seymour narrows, Menzies bay	538
1926	Waterloo bay.	New Chart.	
		Birikau river (near Durnford)	671
		Cape Rachado to Singapore	795

Charts that have received Important Corrections.

No. 1543, England, east coast:—Yarmouth and Lowestoft roads. 1447, Iceland, east coast:—Dublin bar and the river Liffey. 1852, France, north coast:—Dunkerque road. 2733, Iceland:—Portland to Snefells Jökul, etc. 325, North America:—St. Mary river from Mud lake to East Neebish. 324, North America:—St. Mary river from East Neebish to Iroquis point. 2754, North America, east coast:—Long island sound, Sheet 1. 2755, North America, east coast:—Long island sound, Sheet 2. 1714, Haiti:—Cape Haiti harbour. 1573, Honduras gulf with Zapotillos cays. 2627, Vancouver island:—Semiahmoo bay and Drayton harbour. 1897b, Vancouver island:—Victoria harbour. 1499, North America, west coast:—Cross sound to Kadiak island. 1500, North America, west coast:—Kadiak island to Signam island. 2430, North America, west coast:—Queen Charlotte islands and adjacent coasts of British Columbia. 2464, Madagascar:—Noel Andrianmitarika to Mananonoka point. 701, Madagascar:—Bombetoke bay. 378, Madagascar:—Maromanjo point to Makambytra bay. 86, Red sea, Sheet 2. 833, Bay of Bengal:—Rangoon river and approaches. 507, Japan:—Go y mai channel to Yezo strait. 93, Japan:—Akashi-no-Seto and its approaches. 1644, Bering sea:—Komandorski islands. 2764, Australia, east coast:—Coral sea and Great Barrier reefs, Sheet 2. 1807, Australia, north coast:—Gulf of Carpentaria, southern side. 1963, New Guinea:—Kiriwina or Trobriand islands. 97, anchorages in the Solomon islands. 209, anchorages in the Solomon island. 1380, Pacific ocean:—New Caledonia, New Hebrides, and Loyalty islands.

(J. D. Potter, Agent.)

Pilot Charts.

Pilot Charts of the North Atlantic and North Pacific Oceans for April, May, June, and August, 1896. Published monthly at Hydrographic Office, Bureau of Navigation, Department of the Navy, Washington, D.C. Charles D. Sigbee, Commander U.S. Navy, Hydrographer. Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

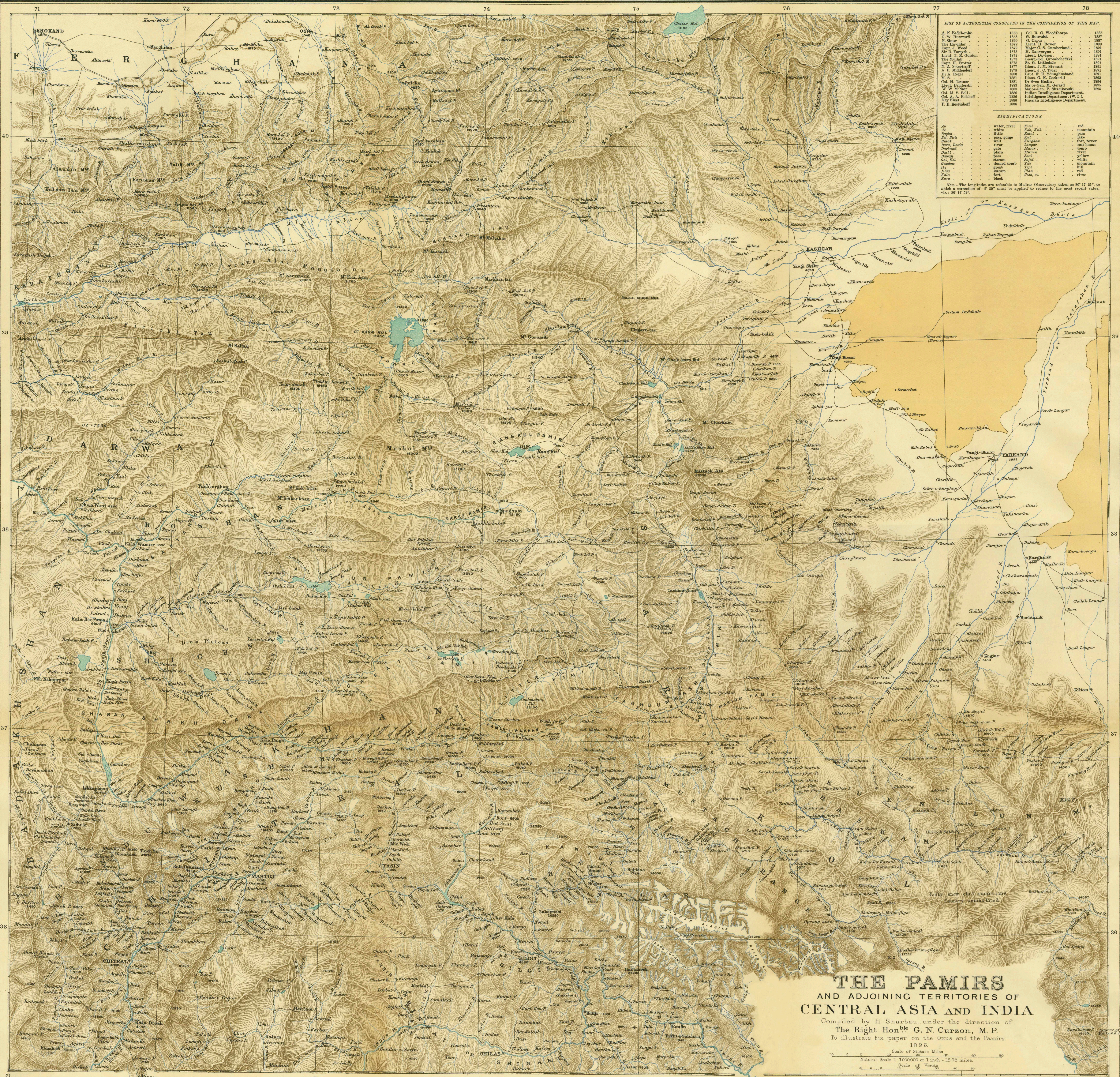
Victoria Falls.

Newnham.

Twelve photographs (in three frames) of the Victoria Falls, Zambesi river, taken by F. J. Newnham, Esq. Presented by F. J. Newnham, Esq.

This series consists of twelve photographs of the Victoria Falls of the Zambesi and the neighbourhood. The views have been taken from various points, and convey a very good idea of the remarkable characteristics of this locality.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



LIST OF AUTHORITIES CONSULTED IN THE COMPILATION OF THIS MAP.

A. P. Fedchenko	1868	Col. R. G. Woodhouse	1886
G. W. Hayward	1868	G. Woodhouse	1887
H. Shaw	1869	O. Capper	1887
St. D. Foy	1872	Lieut. E. Bower	1891
Col. J. Wood	1872	Major C. S. Cumberland	1891
St. D. Foy	1872	H. D. G. G. G.	1891
Lieut. T. V. Gordon	1873	Lieut. Davison	1891
St. D. Foy	1873	Lieut. Col. G. G. G.	1891
Col. H. Trotter	1873	St. G. Little	1891
A. F. Mikhaïlov	1873	St. G. Little	1891
Dr. A. Hovel	1873	St. G. Little	1891
Col. H. Tamm	1880	St. G. Little	1891
Lieut. Bower	1881	St. G. Little	1891
Col. W. M. Nairn	1881	St. G. Little	1891
Col. A. S. Bell	1881	St. G. Little	1891
Col. A. A. Boshoff	1886	St. G. Little	1891
St. G. Little	1886	St. G. Little	1891
P. E. Kossiaïoff	1886	St. G. Little	1891

SIGNIFICATIONS.

Ab	water, river	Kul	red
Al	white	Kul	mountain
Al	little	Kul	pass
Al	pass, gorge	Kul	lake
Al	wall	Kul	fort, tower
Al	river	Kul	rest house
Al	gale	Kul	tomb
Al	plateau	Kul	white
Al	pass	Kul	yellow
Al	stream	Kul	blue
Al	domed tomb	Kul	mountain
Al	grass	Kul	white
Al	stream	Kul	red
Al	fort	Kul	black
Al	black	Kul	black

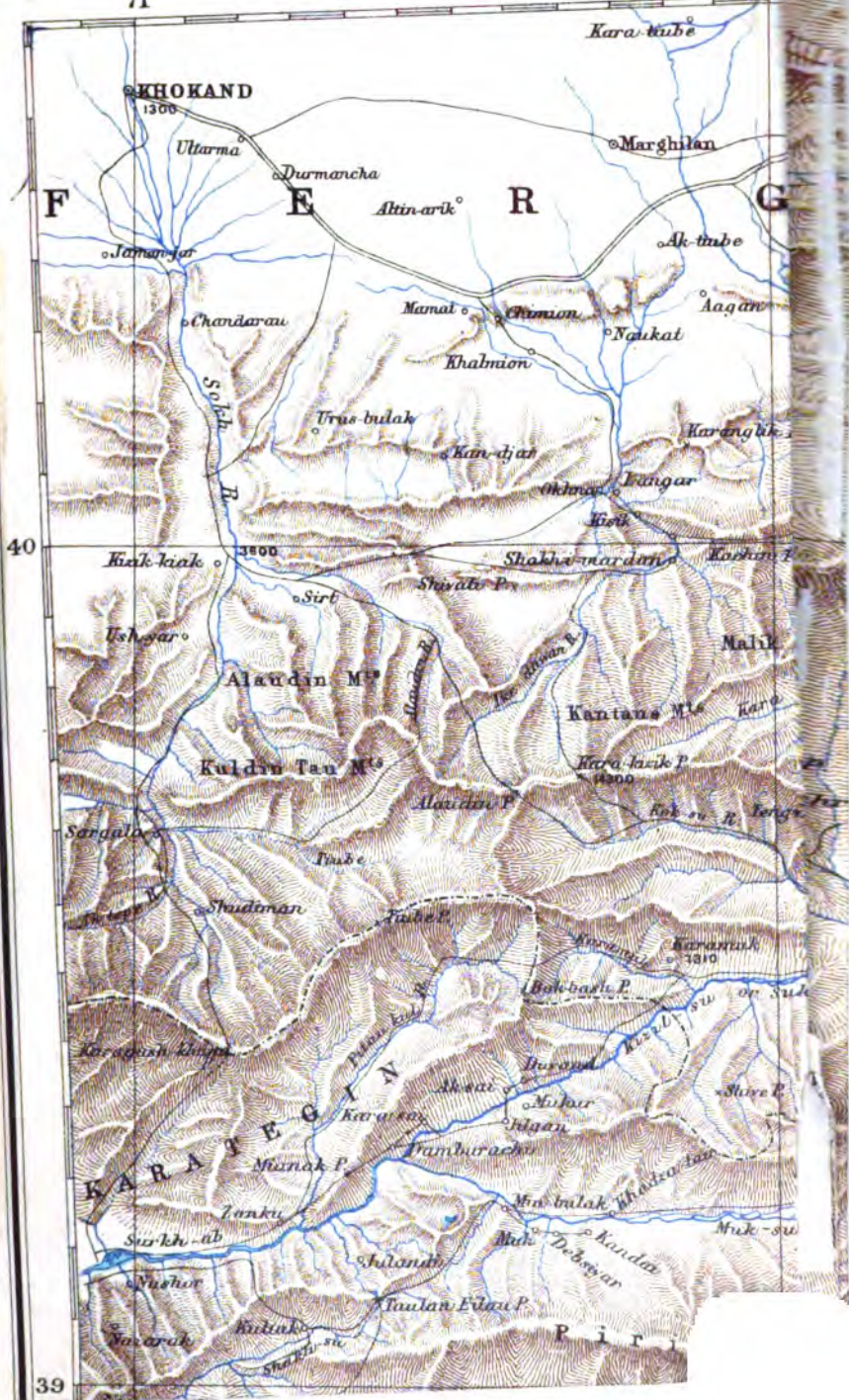
Note.—The longitudes are referable to Madras Observatory taken as 80° 17' 51", to which a correction of 2' 30" must be applied to reduce to the most recent values, viz.: 80° 14' 51".

THE PAMIRS

AND ADJOINING TERRITORIES OF CENTRAL ASIA AND INDIA

Compiled by H. Sharbau, under the direction of
The Right Hon^{ble} G. N. Curzon, M. P.
To illustrate his paper on the Oxus and the Pamirs.
1896

Scale of Statute Miles
Natural Scale 1:100,000 or 1 inch = 15.78 miles
Scale of Versts
Scale of Fathoms



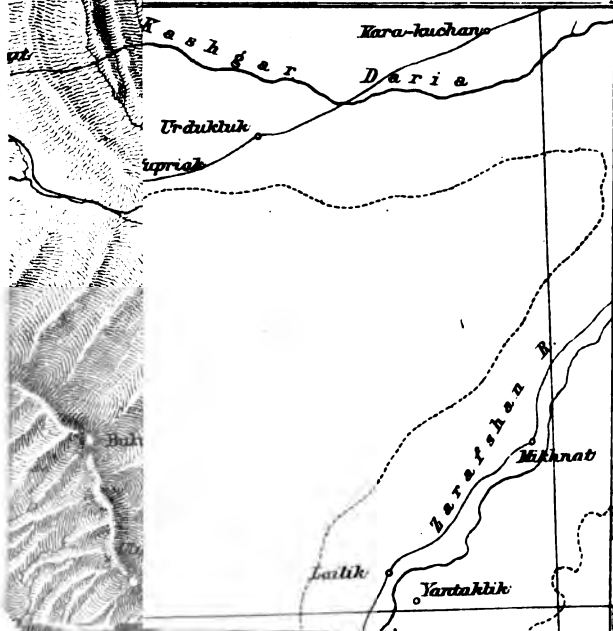
CONSULTED IN THE COMPILATION OF THIS MAP.

1868	Col. R. G. Woodthorpe	1886
1868	G. Bonvalot	1887
1869	G. Capus	1887
1872	Lieut. H. Bower	1890
1872	Major C. S. Cumberland	1891
1878	H. Dauvergne	1891
1878	Lieut. Davison	1891
1878	Lieut.-Col. Grombobeffski	1891
1878	St. G. Littledale	1891
1877	Lieut. J. M. Stewart	1891
1879	Lieut. J. C. Tyler	1891
1880	Capt. F. E. Younghusband	1891
1881	Lieut. G. K. Cockerill	1893
1881	Dr Sven Hedin	1894
1883	Major-Gen. M. Gerard	1895
1883	Major-Gen. P. Shveikovski	1895
1886	Indian Intelligence Department.	
1886	Intelligence Department (W.O.).	
1886	Russian Intelligence Department.	

SIGNIFICATIONS.

ter, river	<i>Kiril</i>	red
ite	<i>Kok, Kuk</i>	mountain
le	<i>Kotal</i>	pass
s, gorge	<i>Kul</i>	lake
il	<i>Kurghan</i>	fort, tower
er	<i>Langar</i>	rest house
e	<i>Masar</i>	tomb
in	<i>Murax</i>	river
a	<i>Sari</i>	yellow
man	<i>Safed</i>	white
ned tomb	<i>Tau</i>	mountain
at	<i>Tepe</i>	hill
man	<i>Ulan</i>	red
ok	<i>Ussu, su</i>	river

ferable to Madras Observatory taken as 80° 17' 21", to must be applied to reduce to the most recent value,



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THE PAMIRS AND THE SOURCE OF THE OXUS.*

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PART II.

To revert to my journey. Having marched down the Wakhan Pamir to Bozai Gumbaz †—where Captain Younghusband, after being visited in a friendly way by the Russians, and after having entertained them, was arrested by Colonel Yonoff in August, 1891, on the return of the latter from his excursion across the Indian frontier—I diverged to the north-east to visit the Chakmak Lake and the Little Pamir. In the valley between the lake and Bozai Gumbaz, which is half a mile wide at the bottom, and about 12 miles in length, the Sarhad branch of the Oxus meanders about with a very tortuous course in a bed 20 yards wide, through scenery that very fairly recalls that of a swampy Scotch moor. There is, however, a great deal of sand and stones and clay, and the ground sparkles with immense patches of saline efflorescence. The Sarhad branch is recruited by three or four streams which come down from gorges in the mountains on the north side of the valley, but which, at the time of my visit, were almost empty rills. As we ascend the valley, the ground becomes broken up into clay hills, and presently

* Paper read at the Royal Geographical Society, February 18, 1895. Map, p. 96. Continued from p. 54.

† Bozai Gumbaz, or the Tomb of Bozai, sometimes also and more strictly called Gumbaz-i-Bozai, is a conical mud cupola resting upon a square brick foundation, at a little distance above the confluence of the Sarhad and Wakhan streams. The Russians, in 1891, tried to set up a claim to its possession, on the ground that Boza or Bozai had been a Kokandian tax-gatherer, who was killed down there while in the service of his state. Investigation proved this story to be a myth, and Bozai to have been a small local chieftain, who was slain in a fight with the Kanjutis or Hunza freebooters fifty years ago. The elevation was determined by the Boundary Commission of 1895 as 12,680 feet.

we reach a sort of low plateau several feet higher than the river-bed, stretching for nearly 4 miles to the lake. It is bare and flattish on the top, and contains a small lake between 300 and 400 yards long, as well as several largish pools. This is the watershed between the Chakmak Lake, with its easterly drainage into the Aksu basin, and the westerly drainage of the Panja or Oxus valley. In the Russian map this low plateau is called the Andemania Pass.* It is not a pass at all, but a miniature plateau. There is no Andemania or Andemin Pass here, and the latter name has been correctly transferred on English maps—*e.g.* Mr. Littledale's R.G.S. map—to the Benderski Pass between the Little and Great Pamirs, on the further side of the Chakmak Lake, of which it is the native title.

Reaching the edge of the lake, whose waters glistened brightly in the sun, I followed its northern shore over ground that was alternately soft grass, spongy bog, and dry stones, towards the north-east extremity. There I found to my surprise that the main body of the lake, which is from $3\frac{1}{2}$ to 4 miles in length, has an extension in its south-east corner, of which I have found no notice in previous descriptions. Through a channel a few hundred yards wide, the water spreads into a succession of bays or extensions, each of which looks like a separate lake, and which are relieved by promontories and islets. These protract the length of the lake proper for an additional $1\frac{1}{2}$ to 2 miles. It is from the extremity of the easternmost of these bays that the Aksu river emerges, flowing in two or three channels with a slow current through a rushy bed about 30 to 40 yards wide. This is the source of the rival claimant to the parentage of the Oxus, of whose pretensions I have already disposed. From here the Aksu wanders down the Little Pamir, spreading out into marshy swamps and ill-defined lakelets, which on most maps appear as though they were a series of accurately determined lakes. On the other hand, there are two biggish sheets of water in the hills immediately above the easterly extension of the lake or archipelago which appear in no map, and which have no connection with the river or its swamps. From the source of the Aksu, the Little Pamir stretches away with an average breadth of from 2 to 3 miles in the direction of Aktash, a normal Pamir landscape, closed by a snowy mountain at the end of the vista. A domed Kirghiz *ziarat* stood out clearly to the north-east, but on no part of this Pamir did I observe any sign of habitation or of human life.

As regards the name of the lake, I have called it Chakmak, because that appeared to be the generally accepted local designation.† In some maps it has been written Chakmaktin. Gordon and Trotter called it Gaz

* Grombchevski in 1888 called it the Chilob (*i.e.* Chelap) or Andemanyan pass.

† The first mention that I have found of the name is in one of the routes by Mohammed Amin, in 1867. He calls it Chakmaklig. *Vide* Davies' 'Trade Report of N.W. Frontier,' Appendix IV. B.

or Oi Kul, *i.e.* in Turki "Goose Lake," which is a common title applied by the Kirghiz to any or all of the Pamir lakes. Regel, the Russian, is quite alone in applying the name Suman Kul. The Russian map names the series of swamps or lakelets further down the valley successively as Turdânin Kul and Karadumer Kul. Lake Chakınak possesses yet additional names, for whereas English writers have frequently employed the title Little Pamir Lake, which is the Kul-i-Pamir-Khurd of the Wakhs, the natives have also described it to travellers as Durna Kul or Tourna Kul (which I suspect to be the same word as the Russian title just quoted), and as Barkat Yasin (explained by Gordon as meaning



BOZAI GUMBAZ.

Burgut Nursi, *i.e.* the "Eagle's Place or Nest"). I believe myself that the last-named is the name rather of one of the neighbouring ravines; and the same applies to the name Chelap, which was also given to me, and has appeared in some maps as appertaining to the lake, but which seems to belong preferably to the district in which it is situated. Colonel Trotter gave the elevation of the lake as 13,200 feet; Captain Younghusband as 13,850 feet; Lord Dunmore's aneroid, which appears to have been uniformly as treacherous as was my own, made it 14,230 feet. The Boundary Commission of 1895 made the source of the Aksu 13,100 feet. The Mirza's figures in 1869, 13,300 feet, were therefore wonderfully near the mark.

Pursuing the discussion of the hydrography of the Pamirs, I pass from this point to the next or Great Pamir, in order to make clear its

lake-system. The central feature is, of course, Wood's or Victoria Lake, from the western extremity of which the Panja flows. When Wood arrived at this lake in midwinter (February 19, 1838), land and water were equally covered with snow, and were almost indistinguishable from each other. He accordingly accepted the Kirghiz measurements of length and breadth, 14 miles by an average of 1 mile, checked so far as possible by his own vision. When Gordon and Trotter were there in April, 1874, the lake was similarly frozen over and snow-covered; but they estimated its dimensions as 10 miles by 3. Littledale, in June, 1890, found the lake still half sheeted with the previous winter's ice, but was much struck with its narrowness, which reminded him of a canal. Lord Dunmore, in November, 1892, gave its length as 9 to 10 miles in winter, and 12 miles in summer. The explanation of these varying figures is that, in common with all the Pamir lakes, Victoria Lake varies in size according to the season of the year, the normal dimensions being about 10 miles by $1\frac{1}{2}$ mile, which are enlarged by the annual inundation of a larger area, consequent upon the melting of the summer snows. M. Benderski, however, the Russian topographer, who first saw the lake in 1883, and was attached to the Pamir Boundary Commission in 1895, told the English members of the latter that the lake had greatly diminished in size in the interval, and that he expected it finally to disappear. If the same process has been going on for centuries, we may perhaps find herein an explanation of the apparently extravagant dimensions assigned to the lake (assuming it to be identical with the Dragon Lake of legend) by the Chinese Buddhist pilgrims. As regards its elevation, Wood (whose instrument must have been defective) registered the height by boiling-point at 15,600 feet. Later measurements (Trotter, 13,900 feet; Littledale, 13,980 feet; Boundary Commission, 1895, 13,390 feet) have familiarized us with more modest figures. Touching the name of this lake, the title Victoria Lake, suggested rather than given to it by Wood, whose discovery coincided with the year following upon Her Majesty's accession, seems on the whole to have won most favour, at least with Englishmen. The alternative name of Sir-i-kol, which was mentioned to Wood by the Kara Kirghiz, has been very plausibly explained as referring to the station or camp at the "Head of the Lake;" although some have preferred Sarik or Sarigh-Kol, *i.e.* Yellow Lake. In the Anglo-Russian Pamir Agreement of March, 1895, the Russian name for the lake is given as Zor Kul. Faiz Bakhsh, the surveyor who was despatched to the Pamirs in 1870 by Sir D. Forsyth during the first Yarkand expedition, called the lake Hauz Kalan, *i.e.* Great Pool, or Kol-i-Sikandari, Alexander's Lake—a name which has been mentioned by no other traveller.* The former title is identical with the Kul-i-Kalan of Trotter and Gordon, which may either

* *Journal of the R.G.S.*, vol. xlii., 1872, p. 465.

signify literally the Great Lake, or be a contraction of the longer form Kul-i-Pamir-i-Kalan, i.e. Great Pamir Lake. The name Gaz Kul (Goose Lake) was given to Littledale as the common Kirghiz title; but I have already explained that this is a generic designation applied equally by the natives to any of the Pamir lakes.

A feature already noticed in the valley of the Chakmak Lake also holds good of the Victoria Lake basin, viz. the presence of a chain of smaller lakes in the immediate neighbourhood of and in connection with the main sheet of water. Two such small and frozen lakes were first observed by Gordon and Trotter in 1874, at a slight distance from the



LITTLE PAMIR AND AKSU RIVER.

upper or eastern end of Victoria Lake. Littledale calls one of these lakes, which is "some miles to the east" of the big lake, Aidin Kul. Lord Dunmore applies to one of the number the now familiar designation of Gaz Kul. The Russian map calls the more westerly of the two Lake Kurkuntai, a name which reappears on the Indian Intelligence map as Kuruntea. A further small sheet of water to the east, from which rises the Istik drainage, is called Lake Karadungi. At the eastern extremity of these lakelets is the watershed separating the Panja and Aksu drainages; and here the river Istik or Issik (erroneously called Isligh in Gordon's book) rises from several sources, and flows towards the Aksu, whence it joins at some distance below Aktash. The channel of one of the streams that flows from the watershed on the south into the eastern end of Victoria Lake also spreads out into three

small lakes at the bottom of the valley as it approaches the main sheet of water.

Similar conditions, on a larger scale, may be predicated of the hydrography of the next or Alichur Pamir. Here the lie of the lakes and the direction of the main drainage is again from east to west. The principal body of water is the Yeshil Kul (Green Lake), or Ishal Kul of Pandit Manphul and Isil-kol of Chinese records. This is the finest expanse of water in the Pamirs, being little liable to contraction, owing to its greater depth and more precipitous banks. It possesses a length of from 16 to 20 miles, and a breadth that varies, owing to the peculiar indentations of the shore, from 1 mile to 3 miles, and its elevation is 12,550 feet. From its western extremity issues the Ghund or Gunt river, which, after its junction with the Shakh Dara confluent of the Oxus lower down, flows for a few miles under the title Suchan Dara, and disembogues into the main stream of the Panja, a little above Kala Bar Panja, the capital of Shighnan.

A promontory projecting into Yeshil Kul at its eastern end has been the scene of a twofold historical tragedy, the earlier of which events is said to have been the origin of its name. In 1759, when the Chinese took possession of Kashgar, the two Kalmuk Khojas whom they expelled fled in an easterly direction across the Pamirs towards Badakshan. The Chinese general Fouteh, *i.e.* Fu or Ku Ta-jen, pursuing them by forced marches, came up with the fugitives at the east end of Yeshil Kul, attacked them by night, and inflicted upon them a defeat, from which, however, the Khojas and the bulk of their followers escaped with their lives.* Gordon was told in the Pamirs that they drove several of their women and children, mounted on camels and horses, into the lake, in order to avoid by drowning the worse fate that they anticipated at the enemy's hands, and that ever since sounds of lamentation have been heard to rise from the waters.† The Chinese general inscribed upon a stone a trilingual record in Chinese, Manchu, and Turki of his exploit, which remained there until recent years, when the Russians transported as much of it as remained to their museum at Tashkend. The place was thenceforward known as Soma Tash, which is explained as meaning Written Stone.‡

* *Vide* the interesting letter from two Jesuit priests at Kashgar dated November 26, 1759, and published in *Lettres Edifiantes*, xxxi. 248.

† 'Roof of the World,' p. 158.

‡ Lord Dunmore in his first map spelled it *Somur*. But in his book (vol. ii. p. 167) he substitutes for this *Surma*, which he says means "black." Now, *Surma* is a Persian word, signifying not "black," but "antimony" or "collyrium," the material used by the Persians for darkening the eyebrows and eyelids. A Persian word may conceivably have been joined with the Turki word *tash*, "stone," but the particular combination is more absurd than would be Rouge-hill for Redhill, in Surrey. I made many inquiries on the subject, but with no satisfactory results. The Kirghiz head-man of the Taghdumbash said the name was not *Surma*, but *Suma Tash*, and signified "written stone." On the other hand, the Hunza Wazir thought it was a word meaning "marsh-land" (*cf. su* = in Turki, "water").

The second incident of bloodshed with which the promontory of Soma Tash has been connected, happened less than three years ago. The Alichur Pamir and Yeshil Kul in particular had been for many years the more or less disputed boundary-line between the Afghan and Chinese spheres of jurisdiction on the Pamirs, when, in the early summer of 1891, Colonel Yonoff was despatched by the Russian Government with a body of troops, facetiously christened the Hunting Detachment, nominally in order to shoot *Ovis Poli*, and to indulge in rifle-practice on the Pamirs (of all places in the world!); really to execute a demonstration over the entire region, to turn out any Chinese or Afghan soldiers who might be found, and to anticipate the proposed diplomatic settlement of the dispute with England by forcible annexation. The Chinese, hearing of this movement, sent an officer with a small body of troops to assert their claims at Soma Tash. A gallant young English officer, Lieutenant Davison, who was travelling on his own responsibility in Chinese Turkestan at the time, and had been commissioned by Captain Younghusband from Kashgar to report upon what was passing in the Pamirs, was on the Alichur at the same juncture. Colonel Yonoff, arriving at Soma Tash, ordered the Chinese *Yangdarin* to withdraw, which command the latter with characteristic promptitude obeyed. Simultaneously he arrested Lieutenant Davison and sent him back, *via* the Alai and Marghilan, to Kashgar, an unwarrantable proceeding for which the Russian Government subsequently apologized. The Russians having in the mean time withdrawn, the Chinese again turned up at Soma Tash, and proceeded to build a fort. In the spring of 1892, however, the Afghans, who also claimed Soma Tash, appeared upon the scene, and the Chinese with docile rapidity a second time retired. Colonel Yonoff, however, was not to be foiled. In the summer of 1892 he repeated his military promenade of the previous year; ordered the Chinese to evacuate their armed posts on Lake Rang Kul and at Aktash (on the Aksu), which, of course, they did without a murmur; and, arriving at Soma Tash, essayed the same tactics with the Afghan outpost whom he found there installed. The Afghan commander, though hopelessly outnumbered, refused, and a conflict ensued on June 22, 1892, in which fifteen out of the seventeen Afghans present were slain. The Russians then again withdrew.

Just as in the cases of Lakes Chakmak and Victoria, so here at the eastern extremity of Yeshil Kul is a small subsidiary lake-basin, in the valley of the Alichur river, which contains no fewer than five lakes, scarcely as yet indicated on any map. They lie among the hollows and between "a sea of gravel mounds," the moraine-deposits of ancient glaciers. The nearest of these to Yeshil Kul is Bulun Kul,* which

* This must not be confounded with a second Bulun Kul, a lake which lies on the western side of the Gez defile, on the main line of connection between Kashgar and the northern Pamirs.

lies to the south of its eastern termination, and is connected with it by a stream only half a mile in length. Separated by a low watershed from this lake is another Gaz Kul, or Goose Lake. Next to this is Khargosh Kul, or Hare's Lake, so called because it lies below the Khargosh Dawan, or Hare's Pass, leading to the Great Pamir. This little lake is named Chukur Kul on the Russian Intelligence Map. The fourth in order to the east is Tuz Kul, or Salt Lake; and the fifth and last is Sassigh, or Sasik Kul * (i.e. Stinking or Fetid Lake), which is about 8 miles long by 1 broad.† Eastwards from this point the Aliohur valley continues for a distance of 3 miles to Chatir, or Chadir Tash (Stone House), a solitary rock standing up in the valley-bottom, and presenting, at a distance, the appearance of a house.

The next Pamir lake-system to which, in our northerly progress, we come, is that of Rang Kul, lying in the hollow of the Pamir that bears the same name. This has been explained by Yule and others as signifying Ibex Lake (*rang* being the Turki word for the wild goat). Mr. Ney Elias, however, reported that the Turki-speaking Kirghiz use the Persian word *taka* for ibex (cf. the Min-taka pass before mentioned), and accordingly he preferred the Persian interpretation of *rang*, i.e. variegated, or of many colours.‡ I agree with this derivation, on the further ground that it is from their colour that several of the neighbouring lakes (cf. Kara Kul, or Black Lake; Yeshil Kul, or Green Lake; and possibly Sarik Kul, or Yellow Lake) are named. On the other hand, I have read that the Russians derive the name from a coarse sedge. Rang Kul was reported by Pundit Manphul, upon the information of Mohammed Amin, as lying in the Pamir Khurd, or Little Pamir§—a deception that greatly puzzled Yule and other geographers. As a matter of fact, it is situated in a north-east bay or extension of the valley of the Ak-baital (White Mare), which is the

* Colonel Yule, misled by the exaggerated dimensions given to these small lakes in earlier native itineraries or in Chinese geographies, and by the imperfect information existing in his time, went quite wrong over their identification. He thought, with Major Montgomerie, that Sasik Kul was Victoria Lake; that Pulong (i.e. Bulun) Kul was the imaginary Rang Kul of the Little Pamir; and that Tuz Kul was, possibly, Victoria Lake also (Introduction to Wood's 'Oxus,' pp. lxxvi., lxxxvii.). Almost all the theoretical geographers, even the most distinguished, have been deceived by the fantastic exaggerations as to distance and measurement to which Oriental travellers invariably succumb.

† Abdul Mejid, in his northward march across the Pamirs to Kokand in 1861, mentions having passed two lakes, "at Khurgoshee and Kurreh Kol." The former he identifies in his itinerary with Sussugh Kul; the latter is the Great Kara Kul. His next march, after Kurreh Kol, is described as 15 miles in length, and as terminating at Dysame lake; but there can be little doubt that this is a misprint for the same lake, alluding to his day's march along its eastern shore.

‡ Cf. the well-known Karun river in south-west Persia, which is more strictly Kuran, or Kuh-rang, and is so called from the "variegated mountain" in which it takes its rise.

§ Vide Appendix to Davies' 'Trade Report of N. W. Frontier,' p. ccxxxiii.



LITTLE PAMIR, NEAR MUZMAN-GULJ PASS.

northerly confluent—commonly dry in winter—of the Aksu, after its junction with which the latter river, flowing westwards, is called Murghab. Only in this remote sense—Ak-baital valley being a physical continuation of the Aksu valley, and the Aksu valley being a physical continuation of the Little Pamir—can the Rang Kul lake be said to have any connection with the Pamir-i-Khurd, from which it is really severed by a great distance. Its elevation is 12,250 feet above the sea.

This lake, however, like those already discussed, occupies a lacustrine basin, the sheets of water in which vary in size and configuration according to the season of the year. Severtsoff described it as consisting in reality of three separate basins and an extensive marsh, connected by narrow straits. The main lake has two divisions—Shor Kul on the west and Rang Kul on the east, which are usually so united. In the high waters of summer the two form one unbroken sheet. Lord Dunmore, passing on November 20, 1892, at the opposite extreme of season, found them entirely severed by a neck of land a quarter of a mile across, and unconnected, and erroneously declined to believe that they were ever united. In winter-time the upper or eastern lake, thus diminished, resembles a series of swamps, dotted with islands, whose banks are incrustated with a saline efflorescence. The entire lake-basin is about 20 miles long, and the normal length of the lakes is—Rang Kul 4 miles, and Shor Kul 6 miles. A remarkable feature of these lakes is that neither does any river discharge into them, nor is there any river-exit. Their waters must accordingly be largely recruited by subterranean drainage from the hills. Mr. Ney Elias, in 1885, said that the upper lake was considered to be fresh and the lower salt. Captain Younghusband, in 1890, reported the water as salt, and the colour as a beautiful clear blue. On the southern shore of Shor Kul is a peculiar rock, with a sheer front of 100 feet, which is known as Chiragh Tash or Lamp Rock, from a peculiar illusion produced by the sun's light penetrating through a cave or orifice that is pierced right through the rock. The natives attribute it to the eye of a dragon who is supposed to lurk in the cave. Captain Younghusband, in 1890, was the first to dissipate the mystery by clambering up and discovering the illusion which had puzzled Ney Elias in 1885.* At a little distance from the eastern extremity of Rang Kul is the fort which the Russians have built and garrisoned, since they expelled the Chinese from Rang Kul (which lay far inside the Chinese frontier) in 1892.

There remains but one more lake in the Pamir area, viz. the Great Kara Kul, which lies in the Khargosh or Hare Pamir, on the northern edge of the Pamir region, below the great Trans-Alai range. This is the most considerable body of water in the district, and has by some been identified with the Dragon Lake of local, and still more of Chinese

* *Proceedings of the R.G.S.*, vol. xiv., 1892, p. 227.

legend. Its dimensions have been absurdly exaggerated in the itineraries of mediæval pilgrims. Its extreme length from north to south is in reality $14\frac{1}{2}$ miles, its breadth from east to west 11 miles, and its elevation above the sea is 12,800 feet. Like Rang Kul, it consists of two sheets of water united by a narrowish strait in the centre; or, as one may otherwise put it, of a single lake very nearly cut in twain by two promontories or sandy ridges projecting from the north and south shores. The curious thing about this lake is, that legend with singular unanimity has insisted at very varying periods upon a river discharge from it towards the west or south. At one time this discharge was supposed to be connected with the Surkhab or river of Karategin, at another with the Murghab or Bartang, at a third with the Aksu. And yet while several small torrents pour their waters into the lake, and one rather larger stream, the Chon-su, joins it from the Tuyuk or Ak-baital Pass on the south, there is no present efflux at all. The explanation appears to be, as Kostenko, its first European explorer in 1876, remarked, that the lake-level was once much higher than it is now, and that in those days it may have had a double discharge, both to the north and to the south. Severtsoff, indeed, said that even now, with a strong northerly wind blowing, the water of the lake will sometimes in flood-time be driven up the channel of the Chon-su, and then break out westwards in the direction of the Murghab; but this appears to be a very rare phenomenon, and the absence of modern outlet must be accepted as an established fact. The mountains approach closely to the lake and even project into it on its western side; at its eastern end they are nearly 7 miles distant, and hence the track from the north usually skirts that shore. The strongly indented coasts are carved into frequent promontories, and there is one island nearly 5 miles long. In stormy weather Kara Kul presents a splendid spectacle, for its waters toss and boil like a seething cauldron. Littledale, Younghusband, and Cumberland are the only Englishmen who have seen it.

Though lying in a different basin, and outside the Pamirs proper, I should, perhaps, not omit to notice the Little Kara Kul and its small lacustrine satellites, less for its own sake than on account of the two great mountain peaks which, at a distance of some 20 miles from each other, soar into the air on the north-east and the south-east borders of the lake, and which have given rise to much confusion among travellers and geographers. One of these peaks is visible from the plain of Yarkand and from Kashgar, whence it was roughly fixed, in 1868, by Hayward, and more accurately, in 1874, by Colonel Trotter, who gave its height as 25,350 feet. Both called it Tagharma, because the people said it was near to the place and plain of that name.* A little later, when

* *Taghar* is a Turki word signifying "a bag of grain"—an allusion to the fertility of the surrounding valley.

Trotter was in Sarikol, he saw from the southern side a different peak which was also called the Tagharma Peak. In 1871 Fedchenko, and in 1876 Kostenko, from the Kizil Art Pass, observed a great peak in this direction, the name of which was given to the latter as Mustagh Ata, *i.e.* Father of Ice Mountains. Maps and descriptions continued to confuse these separate mountains, usually representing them as one, until, in 1885, Mr. Ney Elias proved conclusively by his angles that they were distinct. The one to the north-east of Little Kara Kul is the mountain seen from Kashgar (from which it obscures the other), but is erroneously called Tagharma. He gave it the name Mount Dufferin, which appears in the Indian maps, but which, in a region lying so far outside of British-Indian influence, cannot, I think, be pressed. The Russian map calls it Mount Charkum.‡ The second and southerly peak (which from Sarikol obscures the first) is the real Mustagh Ata, the height of which is probably a little less than its nameless brother, being calculated at about 25,000 feet, but which is a far finer mountain, since it is conical and comparatively isolated, whereas the more northerly mountain is the highest crest of an extended ridge. Even now the maps unanimously err in assigning to Mustagh Ata the altitude which appertains to its rival.

Several Russian explorers, notably Bogdanovitch in 1879 and Ivanoff in 1883, have made careful examination of Mustagh Ata, and during 1894, Dr. Sven Hedin, the Swedish traveller and scientist, made four unsuccessful attempts to climb it, reaching on one occasion to a height of 19,500 feet.* The summit, which is the central peak of three, is therefore still virgin, and is regarded by Hedin as almost inaccessible. The sides of this magnificent mountain are rent by deep gorges and filled with enormous glaciers.

Little Kara Kul, lying between them at a distance of about 50 miles due east from Rang Kul, has been formed by the moraines of a retreated glacier, which have dammed the valley. Glacier waters replenish it from the south, but its sole outlet is on the north into the upper course of the Gez stream, which flows towards Kashgar. A little below the point of discharge this stream receives from the north-west the drainage of a small chain of lakes in a separate basin, the lowest of which is called Basik Kul. Further down the Gez valley is the second Bulun Kul, which has already been mentioned.

From a description of the lake-system of the various Pamirs, I now turn to an account of the passes by which they are connected, and which I will trace in the inverse direction from north to south. I hope to have now sufficiently demonstrated that the Pamir region, in contradistinction to long-accepted beliefs, but in remarkable accordance with a prediction of Mr. Shaw,† consists of a series of elevated mountain valleys whose

* Vide *Geographical Journal*, vol. v., 1895, p. 154; and vol. vi. p. 350.

† Vide Yule's Introduction to Wood's 'Oxus,' p. lxxix.

uniform direction is from east to west (with an occasional inclination from north-east to south-west),* which contract into gorges at their western extremities, where they become merged in the mountain systems of Roshan, Shighnan, and Wakhan; which are separated from each other by lofty parallel ridges whose normal trend is from east to west, directing the drainage into the Oxus basin; and which on the eastern side are fenced in and divided from the rival basin of Kashgar by a meridional range or ranges, sometimes included, in the mediæval itineraries and in the geographies based upon them, among the Tsung Ling, sometimes confounded with the obscure Bolor mountains,



DARKOT GLACIER.

and throwing up at one point the mighty pinnacles of Mustagh Ata, and its twin peak. To pass, therefore, from one Pamir to another by the shortest route, it is necessary to follow the transverse gorges or to climb the lower saddles of the intervening ridges. Of these passes there are many, even if we do not accept Ivanoff's interpretation of the native adage, "There are no roads on the Pamirs," as signifying that the Pamirs are everywhere traversable, which they certainly are not. I propose to indicate the principal and most easily accessible of these lines of communication.

* I except from this summary the Taghdumbash Pamir, which, I have previously shown, lies outside of the Pamirs proper, and is part of a different basin.

I. PASSES ON TO THE NORTHERN PAMIRS.

Upon the north, the base of any advance upon the Pamirs from the Russian province of Ferghana is either Osh or Marghilan. The former is the route almost invariably adopted both by military forces and by travellers. From Osh the route proceeds to Gulcha, and thence across the Little Alai range by the Taldik Pass (Littledale, 11,600 feet; Russian and Indian maps, 12,070 feet), or by the adjoining passes of Archat Dawan (11,900 feet) or Shart (12,800 feet), on to the Alai Plateau, or upper valley of the Surkh-ab or Kizil-su. Striking across this valley, we approach the Great or Trans-Alai range, and, crossing it by the Kizil Art Pass (14,260 feet), descend upon the Great Kara Kul (12,800 feet). The route skirts the east shore of the lake, and then takes one of two directions: either (1) a more easterly course, followed by M. Bonvalot's party in 1887, *vid* the Karazak Pass, and Uzbek or Kizil-jik Pass (Indian map, 15,190 feet; Russian map, 15,300 feet), on to the Rang Kul Pamir and lake, and thence to the junction of the Ak-baital and Aksu at Murghabi; or (2) a more southerly course, taken by Littledale in 1890, up the Mus-kol or Chon-su confluent of Kara Kul to the Tuyuk or Ak-baital Pass (Russian map, 15,070 feet; Littledale, 15,525 feet), and thence down the Ak-baital stream to Murghabi, and the upper end of the Sarez Pamir.

The more westerly route to the northern Pamirs from Marghilan takes the following line: Uch Kurghan; up the Isfairam river; over the Little Alai range by the Tengiz Pass (11,800 feet) to Daraut Kurghan on the Kizil-su in the Alai Plateau; across the Great or Trans-Alai range by the Ters-agar or Altindi Pass (12,000 feet) to Altin Mazar; thence by the Takhta-koram Pass (15,480 feet) or Yengi Dawan (15,300 feet) on to the upper waters of the Kudara river, which can be followed down to their junction with the Murghab, or from which a shorter track can be taken more to the east over the Kara-bulak Pass (14,460 feet) to Kara-bulak on the Murghab.

II. PASSES FROM THE MURGHAB VALLEY AND SAREZ PAMIR ON TO THE ALICHUR PAMIR AND YESHIL KUL.

1. Starting from the Russian fort of Murghabi or Pamirski Poste, at the junction of the Aksu and Ak-baital streams, the route commonly followed ascends the Kara-su confluent of the Murghab, and crosses the low and flat-topped Neza Tash (*i.e.* Spear-stone) Pass (Indian map 13,650 feet; Littledale, 14,200 feet) to the headwaters of the Alichur river, which is then followed eastwards, past Chatir Tash to Yeshil Kul.

2. A little to the west of this route is a tract that was followed from Murghabi by Putiata in 1883. It crosses the dividing range by the Buz-tere Pass (14,900 feet), and also debouches on the upper waters of the Alichur river.

3. Immediately to the west of this again is a pass called Agal-khar.

4. From this point the northern boundary range of the Alichur Valley and Pamir is not again pierced by a traversable route until we come to the Marchenai Pass (15,700 feet), leading down from Sarez on the Murghab to the northern shore of Yeshil Kul.

5. To the west of this, the Lenger Pass conducts through the same range to the western extremity of the lake.

III. PASSES FROM THE ALICHUR PAMIR AND THE GREAT PAMIR.

1. Beginning on the east in the mountain cluster that separates the drainage of the Aksu from that of the Alichur, we find a route that



PORT OF TASHKURGHAN.

leaves the Aksu river at some distance above Murghabi, ascends the Shor-bulak confluent to the pass of that name (14,700 feet), and then, crossing the Sari-tash Pass, comes down upon the valley of the Istik river, which can then be ascended in a south-west direction towards the watershed that divides its headwaters from those of Victoria Lake.

2. At some distance to the west a track leads from Chatir Tash up the Gorumdi confluent of the Alichur river, and crosses the Teter-su or Tetez Pass to the headwaters of the Istik.

3. In the same mountain range separating the Alichur drainage from the Victoria Lake basin on the south-west, and from the Istik or Aksu

drainage on the south-east, there is at no great distance a pass named Kojiguit, which was crossed by Littledale and Dunmore.

4. Continuing westwards, we find a pass named Kara Bilis ("Black Pass"), which was first crossed by Ivanoff in 1883, but which supplies a collateral rather than a direct communication between the Alichur and Great Pamirs.

5. The next pass encountered is the lofty and very difficult one of Bash Gumbaz (16,460 feet), crossing the main range between the Alichur river (which is left at Abdullah Khan below Chatir Tash) and the western end of Victoria Lake. Ivanoff explored it in 1883. Littledale found it blocked by snow in June, 1890.

6. The next route conducts from Sasik Kul southwards over a pass which was named by Dunmore Hauz Dawan, from a small lake on its summit, but which appears on the Russian map as Kumdi (elsewhere Kunday). The route comes out upon the Pamir river a little below Victoria Lake.

7. The easiest of the passes between the small lake-basin above Yeshil Kul and the Great Pamir is, however, the next in order, viz. the Khargosh, or Hare Pass (14,450 feet), which debouches upon the Ab-i-Khargosh confluent of the Pamir river.

8. A little further to the west, a track leads from Bulun Kul, over the Koh-i-Tezek Pass (14,200 feet) and Kok-bai Pass (14,400 feet), on to the Mas confluent of the Pamir river, which it reaches at a point named Jangalik or Yumkhana, below Yol Mazar. These passes were explored by Putiata in 1883.

9. It is by following the same stream, the Mas, that communication is also effected between the valley of the Pamir river and the headwaters of the Shakh-dara river (which flows into the Ghund a little above its junction with the Oxus opposite Kala Bar Panja) over a pass, closed by snow except in summer, which Trotter called the Joshangaz, but which appears on most maps as the Mas Pass (15,120 feet).

IV. PASSES FROM THE GREAT PAMIR TO THE LITTLE PAMIR.

1. Gordon and Trotter, returning in 1874 from the Great Pamir and Victoria Lake to the Aksu valley below Aktash, followed down the Istik river, before mentioned.

2. If, however, access is sought to the same valley above Aktash, i.e. to the Little Pamir proper, the upper course of the Istik known as the Chish-tiube can be ascended, and the bordering range of the Little Pamir be crossed by either the Kizil Rabat Pass or the Urta Bel Pass (14,090 feet), which lead down on to the string of lakes below Chakmak Kul. The watershed between the two drainages, in the case of the latter pass, is at a very short distance above the valley and stream of the Aksu.

3. The pass most commonly taken between the two Pamirs is,

however, that which was discovered by the Russian topographer Benderski in 1883, and whose name was changed by the Russians from Andemin to Benderski in his honour. The crest is 15,130 feet. This track mounts the Andemin confluent of the Istik, and then descends upon the Aksu valley some miles beyond the eastern end of Lake Chakmak. At the summit of the pass is a pool or lakelet of water from which—a rare occurrence—a rill flows out at either end, the one to the Great, the other to the Little Pamir. This route was followed by Littledale in 1890, and by Dunmore in 1892; and on their maps the pass is marked as Andemin. The crests of the Benderski and Urta Bel Passes are now the Russian frontier, as fixed by the Commission of 1895.



KIRGHIZ ON THE MARCH IN THE PAMIRS.

4. There remains a pass about which there exists great uncertainty. Gordon wrote in 1874, "A valley at the head of Lake Victoria leads to the Wurm Pass over the southern range, by which the Little Pamir, Langar, and Sarhad are reached in one and two days respectively."* On the other hand, in 1883, Ivanoff and Benderski "endeavoured to find the supposed pass of Varram Kotal leading to the Lake Great Pamir from Wakhan Daria (*i.e.* the Sarhad branch of the upper Oxus), but after several reconnaissances they were obliged to conclude that the mountains separating the Great and Little Pamir were absolutely inaccessible in this direction."† Nevertheless there appears on the

* 'Roof of the World,' p. 157.

† *Proceedings of the R.G.S.*, vol. vi., 1884, p. 139.

Indian Intelligence Map such a pass, named Shor Kara Jilga or Warram, which is made to debouch upon the Sarhad river between Lake Chakmak and Bozai Gumbaz, and which, I suppose, if it exists, comes down one of the many lateral gorges that I passed, and that intersect the range on that side. On the other hand, when I was marching down the right bank of the Oxus from Bozai Gumbaz, and had crossed the Dasht-i-Mirza Murad, I came to a stream which flowed into the Oxus from the north, and which was called Waram. If the maps are (as I suspect) mistaken, this may perhaps be the exit of the pass (if there is one) of the same name. I should add that later on, between 12 and 15 miles below Langar, another stream flows down a very deep *nullah* from the north into the Oxus; and that the Kirghiz in my party reported that by this *nullah* a track ran to Victoria Lake and the Great Pamir. It is possible, therefore, that there may be still unexplored passes in this part of the range. In August, 1895, some members of the British Boundary Commission party essayed to discover this or some other pass over the mountain watershed south of Lake Victoria, but met with no success, finding the range impassable in this direction, and blocked with glaciers and deep snow. In their opinion no such pass exists.

V. PASSES FROM THE PAMIR-I-WAKHAN TO THE TAGHDUMBASH PAMIR.

These I have previously described; viz. the Wakh-jir Pass, which was crossed by Lockhart and Woodthorpe in 1885, Grombchevski in 1888, Dauvergne in 1889, Younghusband in 1891, Dunmore in 1892, and Lennard and myself in 1894, and the elevation of which is 16,100 feet; and the nameless pass in the other and more southerly fork of the Wakh-jir valley, over which Younghusband came on to the sources of the Oxus in 1891.

VI. PASSES FROM THE LITTLE PAMIR TO THE TAGHDUMBASH PAMIR.

1. The most familiar and easiest of these routes is that which runs from Aktash at the head of the Little Pamir, to Tashkurghan, at the head of the Taghdumbash, across another and better known Neza Tash, known also as the Shindi Pass (14,920 feet). It has been taken by many travellers.

2. A little above Aktash, a confluent on the right bank of the Aksu can be followed up, conducting to the Bayik, Beik, or Paik Pass (called by Capus Bijik-bel). It was crossed by Lord Dunmore in October, 1892, but was blocked with snow when the Frenchmen were at Aktash in April, 1887. It was explored by the members of the Boundary Commission in August, 1895; and falls within the frontier assigned to Russia by their agreement. The crest is 15,470 feet. The track then descends by the Bayik confluent of the Taghdumbash river on to the Pamir of that name.

3. Further to the south access can be gained from one to the other Pamir, with some difficulty and only at certain seasons of the year, by the passes at the heads of less-known nullahs which have hardly as yet been thoroughly explored. They debouch upon the Taghdumbash in the stretch between the Wakh-jir Pass and Kurghan-i-Ujad-bai. There are four of these passes—the Karachukur (taking its name from an alternative title of the Taghdumbash river), the Mukhman or Mihman-guli, the Tagermansu (lying just outside the new frontier assigned to Russia), and the upper fork of the Kukturuk valley. They cannot, however, be considered as regular passes, and are frequently blocked by snow.

Having completed my survey of the Pamir Passes, I now return to my own journey. From Bozai Gumbaz I followed the Oxus valley down to Sarhad, a distance of 42 miles, the present outpost of Wakhan territory and Afghan rule, where the river emerges from the mountain defiles and suns itself luxuriously on the more open plain. The track, however, does not closely pursue the river gorge, whose cliffs are too steep to admit of any passage for a greater part of the way, but at a distance of 7 miles below Bozai Gumbaz bears away from the Oxus, and crosses a wide grassy upland plain known as the Dasht-i-Mirza Murad, which is marked on very early maps, and which leads down to the valley of the Waram stream.* Over a second grassy upland called the

* It is at a point on the left bank of the Oxus, named Baikara, opposite to the Dasht-i-Mirza Murad, that a track runs southwards, conducting (1) to the Irshad and Chilinji Passes into Hunza; and (2) to the Khorabot Pass, leading down the Karumbar or Iahkumman valley to Gakuch, on the Gilgit river. The Irshad route is the most direct between Hunza and Wakhan, and was in frequent use both by men and ponies, until a few years ago it was blocked for animals by a change in the direction of a glacier. The pass called Irshad really consists of two passes across the same watershed, quite close to each other. One is called the Kirghiz-Uwin (16,060 feet), the other the Kik-i-Uwin (16,180 feet). The route from the Irshad comes out in the Guhjal or Upper Hunza valley, at a point between Gircha and Misgar called Khudabad. I believe this to be the pass by which MM. Bonvalot and Capus tried to penetrate into Hunza in 1887, but their descriptions and nomenclature are so confused and inexact as to leave the matter in doubt. Anyhow, they were turned back by the snow ('Le Toit du Monde,' pp. 274, 275). The Chilinji Pass (17,000 feet), or Tash Kuprik (i.e. Stone Bridge), lies a little further to the south, and is an exceedingly difficult glacier pass, quite impracticable for animals. From Wakhan it can only be approached after the Khorabot Pass has been crossed, so that two watersheds have to be surmounted before the Upper Hunza valley is reached. After the pass has been crossed, the track joins the Irshad route. The Khorabot or Baikara Pass (15,000 feet) conducts across the main Hindu Kush watershed from Baikara to the headwaters of the Karumbar river, and thence down to Imit at the upper fork of the Karumbar or Ishkumman river. M. Dauvergne, in 1889, after crossing the Baroghil, ascended the Yarkhun river, which had been previously reported, upon native information, as rising in the same lake as the Karumbar river, and found that the Yarkhun did indeed rise in a small lake, one of the numerous Gaz Kuls, but that a low rocky watershed separated this from the larger lake, variously described as Karumbar Sar, Ishki Kul, and Zjoe Sar (?), from which issued the Karumbar stream. About the latter fact there is no doubt, although

Dasht-i-Langar we come back to the main river and to the ruins of the former settlement of Langar, a fort and two stone cairns on a hill, and some deserted dwelling-places and tombs in the valley-bottom. Below Langar the gorge becomes greatly contracted, and the Oxus, gaining volume as it descends, foams noisily along, being here unfordable. Clumps of small timber nestle in the lateral defiles. There is in one place a very bad *pari*, or cliff track, above the river, which Mr. Little-dale described in his paper. Our ponies had to be unladen and pushed and hauled up the rocks, and even so constantly slipped and fell. It is a bad place for their loads, and one of my bags was ripped clean open. Further down we again left the main gorge and diverged inland, mounting and descending successive spurs of great steepness and difficulty, down one of which one of our Kirghiz ponies, missing his footing, slipped and fell, and was killed instantly; until at length, mounting to the Daliz Kotal or pass (13,500 feet), we saw outspread below us the splendid vista of the Oxus valley. The river, released from its long mountain imprisonment, spread itself out in countless fibres over a wide watery plain, doubtless an old lake-bed, closed on either hand by magnificent snow-peaks.* Below us lay the terraced fields of Wakhan. Oxen,

the lake is said not to have a permanent existence, but to consist of an accumulation of snow-water in the spring only. But it is curious that while M. Dauvergne reported the Yarkhun river to Colonel Woodthorpe, as rising in a smaller and independent lake (*Proceedings of the R.G.S.*, vol. xii., 1890, p. 96), in his paper before the Paris Geographical Society he described it as rising in a great glacier, which coincides with the information that I received from Lieutenant Cockerill, who had visited the spot (*Scottish Geographical Magazine*, 1892, p. 365). This glacier, in common with another that descends upon the Yarkhun river immediately south of the Baroghil Pass, bears the name of Chatiboi, or Chittibui, which Major Raverty ('Notes on Afghanistan,' p. 155) explains as Chitti (Hindi for "white") Bhui (Sanskrit for "earth"), a very appropriate designation for a glacier. The rise of the Yarkhun river in this glacier is reported by some of the native travellers, whose itineraries are published by Raverty (pp. 155, 188), and is corroborated by the "Mulla," a map of whose explorations (in 1876) appeared in the *Journal of the Asiatic Society of Bengal*, 1878, part i. He depicted one branch of the river as rising in a glacier named Chatiboi, but this was the Chatiboi opposite the Baroghil. Of its more distant namesake he was not aware. Major Raverty is consequently quite mistaken, if for no other reason, in saying (p. 181) that "the Dragon lake of the Chinese pilgrims Hwui Seng and Sung Yun in the Puh-hoi mountains is the lake of Chitti-Bui." I suspect that the Kotal or Pass of Palpi Sang, mentioned in one of Raverty's itineraries (p. 188) as "a long and narrow *darah* extending upwards for a distance of nearly ten *kurok*, northwards from Chitti-Bui," is the Khorabort Pass, unless a confusion has arisen with the lower Chatiboi glacier, in which case it would be the Baroghil. In 1891 Colonel Yonoff, after arresting Captain Younghusband at Bozai Gumbaz, crossed the Oxus and the Khorabort Pass, which he somewhat rashly rechristened Yonoff Pass, and then, turning westwards, in the inverse direction to M. Dauvergne, descended the Yarkhun river, mounted to the crest of the Darkot Pass, and finally returned to the Pamirs by the Baroghil and Sarhad.

* This plain or valley was called Sarigh Chopan or Chaupan as early as the time of Baber (*vide* 'Erskine's Life,' i. 339, 340, 510), and in the chronicle of Mirza Mohammed Haidar (1543), and again by Munshi Faiz Bakhsh in 1870. The name seems now to have fallen into disuse.

goats, and sheep were being driven in at the sunset hour, and thin curls of smoke arose from the settled habitations of men. Descending to the valley, we camped near one of the Wakhi villages in its bottom, to all of which the Afghans apply the collective title of Sarhad (10,400 feet). Their frontier post is at Chehilkund, on the right bank about 3 miles lower down, where, in a dilapidated fort on a rock, were stationed a *havildar* and a few seedy sepoy.

Sarhad was the place where, in 1890, Mr. and Mrs. Littledale, coming from the same direction as ourselves, were stopped for twelve days by the officiousness or discourtesy of the Afghan captain from



CAMP SCENE, PAMIRS.

Kala Panja, 50 miles further down the river. I had thought to have sufficiently guarded against the repetition of any such *contretemps* by having requested the Amir of Afghanistan, whose guest I was going later to be at Kabul, to send word to his officials in Wakhan of my proposed arrival. This he had done, and the petty *havildar* at Sarhad was well aware of my identity. Nevertheless, the opportunity of swaggering a little before the inhabitants of this remote dependency, and of humiliating the representative of a foreign nation, was too good to be lost; and the *havildar* of Chehilkund, having turned up at his leisure and offered halting apologies for a rudeness which was manifestly designed, presently informed Lennard and myself that we were Russian spies, and that he must accordingly detain us until his commanding officer arrived from Kala Panja. How a Russian spy

could have come by our route from Hunza, could be proposing to re-enter British India by the Baroghil Pass, and could have been described in a letter from his own sovereign as an English traveller and a friend of his own, the *havildar* did not attempt to explain. Leaving him to reconcile these contradictions, and informing him of my sincere intention to mention the matter at Kabul later on, we packed our loads, and, having the superiority of numbers, marched off undisturbed.

I may here perhaps mention the sequel. At my first audience with the Amir at Kabul, he raised the matter, having received my letter of complaint, and having instituted inquiries. The reply of the now frightened *havildar* was really so ingenious as to extort my reluctant admiration. "He was still awaiting," he said, "the arrival of the great English lord *sahib*, whose coming had been announced by His Majesty the Amir, and who would no doubt appear in uniform with an escort of 1000 men. In the mean time two of the lord *sahib's* servants (*i.e.* Lennard and myself) had already passed through with an insignificant following. He himself would continue diligently to await the great lord." I heard afterwards that this polite intention on the part of the *havildar* had been frustrated by an imperative summons to Kabul; but what may have since transpired I do not know.

Crossing the bed of the Oxus, which is here about three-quarters of a mile in width, and fording the river, which was divided into three main channels with from 3 to 4 feet of water, we then struck due south into a gap in the hills, nearly half a mile wide, up which lies the ascent to the Baroghil Pass. For nearly 3 miles the track runs through a flat and swampy valley with abundance of grass, called Pirkhar. It then bears a little to the west, and, gently rising, follows for 5 miles a long and stony bay completely filled with the bed of the Pirkhar stream. At the head of this valley two tracks bifurcate. That to the south-east ascends to the Shawitakht Pass (12,560 feet), which is an alternative to the Baroghil for travellers proceeding directly to Darkot and Yasin, and from there descends on to the Yarkhun river, from whence a gentle ascent of 8 miles leads to the *ailak* or summer pastures of Showar Shur, and from thence over a glacier to the Darkot Pass (Pamir Commission, 1895, 15,200 feet; Littledale, 15,950 feet) and the route to Yasin. The second track, which I followed, led more to the south-west, and, after a climb of three-quarters of an hour, brought me to the rolling saddle or dip in the main range of the Hindu Kush which is known as the Baroghil Pass (12,460 feet). This remarkable depression is from 400 to 600 yards in width, and its crest is about 12 miles from Sarhad. On the southern side the track descends over a gentle grassy slope, that would provide the most admirable golf-links, to the valley of the Yarkhun river, which it strikes some miles below the Shawitakht route. The grassy slopes on both banks of the river are known as Dasht-i-Baroghil. In front of one, along the entire descent, the foreground is

filled by the magnificent Chatiboi glacier, which plunges down like a prodigious frozen Niagara between two snowy peaks of the confronting range. From here, also, after fording the Yarkhun river, an ascent can be made along the edge of a great glacier to the summit of the Darkot Pass. The latter, of course, and neither the Baroghil nor the Shawitakht, is the real defence of India on this side, since it would be almost impassable by armed men.*

From our camp on the Yarkhun river,† where Lennard and I separated, he to return to Gilgit, I to proceed to Chitral, I followed down the gorge of the Yarkhun (also called Mastuj, Chitral, Kashkar, and Kunar river) for three days, a distance of 72 miles, to Mastuj. On the first day I had to ford the river from bank to bank twelve times, and so to circumvent (I might otherwise have had to cross) six glaciers. Of these the great Chatiboi, 600 yards wide, comes right down to the edge of the river, and there towers, a precipitous wall of ice, above the foaming water.‡ Woodthorpe and Barrow, Younghusband and Cockerill were the only Englishmen who had previously descended by this route; but my journey, made at the beginning of October, proved, as the Mehtar of Chitral afterwards told me, that, though very difficult in summer, when the river is in flood and the glaciers require to be crossed, it is available from the early autumn till the late spring, and must consequently be regarded as one of the main possible routes into India. Fortunately, there is at least one place in the valley where a small body of men, taking advantage of the natural conditions, could resist a force ten times their superior in numbers. Nor is it very likely that an invading army from the north, whose objective was Chitral, would trust itself to a route that is practically confined to a single gorge for 140 miles, when the much easier and shorter route by the Dorah Pass is available. At Mastuj I joined Younghusband; and here ends that portion of my journey which I undertook in this paper to describe.

(*To be continued.*)

* *Vide* the account of Littledale's difficult crossing of the Darkot in July, 1890, *Journal of the R.G.S.*, vol. xiv., 1892, pp. 24, 25. Lennard, after leaving me (in October, 1894), experienced almost equal trouble.

† At this point there was formerly a bridge across the river, but it was destroyed by Ali Mardan Shah, the former ruler of Wakhan, on his flight from the Afghans in 1883.

‡ This is the lower Chatiboi, the name—a familiar one for glaciers in these parts—being also sometimes applied to the neighbouring Darkot glacier. I have previously shown that it is again attached to the glacier-source of the Yarkhun river.

EXPEDITION THROUGH SOMALILAND TO LAKE RUDOLF.*

By Dr. A. DONALDSON SMITH.

DURING a sporting trip in Somaliland over two years ago, I conceived the idea that I could carry an expedition across that large extent of unexplored country lying between the Shebeli river and Lake Rudolf, with Somalis as a guard, and camels as pack-animals. Accordingly I came back to England, and set to work to fit out an expedition, engaging the services of Mr. Edward Dodson, a young taxidermist at the British Museum, and preparing to do as much useful work as possible. The Society gave me the only material assistance I received, in the shape of a loan of valuable instruments, so that, with these and the excellent instruction I received from Mr. John Coles, I was able to make an accurate map of the country traversed.

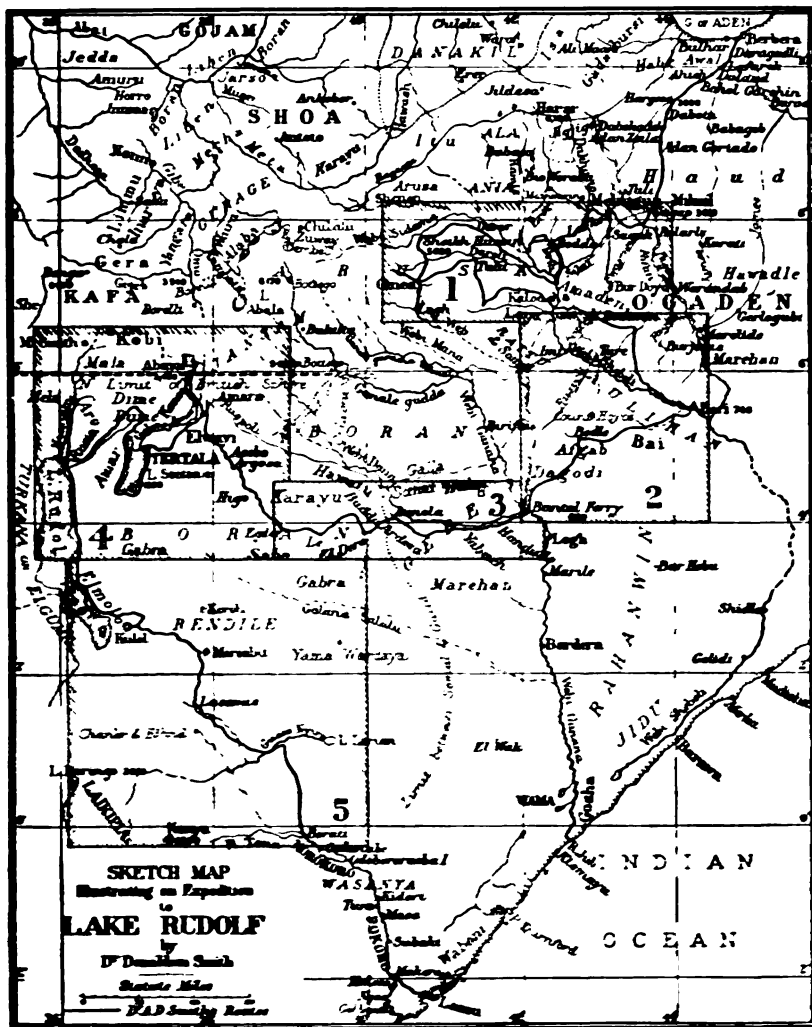
My friend, Mr. Fred Gillett, asked me to permit him to accompany me, with twelve men and twenty camels, in order to get some big game shooting. To this I willingly agreed, as I was desirous of his companionship. Grave doubts were expressed, both here and at Aden, of our ever being able to enter the Galla country, let alone our reaching Lake Rudolf. Ever since the days of Sir Richard Burton, who first endeavoured to make the journey, many attempts have been made to reach Lake Rudolf without success. Captain Bottego and Prince Ruspoli had gone far up the river Jub, or Sonana, and it was reported that the Gallas had resolved to unite in preventing any other white men from entering their country, on account of the manner in which these two Italians had acted, and that it would be impossible to cross the Galla countries without a very large army. However, with light hearts, and fully confident that we should be successful, we set sail from London on June 1, 1894.

We were soon in Berbera, with eighty Somalis and two good headmen. The thousand preliminary details need not be dwelt upon; it is sufficient to say we were heartily glad when July 10 came, and we were able to give the order to march. But I wish to thank Mr. Charles MacConkey, of Aden, and Mr. Malcolm Jones, resident at Bulhar, for their kind assistance in enabling us to get off so early.

When we started from Berbera, we had only 75 camels, instead of the 110 we needed to carry our stores. This was owing to the fact that there was such a drought that camels could get nothing to eat near the coast. The 75 camels we gradually increased to the required number as we went inland, but I was obliged to move slowly at first. I will not detain you long with an account of our journey through Somaliland, as the lions have long ago offered sufficient inducements to explorations in that country. Hiring extra camels to carry water

* Paper read at the Royal Geographical Society, January 6, 1896. Maps, p. 200.

at Hargosa, we were soon across that 100 miles of bushy, waterless plateau-land called the Haud, and found ourselves at Milmil, in the Ogaden country. This is the land of fat camels and fine-looking men and women. The people have lighter complexions and finer features than any other Somalis. The boys are all obliged to attend school to



learn Arabic, a bit of training that improves them in every way. The country is mostly flat, but the Abyssinian highlands are continued down in Western Ogaden in the shape of low mountain ranges and hills till they lose themselves above Ime; and another mountain range runs from Milmil south to Bari, on the Shebeli river.

As our route lay directly west, it was principally through a rough country. The Ogaden is dry like the rest of Somaliland; the wells and pools of water in the river-beds are far apart, and to the south-west the water is brackish. This is not the case, of course, during the spring and autumn rains; but it is astonishing how quickly the country assumes its half-parched appearance after the rains have ceased.

From Milmil we marched a little south to Sesabene, a settlement that was of much importance. It was situated in a little valley, where there were many wells and a good deal of green grass. I saw more cattle and donkeys here than in any other place in Somaliland. The people were very civil, and glad to trade with us. You may imagine my chagrin when I heard, a few days afterwards, that they had just been raided by the Abyssinians under Ras Makunnen. Their animals had all been driven off, the boys and girls taken as slaves, and the older people killed or mutilated. This same Ras Makunnen has been a great leader in the war with the Italians.

The country now became gradually more interesting to us, as it was more unknown. We had one march of three days through a waterless hilly country called Sibi. The Somalis also call this Habr-a-erde, which means "bad for old women." This name impressed us very much, as we had seen the sad state in which old women roam about Somaliland too often. The Somalis are the best savages in Africa, but they have their little ways, and one is not to trouble about a woman after she gets old, whether she be sister or cousin or aunt. So many of the poor old wretches are doomed to wander about, eating berries or begging, till they die of gradual starvation, or are caught by lions or hyenas.

The middle of August found us at Bodele, on the Terfa tug (*tug* is the Somali for *wadi*, a dry river-bed); but before reaching here we had the pleasure of meeting Captain C. J. Perceval, who had penetrated farther than any other white man, except ourselves. At Bodele we found a few Somalis, the last we were to see for many months. My desire was to keep on as nearly west as I could, but the Somalis told me that was impossible—that even a man empty-handed could not reach the water of the Erer, owing to the great rocky walls that surrounded it. The only thing to do was to go and see for myself. Leaving Mr. Gillett with the caravan at Bodele, as he wished to do some lion-shooting, I started off with Dodson and a few boys. We had many difficulties, having to lift five camels bodily over rocks several times. Finally we had to abandon the camels, but not until we had got within a mile of the river. It took some climbing to reach the water, but we were rewarded for the trouble, as a more lovely valley is not often seen. Narrow, and with high mountains rising on either side, it is nothing but a mass of colour, from the yellow reeds along the edge of the stream to the flowering vines covering the rocks. There were many birds, the most striking being a crested starling, of which only a single specimen

had been seen before. There were deserted Galla villages along the edge, and I saw fresh footprints, but I did not succeed in getting any native to approach. For three days on this trip Dodson and I lived on the flesh of a rhino, that had managed to get within a yard of me before I could stop him. On reaching my caravan, I found Mr. Gillett had killed a fine lion. Of course there was no crossing the Erer, so we had to march down Terfa tug to its junction with the Shebeli river. The Shebeli was flooded, and it was all we could do to cross it. We succeeded, but not without the loss of a camel-man, who was washed away and drowned, and two ponies. Mr. Gillett's mule fared badly also, through the greediness of a crocodile. Now was the time for the terrible



LAFERUK, TWO MARCHES FROM BERBERA.

(From photograph by Mr. F. Gillett.)

Gallas to appear. Where was the country teeming with lusty warlike people? Certainly not here! What we found as we progressed was only a few poor villages of a hundred huts each, and the natives presenting the most abject appearance imaginable. Only four years ago they must have been a fine race of men; they loved to tell us of their former glory; their eyes would light up, and they would forget for the instant their present condition. Now the Abyssinians are the masters, and these poor people are only the remnant of a great tribe. They are the Arusa Gallas, and their native land extends 150 miles west of the Shebeli river. You could not find over five thousand souls among them now.

They resemble the Somalis very much in having slender figures and curly hair, but their skins are much darker, and their features more irregular. The Arusa Gallas are blacker than any of the other Gallas I visited. They are very free from immorality, marriage rites being strictly observed. The boys marry usually at the age of fourteen, and the girls at twelve. Later on they may take another wife, or even a third, but I did not hear of any man having more than three wives. Their religious beliefs are very simple. Wak, as they call their god, is merely a power capable of working for their good or evil. They do not associate their idea of Wak with that of a moral being. All the phenomena of nature are embodied in the term Wak. When they sacrifice their animals under a tree and pray for rain, they pray to the rain itself and call it Wak. They differ from the Borans and the Gallas living far to the south, as these people look upon Wak more as an all-powerful man living up in the heavens ready to avenge misdeeds or help in a just cause, according to the very questionable native ideas of right and wrong.

For several marches the country was dry and barren like Somaliland, except along a small river called the Darde, or Daroli, that I discovered emptying into the Shebeli; but we soon began to feel a few raindrops, and then more and more. We were getting up into a high, well-watered mountain region. Nature assumed a different dress. There were the thickest sort of thorny acacias and mimosa trees and bushes, with here and there open grassy plains covered with fine green grass up to one's knees. Giant sycamores, pine and cedar trees, and euphorbias spread out their limbs over veritable flower-beds. Geraniums, fuchsias, sweet-peas, and countless other plants, seemed to be trying to crush each other out.

On September 17 we arrived at Luku, a place of some importance as an agricultural centre, and we were astonished to find there a stone tomb erected to a Mohammedan Sheikh, Abai Azid. It was a rectangular building, with a dome in the centre, and covered with white plaster. "Wait till you see Sheikh Husein," was the cry of the natives when I admired their tomb. They indicated a hill 30 miles off to the south as being the location of Sheikh Husein. The view was extensive. Beyond the hill we saw, rising up to the height of 9000 feet, a noble group of mountains, the two highest peaks of which are called Walenzo and Gubayu. I have named this group the "Gillett mountains," in honour of my friend. It is Mr. Gillett's desire, as well as my own, that the native names of Web and Wabi should be retained for the river passing south into the Jub and the upper Shebeli respectively. Further to the west, and quite distant from any other mountain, a bare rocky mass towered high into the air, called Mount Abugasin. Little did we dream that we should not get out of sight of these mountains for two months.

We were glad to reach Sheikh Husein a few days after, as we were all fatigued with the hard work we had had to do in the various marches. Many a rock had to be rolled aside, and miles of road cut through dense bush. We were given the name of road-cutters by both Abyssinians and natives. The best paths in the country are scarcely fit for donkeys. Strange it seemed to be in a town, after all this, where there were stone buildings. On one side was an acre of ground enclosed by a high stone wall with a curious gateway. Inside was the imposing tomb of Sheikh Husein, and several mosques. There was also a well in the enclosure, where the women drew their water. The tomb was enclosed by a second wall, and was a very imposing structure 30 feet high.



WELLS OF GURATI, SOMALILAND.
(From photograph by Mr. F. Gillett.)

Sheikh Husein was a Mohammedan saint, who came to this country from Bagdad two hundred years ago with his lieutenant, Sheikh Mahomed, in order to convert the Gallas. He had many children by Galla wives, and their descendants form the greater part of the population of the town at the present day. Many are the tales of magic that Sheikh Husein wrought. He was supposed to have come from Harer on a wishing-cloth, and to have built mosques in one night. There were five other white tombs of sheikhs scattered about the hilltop on which the town is situated, making quite a gay appearance.

The natives of Sheikh Husein are much superior to the Arusa Gallas of pure blood. They are very light-coloured, and have much more

regular and refined features. Their town has been held in reverence by all the Arusa Gallas as a holy city, and also as a great centre for trade, ever since its foundation. Strange it is, however, that although they have kept up their observances of Mohammedan law, the teachings of Islam have not extended far beyond their immediate neighbourhood. They are quite apart from any other people I met in Africa in their high standard of morality. Not only do they have a personal sense of honour, but they are able to do little acts of kindness from purely unselfish motives, and even feel a sense of gratitude when they are the recipients of favours. They are well clothed in garments of their own manufacture, make excellent pottery, and are most skilled as smiths.

We could not rest here in peace, however, for it was not long before the masters of this country made their presence felt. We had seen several Abyssinians before reaching Sheikh Husein, but now they commenced to come to the camp in large numbers. It was very cold, and torrents of rain fell every day. The Somali boys were suffering a good deal, and finally broke out in open rebellion. Only a dozen stuck by the expedition. After a good deal of trouble, the camp was restored to order; but there was still much discontent shown.

A message came from the Abyssinian general in command of this country, Walde Gubbra, requesting us to visit him. It would have been impossible to move the whole caravan across the Gillett range, and I could not leave the caravan for fear of the boys deserting. Mr. Gillett came to my rescue, and very kindly undertook to make the arduous and dangerous trip to the Abyssinian town Ginea by himself, accompanied only by eight boys. After Mr. Gillett had gone, I spent an anxious week drilling my boys, and getting them accustomed to shooting straight, when a letter arrived from my friend, saying that Walde Gubbra was a good old man, but wished to see me personally, and that the Abyssinians had promised us every assistance. I had to move the caravan a long distance round the Gillett range to the south-west, and then march it up to a high plateau, so I could have it near while I visited the Abyssinians.

Much time was spent by Mr. Fred Gillett and myself in the Abyssinian camp, while Dodson remained with the caravan, ready to give instant notice if anything went wrong. Every honour was shown us as guests of Emperor Menelek and of his regent Walde Gubbra, and all the luxuries the town of Ginea could afford were showered upon us. Slaves were appointed to do our bidding; enough Darde or Abyssinian wine sent us to half fill the tun at Heidelberg; honey, spiced meal, cakes, and, best of all, abundance of cows' milk. There were some 4000 souls living in Ginea, all Gallas, except the garrison of 450 riflemen. The Arusa Gallas here, as elsewhere, were regarded as slaves, and were even sold in the market as such. The troops were thoroughly drilled, and armed with Remington and French rifles. A braver,

hardier, more energetic, though savage, lot of men could not be found. We made up our minds then and there that any nation interfering with them would have her hands full. But we earnestly wished that they, as savages bearing arms against other poor defenceless Africans, should have such a drubbing that they would not forget it and try to extend their sway further. Let those good people who take an interest in uncivilized nations cast a thought on the black neighbours of the Abyssinians, who are in the worst plight; and let them offer their support to the Italians in their present struggle.

Walde Gubbra received us in great state at first, in an enormous



THE WEBI SHEBELL
(From photograph by Mr. F. Gillett.)

tent made of black cloth. Turkish rugs were spread about for the officers and guests, while he reclined on a sofa dressed in long silk robes. The officers made a fine display with their beautiful white and red cloaks of the softest material. We were soon asked informally to the old general's house, where we met his wife and ladies of his household. The large circular wooden building was not a handsome structure. It was always full of slaves, monkeys, and fleas; and eating honey with one's fingers and carrying on a conversation in two languages were not amusing, so we would make our visits as short as possible.

We were delayed a month about Ginea, waiting for a reply to a letter I sent to Emperor Menelek, asking him to allow us to proceed. We could wait no longer, although Walde Gubbra kept urging us to do

so. Without letting him know, we started west, and reached on November 10 a great grassy plain nearly 8000 feet above the sea, called the Budda.* This plain extends west some 50 miles according to native report, and is then broken by the valley of the Shebeli river or Wabi, as it is called by the Gallas. The Wabi rises near the chain of lakes extending to the south from Dembel or Zuwai, flows about the southern base of Mount Abugasin, where we investigated it ourselves, curves north as it passes Sheikh Husein, and then south again near its junction with the Erer river. Report went on to state that to the south-west a great mountain group called Worgoma towers high into the air, some natives even telling us it was often covered with snow. From this Mount Worgoma rises the river Web. To the west and north-west of the Budda the country gets rapidly higher and more mountainous, till you reach the present capital of Abyssinia, New Antoto. But now the expedition was confronted by one of those mountain walls that leaves no doubt in one's mind as to the possibility of further progress.

Down came the old Abyssinian general, with his army mounted on mules and riding at a quick pace. As we afterwards learned, the Abyssinians expected to ride in among us and drive us about like a flock of sheep, after robbing us of our stores, and sending the three Europeans to Antoto. Now came the time for our Somali boys to show that one great quality they possess—steady nerves in times of immediate danger. They had not forgotten the drilling they had received, but, on the alarm being sounded, were in their places in an instant. Walde Gubbra was taken aback on seeing a determination on our part to protect our own. He came to an abrupt halt when 80 yards away. I walked over with my interpreter to where Walde Gubbra had seated himself, unarmed save a little revolver I held concealed in my pocket. My safety lay in the fact that Mr. Gillett, with Dodson and all the boys at his back, stood ready to avenge any act of violence the Abyssinians might attempt. The old general rose and read a letter from Emperor Menelek, ordering us to return the way we had come, while rifles were being pointed at me from all sides. If, by accident or otherwise, one of the Somalis or Abyssinians had fired his rifle, there would not have been a man among us left to tell the tale. There was nothing to do but accept the situation, bad as it was. I do not think the prospects of ultimate success of any expedition ever seemed worse than they did for mine for the next three months. It was nothing but one continual wrestle with the desire of all my Somalis to return home. Even my head-man, Haji Idris, did everything he could to make me give up the idea of carrying out my original plan. I hope I shall never be obliged to undergo such a three months of trouble again.

* "Budda," or rather "Badda," is the synonym of the Abyssinia "Dega."

I shall not tire you with details, but before we get back to Somaliland I must mention some wonderful caves we discovered. Hearing that they were some 30 miles to the south of Ginea, Mr. Gillett and I avoided the Abyssinians for a few days on the excuse of elephant-hunting, and visited them. We were thunderstruck when we discovered what a superb underground palace the river Web had carved for itself as it dashed through a mountain of quartz. It seemed as if Nature had confined herself to human ideas of the grand and the beautiful in this work, so regular and ornate were her designs. Passing columns and arches and altars of apparently the whitest marble, the clear water disappeared into the dark recesses of a pillared temple. I can give you no idea of how ornate the columns were, with their beautiful capitals and splendid bases, or of the magnitude of the subterranean



CAVES OF WYNDLAWN, AT NORTHERN ENTRANCE.

chambers. I shall consider myself successful if I can only leave you with an impression of something vast and beautiful.

Leaving the caves of Wyndlawn, as I have named them, we were not long in reaching a place called Tulu, halfway between Ginea and the Shebeli river. This is situated on the river Darde, the perennial river I found flowing into the Shebeli, and which rises from the Gillett mountains. Here I received a letter from Emperor Menelek, enclosed in an envelope bearing a gilt crown. The letter was in Abyssinian, but translated by a Frenchman into French and English. Menelek, styling himself the Conquering Lion of the Tribe of Judah, Emperor of Ethiopia, King of Abyssinia, etc., was profuse in his polite speeches. He did not "forbid my going where I wished, but only advised" me not to do so. Thanking him in a hasty letter for his advice, I took his words too

literally, and made another attempt to strike for the south-west. But giving friendly advice is Emperor Menelek's diplomatic method of giving commands, to be backed by Remingtons. Down came Walde Gubbra and his army, and back went our little caravan all the way to the Shebeli river.

The country we passed through to the east of the caves of Wyndlawn was very rough and hilly—bushy in places, but becoming more stony and barren and cut by deep waterways as you near the Shebeli river. There are no inhabitants within 25 miles of the Shebeli until near Imi, 30 miles south of our crossing-place. I sent some of my boys ahead with instructions to rush on to Berbera, buy cloth and camels, and bring our letters, telling them at the same time that the quicker they got back to the caravan, which they were to meet at Bari lower down the river, the more pay I would give them. We found so little water in the Shebeli river that we could walk our camels across loaded, only a little south of the point our poor camel-boy had been swept away by the raging torrent four months previously.

To make the Abyssinians think we were going straight home, we marched some distance into Somaliland before going to Bari, 150 miles south. Being Christmas-time, it seemed as if something enlivening would happen, and we were not disappointed.

We were to have the pleasure of seeing a white man once more. Prince Boris, a Russian sportsman, happened to be in the neighbourhood; so we quickly arranged to spend the festive season together, and a jolly time it was, as you may imagine. After seventeen long marches we were at Bari. I should like to tell of the interesting people we met along the Shebeli river, who were going to war with one another, but time will not permit. On January 27 the sad news came of the death of Mr. Gillett's father; the boys had arrived from Berbera with cloth and letters. Coupled with the sad news were announcements that made it imperative that the friend who had done so much to help me and make the journey pleasant should return home at once. In a short time Mr. Fred Gillett was on his way to the coast. I sent out a collection of natural history specimens, with a small escort, at the same time.

I was left with Dodson as my only European companion; but, fortunately for me, in securing an excellent taxidermist and assistant I had also found a man full of pluck and patience. No sooner had Mr. Gillett left than the whole camp was down with fever, including Dodson and myself. There were scarcely enough boys to mind the camels. The majority of the boys wanted to go home, of course. I will cut the story short till we reached the Jub, as it is altogether too depressing.

On February 1 we were across the Shebeli, and on the way once more to Lake Rudolf. We were obliged to get across quickly to the Jub, as the Abyssinians might be down upon us at any moment. So all

hands that were well worked to help the sick and get the caravan ahead.

The country between Bari and the Jub river is extremely monotonous. It is a sandy plain, rising gradually to 2000 feet midway between the two rivers. The elevation of the Shebeli river is 740 feet, and the Jub 590. It is a very open country, with only three or four ranges of hills running north. The wells are far apart, and all the water is brackish. This fact, I may add, did not enable us to bear fever any better. The inhabitants for 80 miles west of Bari are Ogaden Somalis, who call themselves Aulihan, Rer Ali, and Afgab. After them



LESSER KUDU. SHOT BY DR. DONALDSON SMITH.

come the Dagodi, who are Mohammedans, but have a great preponderance of Galla blood. These tribes are nomads raising camels and sheep except along the Jub, where the Dagodi grow large crops of maize and millet.

The first river we came to was the Web, which we had first seen running through the caves of Wyndlawn. We got there in fifteen long marches. The natives had all been friendly so far, but they would not trade, although I offered much cloth for their animals—a bit of eccentricity on their part that necessitated our eating several sick camels. But along the river they all fled from us, as they had heard bad news about the white man. They were going to collect to fight us along the Jub. We managed, however, after much trouble, to gain their confidence so far that, instead of fighting, they set to work and helped us across the great river lower down. We did not cross the Web, but

followed it down to its junction with the Jub. The only way to cross this latter stream, which was 85 yards wide in most places, and very swift, was to go another march south to Buntal, where the river widens out over 200 yards. This is just below the point where the river Daua empties into the Jub from the west.

Once across the Jub, I seemed to enjoy a new existence. The strain I had been under for three months to keep the caravan together after having been turned back by the Abyssinians was removed; no more fear of that African cossack and no more need to fear any desertion on the part of my boys. My good followers were far enough away from home now to think no more about it, and had begun once more to settle down to camp life. Large doses of quinine had done their work, and a present of a fat camel, brought by an old chief, was all that was needed to make our happiness seem for the moment complete. We were now among a tribe of people called the Gere Gallas, whose country extends 100 miles west of the Jub. But just along the banks of the Jub and Daua are a lot of pure-blooded negroes of quite a distinct type from the Gallas. These Seedy Boys, as they are popularly called, make up half the population of Bari, on the Shebeli river. They raise maize and millet, and usually go about naked.

On the Jub we crossed the lines of march of the two Italian explorers, Prince Ruspoli and Captain Bottego, who had followed the course of the river some distance to the north-west. Their ambition also had been to reach Lake Rudolf, and come out at the south by Mombasa. Prince Ruspoli got much farther inland than any other white man except ourselves, having come from the Jub to the Amara mountains, as I shall point out.

Although we were all feeling in a better mood when we left the Jub, the real state of affairs was far from being what we desired. The large amount of extra cloth that I had ordered from Berbera seemed to have no prospect of being touched. The natives did not wish to sell anything, or else offered their animals at something like six times their value. My loading camels were giving out and I was in the greatest need of fresh ones. We managed to buy an animal from day to day from the Gere Gallas, but we could by no means keep pace with the waste that went on. We found the Gere Gallas very peaceful and friendly for the most part. They raise crops about the rivers, but their main occupation is breeding animals for food. There are three divisions of the Gere Gallas—the Gere Moro nearest the river, then the Gere Badi, and to the west the Gere Libin.

The Gere Gallas are an intelligent lot of people; very light-coloured, and of powerful, slender figures. Though many of them have no religion at all, Mohammedanism is fast taking hold among them. They are very rich in camels and other animals, and can afford to buy plenty of cloth from Somali traders. They appear very respectable in their long

flowing white garments. What is most remarkable, they are at peace with their neighbours the Dagodi and the Borana.

Our route lay for a short distance along the Daa, and then, as that river veered off towards the north, we left it and kept as nearly west as possible. There was plenty of game about, and I had good sport; but the one animal that above all else succeeds in breaking up the monotony of a day's march, whether you wish it or not—the rhinoceros—was not about.

The Daa is fringed with palm trees, from the juice of which the natives make an intoxicating drink. I crossed one day, and went at right angles to the stream for some distance with two of my boys. To my annoyance, I came upon the Daa again, flowing in an opposite direction; but I was surprised to find, at the bend of the river, a band of about a dozen wild-looking men and women, thoroughly intoxicated, and having a fiendish sort of time together, dancing and tumbling about. I tried to approach them as gently as possible, but it was of no use; the instant they caught sight of me they screamed and bolted. Hundreds of monkeys overhead caught the idea there was something wrong about my white face, for, setting up a deafening screaming, they pelted us with the fruit of the dum palm until we were glad to retreat. Except very near the river, the country was barren, and great wind-storms were raging when we were there. It was not an uncommon occurrence to wake up at night and find our tent-ropes dragging about over our bodies, and clouds of dust thrown in our faces. The Daa is 40 yards wide, but only 2 to 3 feet deep, with a current of 4 miles an hour.

Bidding farewell to rivers for a long time, we continued west, and arrived at the wells of El Modo on March 3. This was an important place, as beyond there is a mountainous tract of country in which there is no water for three days (45 geographical miles). A rest of a few days was not enough for my tired camels. It was all we could do to get across the desert. I had to throw away many boxes, including such luxuries as wine and tinned fruit; and we could carry so little drinking-water that we suffered greatly the last day. We had to undergo all this in spite of the fact that we had seven camels carrying cloth for trading, besides many others carrying beads and brass wire. Twelve camels died on the way, and when we reached Aimola, where there was water, there were only 60 camels left, and most of these were completely tired out. The natives had all fled; there was but one thing to be done, and that was to run after them and force them to come to camp and have a shauri with us. We could catch no natives, but succeeded in finding great droves of fine camels. This is what we wished, as the owners must surely come to us when the camels were in our hands. We had not long to wait; soon the camp was full of natives, to whom I returned every animal I had taken from them. The effect

was instantaneous—the whole country came to trade, and, to show their confidence, most of the men brought their wives and children along.

In the ten days we spent there we bought about forty camels and many good cattle and sheep, the natives forcing us to give, however, a high price for everything. I had some good sport here with elephants, rhino, and giraffe very near our camp. Aimola is situated on a fertile plateau, and is just on the border of the Boran country. The Gallas living here belong to the Gere Libin tribe, and are not Mohammedans. The plateau itself, called the Budda Ardesa, is not inhabited. The district inhabited by the Gere Libin begins one march to the north of the Budda, and extends north about 60 miles, the banks of the Daa river being the most thickly settled part.

The spring rains had now begun, and were to continue almost incessantly for two months. It was very cool, and so it was with the best spirits that the two Europeans of the party, at any rate, tramped down the edge of the plateau and found themselves in the lovely valley of San Kural, in the country of the Borans, of whom native traders had brought out such glowing reports.

We were astonished to find that, instead of being divided up into innumerable tribes, these Borans were one great united people. Their history resembles many a European one. The Karayu Borans, who were the strongest, subdued their neighbouring kinsfolk, and by excellent management formed a strong central government, in which at present nothing but harmony prevails. The hereditary king of the Karayu Borans is therefore ruler of all the Borans, and the present owner of that title is named Abofolato, a fat, clever old man living far to the north-west. The Borans I found about San Kural were the Sakuyu, and there were with them some of the Gabra or low caste Borans, who use bows and arrows. The chief difference I noticed between the Sakuyu and the other Borans was that the former have their heads shaved, and a tiny little pigtail sticking straight up from the middle.

The Borans received us with every show of friendship, as they said they had heard we wished to travel peacefully. As we gradually proceeded through their country they brought animals to trade, and provided guides. It was a lovely fertile country from beginning to end—a series of well-watered valleys, lofty mountain ranges, and cool, delightful plateaux. The roads were often difficult for the camels, and we should have to spend a whole day hard at work to do a distance of 5 or 6 miles. Seventy miles past San Kural are several most extraordinary wells—great round pits dug in the solid rock 80 feet deep and 50 feet wide, with long entrances cut gradually down to the bottom. The beginning of these passages would be 60 yards from the well itself in some cases, and would have rough steps cut in them, reminding one of the steps of Clovelly. The wells were cut by people that were much more civilized than the Borans.

After going a long way west through the Boran country, we started up towards the north, as I wished to visit the king Abofolato, and then try to settle the position of Lake Abaya, as this lake, marked in all sorts of places on the maps of North-East Africa as Lake Abbala, was only known by native report. The natives all said their king would be glad to welcome us and trade with us. We were given guides from village to village, and everything seemed to be progressing favourably. But on April 6 all our fond expectations of eternal peace were shattered. I had been out in the morning far from camp with only two boys, and



ERER RIVER, WEST OF BODELE.

had just returned, when I heard a great tumult going on. I rushed out and found that a party of Borans had surprised two of my camel-men, and had killed one and badly wounded another before they were driven off. On looking for my Boran guides, I found they had disappeared. The next morning and the following we marched, but it was through ever-increasing masses of Borans adorned with ostrich feathers. The night was spent with our boots on, and the days in endeavouring to make peace with the natives, at the same time preparing ourselves to withstand an attack. On the afternoon of the third day, however, just

after we had made our camp, between 2000 and 3000 warriors dashed down upon us. Many hundreds were mounted on smart-looking horses. They succeeded in driving off many of our animals before we could check them. The situation looked most serious for us for some minutes. The natives came on with such a rush and in such overwhelming numbers, that many succeeded in getting directly up to our zariba. But we managed to repel the attack, and the enemy were soon on the retreat. At one instant, when a lot of horsemen were collecting near by preparatory to a charge, I handed out a few shot-guns to my boys, loaded with small shot, and ordered them to fire directly at the horses. The effect was magical; the horses were thrown into a panic, and the charge was broken up at once. The attack was scarcely over than the Borans sued for peace, to our great satisfaction. In the course of a week they returned all the animals they had stolen, made presents of honey, milk, and coffee, and received a handsome present from us as a sign of good-will. King Abofolato sent his own son and other relatives to our camp, and everything was settled agreeably to both sides.

The Borans are by far the richest and most powerful natives I met with. They receive many articles of European manufacture, such as cloth, brass wire, and beads, from Somali traders. These Somalis come from the Italian ports, Merka and Magdisha, and exchange their wares for ivory. The principal cloth used by them, however, is made by a tribe called Konso, of whom I shall speak later. They wear a pair of short loose trousers, with a cloak thrown over their shoulders. They are light-coloured, even lighter than the Somalis, and their hair is more wavy than woolly. They are strict worshippers of Wak, and consider themselves far superior to their Mohammedan neighbours. They weigh themselves down with heavy rings of brass worn on fingers, arms, and legs, and cover their necks with enormous strings of beads. With the exception of piercing their ears, they do not disfigure their bodies. The women wear a short skirt made of either cloth or leather, which is their sole garment, but they adorn themselves more lavishly than the men. With the exception of the Gabra, the weapons used by this tribe consist only of a long thrusting spear having a very broad blade. They take a great deal of pride in their horses, and rightly too, as the animals are of a very superior breed. I do not think the Borans number over forty thousand, although reports have informed us that there are millions.

Having escaped the spears of the Borans, we now had to look sharp to escape the horns of that African bully, the rhinoceros, or the sudden charges of an enraged elephant. I cannot blame the elephants for wishing to annihilate me, as I had annoyed them in every case by placing large lumps of lead in tender places about their hearts; but the rhinos had no excuse whatever. Without any provocation, they would suddenly bear down upon the caravan from behind some bush, as if their

lives depended upon crushing every living soul among us, and unless I was ready on the instant to lodge a bullet in the proper place, some damage would surely be done.

On April 16 we were among the Aseba people, a rich tribe of Borans numbering about five thousand souls, long. $38^{\circ} 16'$ E., lat. $4^{\circ} 43'$ N. West of this was a very open, undulating grassy country with scarcely a tree, and sloping gradually to the south and south-west as far as the southern end of Lake Stephanie. But above that point the Tertala range of mountains (5000 feet high), with its broad plateaux, shut in the eastern shore of the lake. It would have been the easiest and most direct way to have marched across this open country to the southern end of Lake Stephanie, but my object was to explore to the north.

After leaving the river Dava, the country we passed through would vary in altitude from 2000 to 4500 feet, with peaks rising 2000 feet higher. South of 4° N. lat. it becomes gradually flatter and lower, and there is less rainfall. There are many evidences of volcanic action, and iron ore is found in abundance, especially to the north-west, as well as coarse granite and mountains of shining white quartz; ammonites are also found near the Dana. Going far up to the north, we came to a black race of people called the Amara, living high up on a mountain, and it was by their village that I was pointed out the grave of Prince Raspoli, who had come down from the Jub river, the only traveller that had ever succeeded in getting nearly so far into the country. The Amara told me, as eye-witnesses, how an elephant had seized him, and, after tossing him about a long time in its trunk, put him down and trampled on him.

(To be continued.)

POPOCATEPETL, AND THE VOLCANOES OF THE VALLEY OF MEXICO.*

By O. H. HOWARTH

THE physical structure of the Mexico valley is sufficiently striking even to the eye of the casual visitor. A vast plain, approximately circular in form and some 15 miles in diameter, including two extensive lake systems, and enclosed by lofty mountain ranges although its own altitude is over 7000 feet, must have obvious features of peculiar interest. But that interest is, I think, largely increased by certain considerations as to its physical history, which would not be realized without a closer study of the region from various points of view. I do not, indeed, know of any tract of country capable of creating such surprisingly different impressions according to the particular point

* Paper read at the Royal Geographical Society, April 22 1890. Map. p. 24.

from which it is examined; and it was from recent observations of this peculiarity that I derive the conclusions to be mentioned in these notes.

The very high elevation of these large interior plateaus at a point where the continent is narrowed to a width of only 300 miles between the two oceans, is in itself a remarkable feature. The valley of Toluca, 40 miles south-west of that of Mexico (to which it bears a considerable resemblance), is 9000 feet above sea-level, and is also surrounded by ranges of—geologically speaking—recent volcanic origin. But the peculiarity of the Mexico valley consists in the complete distinction between the character of the ranges bounding it on the north and west, and of those on the south and east. In the former are represented the older porphyries and some of the tertiary sedimentary rocks of the western Sierra Madre; while in the latter the predominance of recent basalts and lavas becomes more striking the more they are examined. The difference even in superficial outline is observable from many points; and though the general conformation of the valley so strongly suggests at first sight its possible origin as a great volcanic centre, it will be seen on further study that the eruptive line has been wholly independent of this particular basin, and that its development in its present form has been, so to speak, accidental.

It must be noted, in passing, that a lofty eruptive cone, terminating in a crater—active or otherwise—does not necessarily represent what may be called a volcanic centre; that is, the original position of a volcanic rift. As a rule it does not. It merely indicates some point on or near such a rift where the presence of water, or some other material developing gaseous matter at high temperatures, has had access to the rift, and has thus given rise to a long-continued explosive discharge of gaseous products, resulting in the building up of a cone of disrupted rock around its vent. The original eruptive discharge, within large continental areas, has frequently taken place without any formation of such cones, until the necessary conditions were encountered. But where a succession of eruptive cones can be observed, they afford a general indication of the course of the rift from which they were derived. If we trace the belt of great cones across this part of Mexico, we shall at once notice in succession those of Orizaba, Malinche, Popocatepetl, Ajusco, Toluca, Jorullo, and Colima, including, with a few others, the highest cones in the Republic, and strongly suggesting (in view of the intermediate formations) a continuous series.

It would thus seem that the main volcanic fissure which at various periods has extended across the continent at this latitude has taken a course nearly from east to west. After examining the eruptive evidences at many points along this line, and especially along the ranges bounding the valley of Mexico on the east and south, it seems to me clear that the primary and largest rift, or vent, passed along the ridge now crowned by the crater of Ajusco; and that, in the then absence of water with

possible access to the rift, the outflow of lavas took place without explosive violence for a long period. Almost the entire mass of the Ajusco ridge consists of a basaltic lava of a singularly uniform character; and the great stream known locally in the valley as the Pedregal has been traced westward nearly to the Pacific coast at Acapulco—a distance of over 200 miles.

The special interest attaching to this vast outflow of molten matter lies in the fact that it is undoubtedly one of the largest continuous masses of recent eruptive rock, derived from one vent, in the known world. This interest is, I think, the greater in view of the fact which has impressed me more fully after each inspection, viz. that all the



POPOCATEPETL.

surrounding cones of eruption along this belt—not excepting even the mighty Popocatepetl itself—must be regarded as subsidiary vents of a later date, from which explosive outbursts took place on the skirts of the Ajusco ridge *after* the enormous volume of matter silently erupted from that original fissure had filled and obstructed its own vent. A visible result of this piling up of material was so to alter the surface conformation as to give rise to accumulations of water at various points, resulting in violent lateral outbreaks wherever it encountered the heated matter and the unspent forces found their line of least resistance. It doubtless is not easy at first sight to regard so gigantic and commanding a cone as that of Popocatepetl as a mere secondary side vent, the offspring of one so much less striking to the eye. Yet the signs that this was the case are to my mind both numerous and convincing. One of

the most remarkable of them is the singularly small quantity of stream-lava definitely traceable to the vent of Popocatepetl itself. Excepting the flow on the south-east flank of the mountain, which terminates at or near Atlixco, only $3\frac{1}{4}$ miles from its foot, I have been unable to find any considerable stream that could be so traced. The great cone I believe to have been built up entirely by the long-continued ejection of scoriaceous bombs, cinders, and ash, in the course of periodical and violent eruptions of gases and steam after the great lava-flow of Ajusco had subsided. The same feature is observable in the case of the numerous smaller cones of eruption on the same belt. Even the main crater of Ajusco itself, although it rises to an altitude of 13,000 feet and occupies a central position on that range, must, I think, be regarded as a subsequent vent, and not as the original outlet.

Within the valley of Mexico, on the south-east end, are several smaller cones rising from the plain amongst the present lake-beds, and also representing later discharges of vapour and loose material, and not characterized in any instance by an extensive lava-flow. One of the largest of these, called San Pablo, I ascended and examined in November last. It is a prominent mountain near the line of the Interoceanic railway at Los Reyes, towards which village its only lava-stream has flowed. The cinder-cone has an altitude of 9000 feet, being now covered with vegetation. On reaching its summit, I found the crater to be about 300 yards in diameter and 250 feet deep; the interior partly precipitous, and partly a steep slope of scoria and cinder. On the very lip of the crater patches of barley were cultivated, and the evidences of a gradual cessation of the eruptive action, long after the lava-flow, were very distinct. From this summit I was able to observe four other smaller cones along the same line, one of them of such singular symmetry of form as to give one the impression of being an artificial structure. All of these afford the same indications of being "after-vents" of the great Ajusco outlet, in the same series in which Popocatepetl happens to be by far the largest secondary cone.

The two great summits, Popocatepetl and Ixtaccihuatl, forming one range and separated by a pass of about 12,000 feet altitude, are commonly spoken of in Mexico as "the volcanoes," though it has been suggested as long as half a century ago, by travellers who had examined them, that the latter mountain does not belong to the volcanic system at all. I have not been able to obtain any authentic account of an ascent of Ixtaccihuatl. The ridge of which the outline has originated the name (the "White Woman") is very difficult of access, and, being nearly 2000 feet lower than Popocatepetl, does not offer to the ordinary climber the same inducement to attempt it. After making an ascent on the west flanks nearly to the snow-line, I am strongly of opinion that the above view is correct, and that Ixtaccihuatl has no crater, and does not represent any eruptive vent. I found the entire body of the

mountain, so far as I could observe it, to consist of an ancient porphyritic rock of the same character as that of the western Sierra Madre generally, and with no indications whatever, either superficial or otherwise, of erupted materials corresponding to those of the volcanic system. The external structure is quite distinct, the sides of the mountain being deeply serrated into precipitous cañons, separated by lofty porphyritic ridges; and the intervening stream-beds filled with boulders and pebbles exclusively of the same rock. Following one of these gulches from the town of Amecameca almost into the heart of the range for a distance of several miles, I did not observe a single fragment of basaltic or scoriaeous rock in its course.



POPOCATEPETL FROM AMECAMECA.

Following the ranges encircling the Mexico valley northward and westward from Ixtaccihuatl, one cannot but be struck with their wholly distinct characteristics as to contour, weathering of surface, and even the flora produced by them. These ranges are almost entirely devoid of the pine-growth which clothes the mountains on the south, and vegetation is far more scanty. While the cultivation in the valley itself has crept far up the sides of the southern ranges, it is abruptly cut off at the foot of the barren hills on the north side; and on leaving the valley northward this general aspect is maintained all across the range until we descend into Tula, where a lava-stream is again observed, but flowing from the north, and indicating by its greater age and distinctive character a totally different origin. This feature in the history of the two ranges is singularly evident when the northern mountains are observed from any point where the view of the eruptive cones and

lava-ranges is obstructed by intervening elevations, and the valley and its boundaries are only seen in their aspect looking northward.

Summing up these remarks, we can hardly escape the conclusion that, prior to the elevation of the vast lava masses discharged upon the eruptive belt from east to west, the altitude of the land fell gradually from the south of the porphyritic range, and that the continents of North and South America may have been separated by inlets from the two oceans meeting between lofty islands—links in the great chain stretching from Alaska to Patagonia.

The climatic conditions belonging to so extensive a range as that of Ajusco are of course various, and dependent on altitude. The general level of the Mexico valley is over 7000 feet, and the climate, therefore, can hardly be described as tropical in the popular sense. Frost, though very infrequent, is not unknown; and the air-temperature is never oppressive. But it may be remarked that the so-called "region of eternal snows" on the great summits is somewhat mythical. There is, in fact, no "snow-line," even on Popocatepetl, although as a rule both it and Ixtaccihuatl are seen with a snow-cap extending down some 2000 or 3000 feet. This, however, is an extremely variable condition. Whilst climbing the spurs of Ixtaccihuatl in November last, I found no snow at 11,000 feet; on the contrary, the vegetation was abundant and varied—even a delicate maidenhair fern being amongst the products at that altitude. At the same time the cone of Popocatepetl on the south and east side was almost free from snow; and, in the absence of any heavy precipitation later, it is probable that by February (the best month for attempting the ascent) it may have been nearly clear. This, of course, would not be the case in all seasons: but there are occasions when even at 17,000 feet most of the snow disappears.

The melting of the snows at this high altitude is the origin of some very beautiful phenomena, the existence of which has sometimes been contradicted—on account, I think, of the uncertainty of their occurrence during any one season. The direct radiant heat of the sun suffices during the day to maintain a rapid melting, the results of which are of a striking character so long as they remain undisturbed by further snow-fall. Two or three climbers who have made the ascent have described a tract upon which great difficulty was experienced in threading their way amongst crowded ice-pinnacles of such sharpness that their hands were cut and torn in the attempts to traverse them, necessitating the wearing of stout leather gauntlets. Others have stated this obstacle to be imaginary or exaggerated—I have no doubt for the simple reason that on the particular occasion of their ascent the ice-pinnacles were not there. Their formation in certain seasons is due to the rapid consolidation and equally rapid melting of heavy masses of snow; and while, at one period, the continuance of fine weather may have removed them altogether, or a renewed snowfall may have covered up those already formed, at

another the arrest of the melting by cloudy weather and low temperature may retain them in the same condition for several weeks together. During the early part of November last, though unable to ascend as far as the spot, I could examine with glasses a large area of this ice-pinnacled surface on the flanks of the final cone, the whole of the steep declivity being closely studded with shining points of ice, the appearance of which in a brilliant sunlight it is impossible to illustrate by any comparison which would convey an idea of its beauty.

On the north-west side of the cone is a precipitous face of rock some 150 feet in height, where the looser material has fallen away, leaving the perpendicular wall exposed just at the foot of the snow-cap, as it was



CLIMBING POPOCATEPETL.

at the time above mentioned, when I was able to observe it from a point on the pass directly facing it. The mass of snow overhanging this cliff had developed, by partial melting, a solid curtain of icicles in front of it, which I could not estimate to be less than from 50 to 60 feet in length—another transient effect of rapidly varying temperature, the magnificence of which can hardly be described in words, and, owing to the difficulties of access to the spot, can never, I fear, be available to the photographer.

The crater of Popocatepetl lies upon the south-east inclination of the cone, and from below can only be seen from the southern parts of the state of Puebla. Its condition at present, as well as the unbroken conical structure of the whole mountain, indicates a long period of intermittent and gradually subsiding activity, which now appears to have practically ceased. Various records allude to a state of eruption

at the period of the Spanish conquest, and one outburst is said to have occurred about the commencement of the present century. Between those dates, a traveller describes the crater as containing a lake in which fish were found; but the structure of the vent enables us to dismiss this account as fabulous. It is tolerably certain that action had long ceased in the year 1846, when an ascent was made; and I am inclined to regard even the earlier statements with some doubt. The invasion of the Mexico valley by Cortez by way of the pass between Popocatepetl and Ixtacihuatl, under the circumstances of eruptive action of the former, is questionable, and would at least indicate that it was of no great violence. A minor evidence as to this came to my knowledge as recently as December last, when an Indian discovered on the flanks of the mountain one of the extensive caves which, according to the immemorial custom of the pre-conquest races, had been utilized for purposes connected with the sacrificial worship. In it were found a number of earthen vessels, and the usual clay idols, one of which, a life-sized human figure covered with a curious representation of scales resembling chain-armour, he brought down to the city. The occupation of this cave, immediately below the cone, is not likely to have occurred at any period shortly subsequent to one of severe eruption. Another trivial but curious item of evidence on the same point may perhaps be observed in the ancient local names. A small eruptive cone (now totally extinct) on the skirts of the Ajusco range, bears the name of Chikli (the "hill throwing up sparks"); while the mighty volcano dominating all the rest is only Popocani Tepetl ("the mountain that smokes"). The great ridge from which all this action originated, and the enormous lava-stream flowing from it, are known by no ancient names at all, and only preserve the recent Spanish ones of "Ajusco" and the "Pedregal." If any historical fact is indicated by this, it would seem to be that, while the main eruption and its outflow were never recognized by the ancient population as associated with volcanic energy at all, the great cone was already in a dormant and smouldering condition when its name was bestowed, and only the small lateral outbreak, occurring at a later date, gave them a glimpse of the subterranean fires. The vast quantity of scoriaceous and obsidian bombs scattered far and wide over the plains to the north-east, and of which the renowned pyramids of the sun and moon at Teotihuacan were constructed, were undoubtedly discharged from Popocatepetl. As these pyramids and the city surrounding them are held to be amongst the most ancient remains of human work in Central America, they again confirm the view that the great eruptions must have antedated the period of these names by many hundreds—if not some thousands—of years.

The gradual subsidence of volcanic disturbance along the trans-continental rift pointed out above is an extremely interesting evidence of its original continuity. Of the seven principal vents mentioned, only

one—that of Colima (which, it will be noted, is in close proximity to ocean waters) shows intermittent signs of activity at the present time. It is a familiar fact that accounts of volcanic eruptions—like those of earthquakes and floods—seldom lose much in the process of transmission from one country to another. Frequent opportunities of comparing the reports abroad either with personal observation or the accounts of local residents prove that exaggeration is the rule, and not the exception. Only a year ago statements were published in England of a violent eruption of Orizaba, which I have since ascertained to have been entirely imaginary. The same is the rule respecting the periodical



CRATER OF POPOCATEPETL.

earth-tremors in the Mexico valley, which are apt to recur annually about the close of the rainy season. The only one of any severity for many years past has been that of November, 1894, and even that was scarcely perceived by many residents in the city.

The most remarkable instance of rapid extinction on the volcanic fissure which has split the American continent at this latitude is, perhaps, that of the celebrated volcano of Jorullo, in the state of Michoacan. The sudden outbreak of this extensive vent in the midst of a plain country has been familiar by description to most of us; and its long-continued activity is still supposed by many to constitute it one of the marvels of the natural world. Until I visited the State in October last, I was entirely unaware of its complete quiescence. It was undoubtedly in full activity in, and for many years subsequent to, 1836; but my informant at Patzcuaro, a farmer whose land is on the skirts of Jorullo,

assured me that there is now scarcely a sign of subterranean heat at any point in the entire district. It must not, of course, be assumed that there can never be a re-opening of the same fissure, and fresh eruptive outbreaks on the same line. But the parallel facts in regard to these seven great vents from east to west in Mexico afford, in my view, the clearest indication that they form a continuous chain, having the same volcanic origin.

There is a yet further evidence of the probability that before the formation of this fissure the North American continent sloped towards the south from the general altitude of the Mexican plateaus to the sea-level. When the great lava-bank of Ajusco dammed up the valley of



VIEW FROM CHEPULTEPEC.

Mexico, the natural tendency of the molten mass would be to fall over towards the south side into the state of Morelos, some 2000 feet lower, so that the bulk of it would lie towards that side of the original fissure from which it rose. Hence we should expect to find that any smaller lateral eruptions, occurring later, would find their vent on the north of the ridge; and that, in fact, is precisely what has happened. Nearly all the minor cones are found within the valley of Mexico; and, after careful observation, I have as yet seen but one on the south flanks of the range, in the State of Morelos.

The dimensions of the cone of Popocatepetl have been stated, or guessed at, on many occasions, but have not, I think, been determined with much accuracy, excepting that of the altitude, which may be taken at a little over 17,800 feet. The crater is stated in one account to be 3 miles in diameter, but the absurdity of this is obvious. The

measurement at its mouth is probably about 2700 feet. The depth has been stated variously at from 1000 to 2000 feet; but it is also obvious that any attempt to sound a jagged and irregular chasm such as this, more or less choked at different points of its depth, must be futile. History relates that in the year 1522 an adventurous explorer named Francisco Montaña permitted himself to be lowered into it to a depth of 500 feet. It is to be regretted that he did not leave some record of his experiences, which thus far have little value, except, perhaps, as another indication that at that period no very violent eruptive disturbance was in progress. It is recorded, also, that a party of ten men were deputed by Cortez to make the ascent of a crater in the



ITACCIHUATL.

neighbourhood of the Mexico valley, which, it may be assumed, was that of Popocatepetl; but in this instance also the only record of interest is that the mountain was then discharging smoke. Successful ascents during the past twenty or thirty years have been not infrequent, though the failures have doubtless been far more numerous. This is due partly to the uncertainty of weather conditions, as the slightest changes in atmospheric currents from either the Atlantic or Pacific side will result in the formation of vast masses of cloud about the peak in an incredibly short time; partly, also, to the fact that the last 5000 feet of the ascent, above the limit of vegetation, must be accomplished entirely on foot; and partly, of course, to the laborious nature of the work at those altitudes.

Along the line of secondary cones east of the lake of Texcoco, in the Mexico valley, the disruption of the ancient porphyries which have been

upheaved near the volcanic belt, can be observed at several points. One of the most interesting of these is the hill of Texcotzingo, about 2 miles south of the town of Texcoco. It consists of broken masses of a porphyry identical with that of Ixtaccihuatl and the ranges to the north of the valley. The existence of this abrupt and rugged pile in its present condition at an ancient date is shown by remains of human workmanship of the earliest period in the valley of Mexico. The relics of two sacrificial temples, with colossal and grotesque idols, two long flights of stairs, a circular bath, and a square tank surmounted by the figure of a gigantic frog, all carved in the solid rock, indicate that, notwithstanding the broken and inaccessible nature of the hill, it was at one time an inhabited spot, and tradition still assigns names to the various sculptures, and a specially sacred character to the locality. Although so near the line of volcanic cones, which includes that of San Pablo, mentioned above, it is entirely external to the more recently erupted matter, and has no trace of such matter upon it. But in a deeply channelled stream-bed 300 feet below, on the south-east, is seen the oldest basaltic lava of the Ajusco series, identical with that which is found in the barrancas near Cuernavaca, in Morelos, some 10 miles south of the Ajusco ridge. In a paper on the "Western Sierra Madre," communicated to the Society last year, I mentioned an instance in Guadalajara as the only example of columnar structure in the basalts with which I was then acquainted in Mexico, and my attention was drawn to the fact that several others exist. In this cañon below Texcotzingo I found an extensive and very beautiful display of that formation. For a distance of more than 100 yards the bed of the stream itself and its precipitous banks consisted of a mass of truncated five-sided and six-sided columns, rising in ranks or steps one above another, in some places with such regularity as to give the appearance of an artificial construction. The origin of this formation, by the gradual contraction of the rock, or rather the release from compression, acting equally in all directions, seems singularly evident in this case. In illustration of it on a smaller scale, I may mention an extremely curious instance which came under my notice in August last, in one of the "Dry Lake" desert valleys of South Nevada. On the level of these valleys an area of several square miles is sometimes occupied by a shallow lake-bed, covered with only a few inches of water during the rains, and in the summer perfectly dry and devoid of all vegetation. The sandy mud of which this floor is composed, owing to the long distance from which it has been gradually washed, and the complete mixture of its materials, is of a perfectly homogeneous consistency over large areas, and becomes so solid under the fiery sun of the summer that a carriage and horses driven across it will scarcely leave a track. At certain points where the last remaining moisture is evaporated, the contraction following upon this baking action produces the cracked surface familiar to every one. Where all

the conditions of material, temperature, level, and evaporation are perfectly uniform, the strain of this contraction operates with absolute equality in all directions, and with most curious results. In the case I refer to, the lake-floor over which I was driving appeared for a considerable distance exactly as if paved with hexagonal tiles, of perfectly equal size, and laid about three-quarters of an inch apart, the hexagons being about 6 inches in diameter. Wherever any of the above conditions became less uniform, the cracking became less symmetrical; but over some portions the appearance was such as must have attracted the least observant eye. At the same time the conclusion as to the identity of



SUNSET ON IXTACCIHUATL.

this action with that which, by a slower but similar process, produces basaltic columns, seems inevitable.

Another singular instance of an angular structure resulting from natural causes, though far different from the above, and less easy to explain, is to be noted in the formation of certain volcanic craters; and I found an interesting example of it in that of San Pablo, near Los Reyes, in the Mexico valley. The mouth or lip of this crater is neither circular nor oval, but distinctly five-sided. The ridge is not level, but its angles are marked by five peaks, or rounded elevations with depressions between each, having the outline of a festoon from one to another. I have noticed this formation in other craters elsewhere (but not of the same symmetry), and have attributed it to the changes of wind during the eruptive action driving the ejected material to one side or another; but the case of San Pablo does not seem to me so easily accounted for in this way, as the five elevated points are all of more or

less solid scoriaceous rock, and not of loose cinder. I am unable, however, at present to suggest any other reasons for this peculiar structure.

While making my way over the 4 or 5 miles of exceedingly rugged lava which has flowed from this cone to Los Reyes, I was again much struck with a certain mechanical process which I have more than once suggested as the origin of the loose-boulder pyramids on which it was so frequently the habit of the ancient Mexicans to erect their sacrificial temples, or "teocallis." It is difficult in most cases to suppose that any original design led them to undertake the enormous labour of raising the great pyramids and mounds with this small material.

Owing to the fertility of the decomposing lava, every opportunity has been taken on the San Pablo stream to clear and plant plots of ground amongst the rocks, wherever there is the least chance of so doing. These plots are naturally made square, or as nearly so as the surface will admit, and in clearing them the small boulders and stones are deposited in a heap at the nearest convenient spot. As the adjoining square plots increase in number around this spot, it becomes by common consent the depository of loose stones, and is also approximately square. Even as it increases in height, and the stones have to be carried up its sides, the labour is less than that of conveying them a long distance. Thus commences the construction of what may be described as an unintentional pyramid, which in the course of years may assume very large dimensions. It is easy to suppose that in early ages this may eventually have suggested its completion for the purpose of rearing on its summit a temple devoted to the worship of that sun to which the success of all this toil in cultivation was primarily due. On the lava-stream of San Pablo I found two or three such undesigned pyramids actually in course of construction, though doubtless they will never now be devoted to that object.

One can hardly dismiss the subject of Popocatepetl and its colossal neighbour Ixtaccihuatl without some reference to the impression created by the scenic aspect of these magnificent snow-summits under favourable circumstances. It would be hard, I think, to discover in the world a scene more sublime than is presented for an hour before and after sunset, from the terrace of the "Holy Mount" of Amecameca, facing the two great mountains. It is one for the enjoyment of which neither scientific nor technical knowledge is needed; and few who have witnessed it can recall it without an afterthought that for that one sight alone life has been worth living.

Before the reading of the paper, the PRESIDENT said: We had the pleasure last year of listening to a paper by Mr. Howarth on the Sierra Madre of Mexico. This evening he is going to give us what will be, I think, a very interesting account of Popocatepetl and the volcanoes of the valley of Mexico. I will now ask him to read his paper.

After the reading of the paper, the following discussion took place:—

Mr. WILFRID AMOR: First of all, I have to offer my thanks to Mr. Howarth for his address. As regards the theory of the formation of the valley, I think there can be no doubt about it that the general idea of Mr. Howarth is perfectly correct. Nevertheless, I believe that there is some importance to be attached to the general fact that these valleys of Toluco, Mexico, and Puebla, and the valley of Morelia still further to the west, lie parallel to each other, and to the ridges between them, and are longer in the north and south direction than in the east and west. That seems to point out, I think, to their being formed by the crumpling up of the surface of the Earth in a general direction parallel to the Sierra Madre, Rocky mountains, and the Andes. A very interesting point is the question of the age of the rocks. He has pointed out that on the north and west of the valley of Mexico they belong to the older formations, whereas on the eastern and southern boundaries they belong to the Tertiary, or more modern formations; that might perhaps militate against the idea of all the valleys being formed by the folding and wrinkling of the surface. But I think, considering it a little more carefully, the antagonism will only appear to be superficial, because the masses of rock will be thrown out on the line of least resistance, and the cone of Popocatepetl would be, as Mr. Howarth pointed out, one of the more recent ones. Mr. Howarth has remarked that Ixtaccihuatl and Popocatepetl are both called volcanoes. It is only an instance out of many in which the original words in Mexico have lost their true meaning. To the average Mexican in Mexico, "volcano" means "a snow-capped mountain" more than a vent of volcanic action. Thus the mountain of Colima is known as Volcan de Fuego, others are called volcanoes. Another interesting point is, that the crater is inclined towards Atlixco, and the inclination, in so large an opening, deludes those who ascend the mountain into the belief that they have reached the summit when they have attained the lower lip and look over into the crater, whereas there still remains a long climb. With regard to the nature of the soil in the valley of Mexico, there are some remarkable points which I don't think have been put on record before. One is the extreme lightness of the soil of which the valley is composed. I had occasion to have a cubic foot weighed on several occasions in different parts of the valley, and it was found that at from 1 to 5 metres in depth, the weight of 1 cubic foot was 73 lbs., and only 57 lbs. when dry. It shrank about one-eighth of its volume; so really the specific gravity was practically the same as water, between 62 and 64 lbs. At 5 metres' depth, the weight of the material was only 47 lbs., which is lighter than water, and it shrank 5½ inches in depth over the whole cubic foot, very nearly one-half, and then the weight of the remainder was 21 lbs., which would make the cubic foot a little less than 40 lbs., two-thirds of the weight of water. This material extends to the depth of about 60 metres, as has been found out by sinking artesian wells. It is well known that the earthquakes or earth-tremors were very frequent and severe in the valley of Mexico before twenty-five years ago. They have become very much less frequent and very much less serious ever since artesian wells were sunk in the valley. Finally, I have in my hand a rather curious specimen. It is an egg that was found at a depth of 4½ metres in the valley of Mexico. I don't profess to know what species it belongs to; it is not a fossil, but it was found with four others, three of which were sucked by the Indians who discovered them, and it was perfectly full of liquid at the time and very heavy. Now it feels more as if it had been blown; but, as will be seen, it has no pin-holes. The moisture gradually evaporated in that very dry climate. The remarkable fact is that the egg was found at a depth of 4½ metres, and at a depth of 1 metre there is throughout the valley a hard layer of marl, of varying hardness and

thickness, from 6 to 18 inches, and the hardness is such that in some places it requires a pick to dig it out, while at other places it crumbles in the hand. In general it is very hard. This egg was found 2 or 3 metres below that hard layer. At a point not 20 kilometres from where this egg was found, above the marl, there has been discovered the perfect skull of a mastodon, besides other remains. Now, that would indicate that this egg was laid long before the mastodons had left the neighbourhood, and I believe the species still exists from which this egg came. Its age I leave wiser heads than mine to discuss.

Father JOHN GERARD: I am afraid I cannot say anything on my own authority about the egg, but I took it down to Mr. Bowdler-Sharpe, and, after some investigation, we came to the conclusion that it is the egg of the *Pelicanus erythrorhynchus Americanus*. The American pelican is still extant, but, it would seem, was in existence before the mastodon became extinct. The appearance of the egg tends to show that it was originally laid in a salt marsh, and I fancy the saline liquid found in the egg was water from that salt marsh. Mr. Amor mentioned to me, that as it evaporated it did so with a hissing sound, which he heard in the drawer in which it was kept. It can scarcely have been the original yolk and white which the Indians sucked.

Mr. GEORGE T. PRIOR: As Mr. Howarth has been good enough to place under our keeping at the Natural History Museum many of the rock specimens which he collected in Mexico, I need scarcely say that I have listened with great interest to the paper to-night, in which he describes the geographical features of the country from which those specimens came. As I have never had an opportunity myself of visiting Mexico, the few remarks I should like to make must be purely from the museum point of view, and rather of petrological than geographical interest. First, by way of mild criticism, I cannot help thinking that Mr. Howarth is inclined to lay just a little too much stress upon the differences in outward aspect which he noted in the field between what he calls the older porphyries and the more recent lavas. From an examination of the hand specimens which we have at the Museum, I cannot help concluding that the so-called porphyries are lavas, equally with those of Popocatepetl. As Mr. Howarth has pointed out, they certainly present striking differences in outward aspect, but they both belong to that type of igneous rock, to which the name of andesite has been given, owing to its prevalence in the Andes. They differ, however, so far in chemical composition that the lavas of Popocatepetl are more basic, dark, and somewhat glassy hypersthene-andesites; while the lavas of Ixtaccihuatl are lighter and more porphyritic, horn-blende andesites. Of course, I cannot say anything as to the relative ages of these two lavas. Mr. Howarth may perhaps be able to give us a little more information on that point. The ridge-like appearance of Ixtaccihuatl, and the absence of any definite crater, suggest that its lavas may possibly have been erupted by a quiet fissure eruption, somewhat similar to that which gave rise to the enormous lava-flow from Huasco, described by Mr. Howarth. In this connection, it may be of some interest to mention that in earlier stages of the Earth's history there have been flows of lava beside which this Huasco flow sinks into insignificance; for example, the Deccan basalts of India attain a thickness of about 4000 feet, and are estimated to cover an area of 200,000 square miles. Before I sit down, I should like to say that at the Museum we owe a debt of gratitude to Mr. Howarth for the great trouble he must have taken in collecting and bringing home the excellent specimens which are now deposited in the Museum. I shall be only too glad to show them to anybody who may be induced by the interesting paper which we have listened to to-night to come and see them.

The PRESIDENT: We have to thank Mr. Howarth for an exceedingly instructive-

paper, suggesting a great number of very interesting points, but I wish, before proposing a vote of thanks to Mr. Howarth, to make a few remarks on the subject of the first recorded eruption of the great volcano of Popocatepetl. I understood Mr. Howarth to say that an actual eruption of fire and red-hot stone had not taken place for many hundreds of years. Now, that charming old writer, Bernal Diaz, a soldier in the army of Cortes, describes with great minuteness the eruption the Spaniards saw from a short distance, when marching to Mexico. He says, "A great column of smoke rose straight into the air to a considerable height, and then spread out as a large cloud." But he also says, "With this smoke there was to be seen flame in various directions, red-hot stones being thrown up in great quantities and with violent explosions. The people," he says, "were terrified, not at the smoke, which was of very common occurrence, but at the flames and red-hot missiles flying out of the crater, which they had never seen or heard of before. They believed that the tyrants who had been cruel to them were being roasted in that volcano, and consequently they were horrified when they beheld these fiery tyrants flying out of the crater and spreading over the earth." When Diego Ordaz, a companion of Diaz, volunteered to examine the crater, the Indians whom he asked to come with him positively refused to go beyond a certain place, which they called the cave of their gods. There they stopped, while Diaz and his companions pushed on. When they got near they felt most violent tremors of the earth, accompanied by a pouring out of flame and missiles, and they hid themselves or sheltered themselves from its violence in some of the crevices of the rocks; but when this lulled they pressed onwards, and did reach the lip of the crater, looked down, and saw a mass of fire below, and it is particularly interesting that when they returned to Cortes with a report of this eruption, they brought with them some of those great icicles which Mr. Howarth has described. Now, with regard to the second ascent ordered by Cortes, which was conducted by Montano, we must recollect that Montano, so far as we know, never said he was lowered down 500 feet. The only person who said so was Don Antonio Herrera. If Montano said that he was lowered down 5 feet, Herrera would be quite likely to say that he was lowered 500 feet. I can see nothing extraordinary in the fact that, when ordered to collect sulphur, they may have been lowered down in a basket to scrape the inner surface. Bernal Diaz further mentions that there was a second great eruption twenty years afterwards, in 1539. I will not detain you longer with further remarks, but I am sure that the meeting will wish me to return most cordial thanks to Mr. Howarth for his interesting paper, and for the way in which he has illustrated it, and especially for showing us that gigantic tree at Oajaca, although, as he said, it has nothing to do with the volcano of Popocatepetl.

THE CENTRAL CAUCASUS.*

FROM time to time, while Mr. Douglas W. Freshfield was engaged in opening the Caucasus to European mountaineers, he has communicated to the Royal Geographical Society reports of his journeys, which have appeared in the Society's monthly publication; and his first visit was treated at greater length in 'Travels in the Central Caucasus and Bashan,' published twenty-seven years ago. Now when the fruit of his sowing has to a large extent been gathered in, and when relief from

* 'The Exploration of the Caucasus.' By Douglas W. Freshfield. With illustrations by Vittorio Sella. London: Edward Arnold, 1896. 2 vols. Maps and plates.

the many official ties which bound him to the science of geography and the sport of mountaineering has been earned for a time, Mr. Freshfield has brought together the material for two monumental volumes, which are placed before the public in a form more splendid than any other book of recent travel can boast.

The refined and scholarly literary style of the text is Mr. Freshfield's own; the illustrations of unexampled beauty are transmitted direct from Nature through Signor Sella, whose name deservedly shares the title-page, and the skilful German photo-engravers who have reproduced them, enhanced in clearness, if that be possible, and disfigured by no trace of retouching or "artistic improvement." With these photographs and the new map of the Caucasus, drawn by Mr. Reeves, the reader is more nearly in the position of an actual traveller than the reader of a book of travel ever was before. To study one of the long panoramas in conjunction with the map is to seem to see the mountain system itself, with its forests, rocks, and snows, its lofty passes and deep-cut valleys, tenanted by the strange remnants of peoples who make their last stand there against the inevitable absorption into Europe.

While the illustrations are beautiful in themselves, and form a gallery of mountain pictures which it is a pleasure for the least instructed to pore over, their chief value lies in the fact that they are in the truest sense illustrations, supplementing the written description, and enabling it to tell its story with additional effect.

The design of the book is thus stated in the preface, after reference to the varied sources of the work: "In these volumes I have endeavoured to bring together some of this miscellaneous matter, and to make my chapters such a series of sketches of the Central Caucasus, its scenery and its people, as may stir pleasurable memories, or anticipations, among travellers, and also interest that great body of readers who love mountains and like to hear about their exploration. The arrangement of the book is in the main topographical; that is to say, I have abandoned chronological order and continuity in the narrative of particular journeys, in order to bring together the facts concerning each district, or portion of the chain, into single or consecutive chapters. The method has its drawbacks; but on the whole these have seemed to me, in the present instance, to be more than counterbalanced by its advantages. The record of adventure may be less vivid, but the pictures of the country and its people should gain in definiteness, and it ought to be easier to select characteristic facts from among trivial details."

The contents of the work are divided into chapters, each of which has some special interest of its own. In the first, on the discoverers of the Caucasus, the curious errors which long clung even to geographical writers on this range are exposed and criticized with no little humour, and with a sensation of sarcasm held in check. The belief generally

held up to thirty years ago, and often expressed since, that there are no glaciers in the Caucasus, gives occasion to some caustic remarks on the fatuity of scientists; but Mr. Freshfield is careful to explain that in his use of the term *scientist* bears the same relation to *man of science* as *poetaster* does to *poet*. The story of how the Russian surveyors were induced, by the action of English climbers, to extend their survey to the snow and ice-covered regions of the chain, brings into prominence one of those instances in which geography, perhaps even geodesy, has been directly advanced by the influence of mountaineers. The second chapter summarizes the characteristics of the Caucasus as a chain, dwelling on the important fact, so often lost sight of, that the watershed does not in all cases correspond with the axis of greatest height, and pointing out how the scenery varies in response to the change of geological structure from north to south across the chain, and how the transverse gorges are cleft clear through all the formations right down to the roots of the mountain. The area and length of the glaciers, as measured on the new Caucasian survey maps, show that the greater glaciers have, as a rule, a larger area in proportion to their length than those of the Alps, while in length only the Aletsch glacier of the Alps exceeds those of the Caucasus.

Of all features in which the Caucasus asserts its supremacy over the mountains of Western Europe, its remarkable vegetation comes first. For colour and quantity, for size and splendour, the flowers of the lower valleys are unequalled in the temperate zone, and the close contrast of blossom and snow-field inspires many passages of gorgeous description.

A third introductory chapter on Caucasian history and travel leads on to the detailed description of the several regions into which the Central Caucasus is naturally divided. Kasbek, a "solitary classical mountain," the first great summit scaled by Mr. Freshfield in 1868, to the incredulity of the Russians who welcomed his descent, appropriately takes the first place; but the description of the Ossete region in which it lies possesses a value far above that usually attained by stories of a first ascent. The Mamison pass and Gebi, the Adai Khokh group, the valley of the Uruk, Balkar and Bezingi are passed in picturesque review, and a series of fascinating chapters follows with the description of Suanetia. Nowhere else has so remarkable a community been preserved intact in the strong rooms of the mountains until the latter part of the nineteenth century as here in Free Suanetia. Now the valley is, under Russian discipline, yielding to the conventionalities of Western civilization; but when the small party of English mountaineers dropped into it from the outer world nearly thirty years ago, it was as fresh and wonderful to them as they were to the picturesque banditti dwelling in towers along the Ingur. Of the mountain summits which guard the head of this wonderful valley, these volumes tell us much, of Ushba and Shkara, whose stately forms are depicted in every variety of atmospheric

condition, and of Tetnuld, the ascent of which is described in a chapter by itself. It was during his visit to the Caucasus in 1887 that Mr. Freshfield made the pioneer ascent of "the gigantic pyramid of Tetnuld." With this mountaineering triumph the first volume ends.

The second volume describes many peaks and valleys, but several of the records are from the pens of fellow-mountaineers, and the necessary change of literary style somewhat mars the unity and homogeneity of the work. Thus the exploration of Dykhtau and Katuintau is described by Mr. H. W. Holder; that of Shkara, Janga, and Ushba, by Mr. J. G. Cockin; the ascent of Koshtantau, by Mr. Hermann Woolley; and the sources of the Kuban, by M. Morice de Déchy.

The chapter of deepest human interest is unquestionably that entitled "Search and Travel in 1889," which recalls the sad fate of Messrs. Donkin and Fox, and recounts the journey of search which Mr. Freshfield and Mr. Dent undertook in order to clear up the mystery surrounding the disappearance of those climbers. It was with a satisfaction which all who read of the natives of the Caucasus in this book will share, that the searchers found indisputable proof of the fatality having been a pure accident, and so cleared the people of the Caucasus from the suspicion of having murdered the strangers.

A chapter on the solitude of Abkhasia concludes the book; and it gives an opportunity for some excellent advice to climbers not to degenerate into gymnasts, but to make full use of their opportunities in mountain exploration, not for observation only, but for contemplation as well.

As Appendix A, Professor Bonney gives a valuable "Physical History of the Caucasus," giving a complete summary of the geology of the range, illustrated by a geological map. In Appendix B there are lists of the peaks and passes along fourteen routes, with distances and particulars as to resting-places, and notes on previous climbs. Appendix C contains some meteorological statistics for 1890, which would be of greater value if the figures had in all cases been means of several years; D gives some statistics as to Caucasian glaciers; E contains notes on the maps and illustrations; and, finally, Appendix F is a brief list of the more important books relating to the range.

One feature in the binding of the volumes must be noticed with special approval. It is the manner of carrying the large folding map in a recess of the cover, which is much more convenient and less unsightly than the plan of placing the map in a pocket or under a strap of paper. The printing of the process-blocks is, like that of the photo-gravures, exceptionally successful.

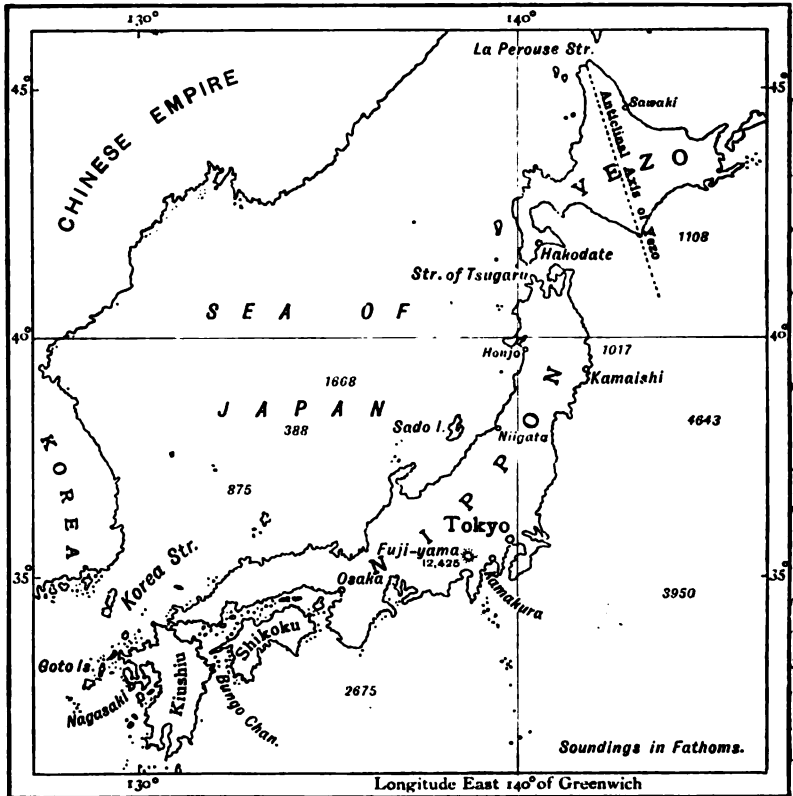
THE GREAT SEA-WAVES IN JAPAN.

By Professor JOHN MILNE, F.R.S.

JAPAN, in her recent war with China, lost some 5000 soldiers. In 1891 an earthquake originating in the central provinces resulted in the death of about 10,000 of her people. Now we learn that on June 17 the north-eastern shores of this same country has been devastated by huge sea-waves, and 27,000 lives have been sacrificed to swell the list of those who in previous years perished in like manner. To the south of the devastated region, nestling amongst sand-dunes and crooked pines, is the village of Kamakura, which in ancient times was a Shōgun's home, the capital of the empire, with a population estimated at a million. Often was this city sacked and laid in ashes, but the most terrible disasters to which it was subjected, and which eventually resulted in its abandonment, were earthquakes and great sea-waves, which, for example, in 1293 carried away 30,000 of its inhabitants. All that remains to attest to the former glory of this ancient capital is the huge bronze Buddha, so well known to all who sojourn in Japan, which yet sits upon its massive pedestal and with its calm eyes of gold looks out upon the broad Pacific, the home of the sea-god which has so often created devastation round its feet.

To the south of Kamakura we come to the coasts of Shikoku and great cities like Kochi in Tosa and Osaka, the histories of which are filled with stories of similar disasters. In 1703 we read that on the coasts of Awa the number of those who lost their lives exceeded 100,000. Without multiplying instances of these great catastrophes, more terrible in their results than war, a glance at the localities where they have occurred shows that they have been without exception confined to the eastern seaboard, where the land suddenly sweeps downwards beneath the deep Pacific. Along the line of this submarine slope, which forms one of the largest and sharpest contours on the surface of our Earth, earthquakes are frequent, and from a study of these we are led to the conclusion that if a monocline is the home of faults, it is also the birth-place of the seismic disturbances, violent shakings accompanying which are so often felt along the coast. It seems probable that in a north-west to south-east direction this mighty fold is intersected by a puckering which is the submarine continuation of the anticline forming the backbone of Yezo. From the times at which shocks have been noted at different points along the eastern seaboard of Japan, arriving first at harbours along the shores which have been recently inundated, and later at places lying farther to the south, approximate determinations of the positions from which these have emanated have been made, and we are led to the conclusion that the Yezo anticline is yet in process of construction, and a submarine range of mountains may be slowly growing upwards.

The dress which mother Earth is slowly drawing round her shrinking body is composed of stiff materials, and as she takes in a seam or gathers in a tuck, this often happens with an angry rend. The extent to which rocks will bend is limited, and if the forces causing bending continue to operate, it is followed by a sudden fracture. The earthquake of 1891 was the result of a fracture perhaps 60 miles in length, the result of which was that the country, which included lines of mountains on one side of this, suddenly fell downwards, relatively to all upon the



other side. The sudden displacement and subsequent settlement of this material caused the shakings which in that year destroyed two of the most fertile provinces in Central Japan. If we transfer these conditions to a line on the face of the Pacific monocline, and imagine that on June 17 bradyseismical folding exceeded the limits of elasticity, that this was followed by a gigantic fracture and large displacements in the rocky crust, even if these were only half of those which we can see to have happened in Central Japan, it seems reasonable to suppose that such violent changes would be sufficient to cause not only a mighty earthquake, but also a great disturbance in the waters.

That great earthquakes with a submarine origin have been accompanied by sudden changes in the form of an ocean bed is well known to those who, like Mr. W. G. Forster, of Zante, have had the charge of submarine cables near earthquake regions. A great earthquake has occurred, a cable has been broken at two points, and between these points soundings have shown that there has been so great an increase in depth, that, rather than attempting to lay a new cable along the old line, a line has been chosen round the site of the disturbances.

From these remarks, it must not be assumed that all sea-waves are the announcement that changes which are usually too slow to be apparent in a lifetime have taken place suddenly, because we have abundant evidence to show that they have sometimes resulted from submarine landslips, and often from volcanic explosions. The sea-wave which in 1883, which was the year of the red sunsets, inundated the coasts of Java and Sumatra, causing a loss of 36,000 lives, originated in the latter manner, as also did the Peruvian waves of 1868 and 1877, the effects of both of which were felt upon the coast about which we particularly write.

The reason that we incline to the belief that the Japan disaster was of a seismic rather than volcanic origin, rests on the fact that its origin appears to have been near to origins from which destructive earthquakes have often been recorded; that the contour of the sub-oceanic crust off the north-east coast of Japan is one where sudden yieldings might be expected; and, lastly, upon a piece of information which, to those who have not closely followed the developments of seismology, may appear both strange and wonderful.

In the Isle of Wight, at the little village of Shide, an exceedingly delicate seismograph has been established, which day and night photographs the slightest movements in the pier on which it stands. The installation is so located that it is not interfered with by vibrations produced by railway traffic and other artificial disturbances. A little after 9 o'clock on the night of June 29 this instrument was suddenly disturbed, showing at least five maxima of motion during the next hour. This was the record of an earthquake which had taken place in Cyprus, about which we read a brief telegraphic notice in the papers on the following morning.

As to whether the Japan disturbance sent an earth-message to Europe we are doubtful. If the destruction in that country occurred on June 17, as telegrams inform us, the answer, so far as we yet know, is negative, and therefore the sea-waves of Japan were not accompanied by any extraordinary earth-shaking; but if the disaster happened on the day previously, then earth-messages of a very distinct character were received in Europe. The first announcement reached the Isle of Wight and in Italy on the evening of June 15, while in the latter country messages were pronounced at about five and nine in Japan time on

the following morning.* On this day, therefore, it is certain that tremors announcing a great convulsion were passing round, and possibly *through* our Earth, whilst telegrams tell us that on the following day there had been a great disaster in Japan. Whether these refer to the same or to different catastrophes, it is not yet possible for us to decide. Assuming the substance of the telegram to be correct, what we do know is, that a sea-coast has been devastated, 27,000 lives have been lost, whilst 8000 destitute and wounded survivors remain to tell the story of a national calamity.

By her contributions to art, Japan has given pleasure to the world; the gentle manners of her people, her victories, and her progress have called forth the praise and admiration of all nations; and now, in the time of affliction, she seeks that sympathy which it is within the power of every one to offer.

Since the above was written, the following information has been received:—

“It seems clear that the wave originated at a short distance from the Japan coast, which here tends in a north-easterly direction from the northern port of Sendai, halfway between Tokio and the island of Yezo or Hokkaido. Some displacement of the ocean bed about the southern edge of the great Tuscarora Deep probably caused a disturbance, the western section of which, in the form of a sea-wave, 80 feet in height at some points, impinged upon an extent of coast-line some 300 miles from the south-west to north-east. The far-famed Matsushima Archipelago, the exquisite scenery of which is yearly visited by many foreigners, lay just outside the southern limits of the wave, but to the north all is now ruin. From Kinkasan, the northern island of the archipelago, the coast is fiord-like in character, abrupt mountain ridges run down almost to the water's edge, and in the bays and estuaries that interrupt the shoreline several important towns and many fishing hamlets were situated. With a few exceptions these have been destroyed—notably the town of Kumaishi, 10 miles distant from the iron-mines of that name, of whose 6000 inhabitants very few survive.”

The above extract shows the reliability of seismographic records. Although newspapers told us that on June 17 there had been great sea-waves in Japan, instruments in Europe indicated that on that day the earth was at rest, but that there had been violent movements commencing some two days previously. The surmise was that there had been errors in the telegraphic information, and that this was so and that the seismographs were correct is now established. We have here one good illustration of the benefits which might be derived if a geodynamic observatory were established in the British Islands.

* The reason that no records were obtained at Shide on this morning was, that on that day the instrument was dismantled for adjustment similar to those of an instrument which, by kind permission of Mr. A. Harbottle Escourt, the deputy-governor of the island, was then being installed at Carisbrooke Castle.

THE CENTRAL ASIAN EXPEDITION OF CAPTAIN ROBOROVSKY AND LIEUT. KOZLOFF.

THE work of exploration of Central Asia, prosecuted for years in succession by the late Prjevalsky, was not abandoned by the Russian Geographical Society after his death. In the years 1889-90 a new "Tibet Expedition" was sent out under General Pevtsoff, and it included the two habitual companions of Prjevalsky's last journeys, Captain Roborovsky and Lieut. Kozloff, as well as a geologist, K. Bogdanovich. This expedition went from Zaisan southwards, crossing the Tarbagatai region, the Eastern Tian-shan, and then, following the western boundaries of the Hashun Gobi desert, it reached and crossed the border range of North Tibet, the Altyn-tagh, penetrating into the highlands of Tibet as far as the 38th degree of north latitude in the meridian of Lob-nor. Thence the expedition went westwards, along the northern foot of the Altyn-tagh border range, which was explored during several excursions directed southwards, and then it returned to Russian Turkistan *via* Khotan, Yarkand, and Kashgar. Two volumes of reports, accompanied by an excellent map (67 miles to the inch) and detailed geological maps, were the result of this expedition.

In the ~~spring~~ 1894 a new expedition was equipped, with the same purpose. Roborovsky and Kozloff were again members of that expedition, the leadership of which was placed in the experienced hands of Roborovsky, whose acquaintance with Central Asia dates from 1879. A teacher of natural sciences, Ladyghin; a preparer of zoological specimens, Kurilovich; and six Cossacks and noncommissioned officers, mostly also members of previous expeditions, joined the two indefatigable travellers. The aim of the new move was to proceed from Russian Turkistan south-eastwards, and to explore and to map, first the Nan-shan highlands, explored at the same time by the geologist, Obrucheff, and then to penetrate, so far as possible, into the highlands of the upper Hwang-ho, into the outskirts of which Prjevalsky had made two incursions. At the same time, it was intended to explore, and to determine, by means of barometrical observations covering a considerable lapse of time, the altitude of, the remarkable Lukchun depression, which, as had been discovered by the brothers Grum Grijimailo, lies below the level of the ocean, although it is surrounded by high plateaus and mountains.

This last task, and especially the much more difficult task of a detailed exploration of the Nan-shan highlands, were admirably accomplished by Roborovsky and Kozloff. Following Prjevalsky's method, the expedition chose stations (at Lukchun, Sa-chu, in the north of the Nan-shan, and Kurlik, in the south of the same highlands), leaving there M. Ladyghin and some of the men, while Roborovsky and Kozloff, accompanied by one or two only of their travelling companions, and often without a guide, with no more than one or two camels besides their riding-horses, undertook excursions in the surrounding mountains and deserts. Several such reconnoitring expeditions were undertaken in the midst of terrible winter, such as reigns at altitudes of from 10,000 to 14,000 feet amidst high snow-clad mountains. By means of such excursions, each of which was equivalent to a good journey—400 to 500 miles being covered and surveyed each time—Roborovsky and Kozloff succeeded in exploring in detail immense tracts of unbroken land. But the privations of the winter journeys told upon the health of Roborovsky; and when the expedition, making its last move south-eastwards, was at the foot of the Amnemachin snow-clad mountains, beyond which the bend of the Yellow river lies, Roborovsky was overtaken by a stroke of paralysis, from which he has not quite recovered, and the expedition, surrounded by gangs of Tangut robbers, had to return—a circumstance which the Tangut riders took advantage of at once by attacking it. The

party thus returned to Kurlik, then to Sa-chu, and thence, *viâ* Dzungaria, to the Russian town Prjevalsk, on the lake Issik-kul, after having been out from August, 1893, to December, 1895.

The routes of the expedition can be best followed on the map which accompanies Prjevalsky's last journey, while its exploration of the Nan-shan is best seen on the map of this region which is given in the last number of the *Izvestia* of the Russian Geographical Society (1895, fascicule 5). Both Roborovsky and Kozloff wrote, during their journeys, long letters to the Russian general staff and to the Russian Geographical Society; and these letters, in which Kozloff gave splendid descriptions of the nature and fauna of the regions visited, were partly printed first in the St. Petersburg military paper *Russkiy Invalid*, and then reproduced in full in the *Izvestia* for the years 1894 and 1895.

In the following condensed record, separate headings are given, which will render it easier for the reader to follow Roborovsky and Kozloff in their two years' travels. Their reports concerning the exploration of the Nan-shan have been somewhat shortened, as their work will be better understood when it is taken together with the geological explorations of the same highlands made by Obrucheff. The Russian geologist's sketch-map will also give a better general idea of the structure of the various ridges and valleys of which these highlands, rather monotonous in their physical characters, are composed.

From the Russian Frontier to Lukchun.

The expedition left the Russian frontier on August 8, 1893,* at the hamlet Okhotnichiy (Hunters'), east of Lake Issik-kul, its primary intention being to cross the Khan-Tengri mountains on its way south-eastwards. They soon had, however, to abandon this plan, and move towards the Yulduz plateau (on the Haidu river, tributary of Bagrach-kul) by following the Tekes. This river, as is known, is separated from the Yulduz by high snow-clad chains which run east-north-east and may be considered as a continuation of the Khan-Tengri chain.

The valley of the Tekes, peopled by Olyut Kalmuks, who carry on some agriculture and trade in cattle with Kashgaria and Kulja, is very attractive, owing to its rich vegetation. But the explorers had soon to leave it and to enter the mountain region; they followed first the Koku, a tributary of the Tekes, and next crossed the two parallel snow and glacier-clad chains. The two passes across the two chains (Mukhurdai, 12,000 feet, and Sari-tyur, 11,000 feet) offered no difficulties, especially the second. Beautiful glaciers descended on all sides, surrounded by old moraines, and tempting the travellers by the easiness of access to the frozen ice-streams. Then a third pass, quite smooth and flat, covered with a marshy meadow vegetation, and only 10,000 feet high, brought the travellers to the Yulduz plateau.

The Great and Small Yulduz plateaus, 8000 feet above the sea, are the bottom of an Alpine lake. High mountains, all snow-clad, surround them on all sides. The Khaidik river (also Haidu-gol) pierced at last the 12,000-foot-high mountains in the south-east, and emptied the lake; it now flows through a gorge 5000 feet deep, while the bottom of the old lake is covered with a comparatively varied vegetation and with rich meadows of steppe grasses, and is inhabited by a great number of stags, argalis, roe-bucks, boars, wolves, and foxes—the latter being renowned for their soft and thick fur—as well as by countless aquatic birds nesting in the ponds and marshes.

* All the dates in the following are given in the New Style.

Turgut Mongols, who came some two hundred years ago from Russia, have taken possession of the Yulduz. They have protected themselves from the Kashgarians by rendering impracticable the three passes which lead across the high Kok-tepe mountains towards the south-west, and they receive only the Dungan and Sart merchants, whom they know. Four very easy passes open a communication towards the north-west, across the snow-clad Narat mountains. The Yulduz Mongols are governed by their own khan, and hate the Chinese, whom they accuse of having poisoned two of their khans. Their numerous herds of sheep and their excellent horses prosper at this height, where no torrid heat is known in the summer, while the western winds keep off the insects.

Through a Buddhist priest who knew and liked Prjevalsky, and who had been called in by the Yulduz Mongols to pray for their delivery from a throat disease, Roborovsky and Kozloff obtained the necessary guides—the latter for a journey to Kucha, in Kashgaria, and the former for continuing his journey south-eastwards, to Karashar and Lake Bagrach-kul, or Denghiz.

The expedition went down the Khaidik-gol, accompanied in the most friendly way by the Mongols, who saw in them friends of their priest. But, the bed of the river being soon narrowed by the crags, they had to leave it and to travel on the ravine-cut plateau, into which the river dug its bed; and well it deserved, in the next 60 miles, its name of "Seventy passes" (Dalin-daban), as the route had continually to cross the several-thousand-feet-deep ravines cut in the 10,000 to 11,000-foot-high plateau, composed of various slates. But, the land gently sloping westward, they soon came to a more open region, of red sandstones, conglomerates, and slates; and on a tributary of the Khaidik-gol (Tsagan-usu) they found a stone wall which once crossed the 5-mile-broad valley, and served to protect, three centuries ago, the Mongols against the raids of the Dzungarians. Turguts from the Yulduz stay here in the winter, while some of the poorer ones are settled permanently, and grow some millet, wheat, barley, and flax, as also some water-melons, melons, and vegetables. Many ruins, dating from the Dungan rising, covered the wide, flat, and fertile country—a former bottom of Lake Bagrach, or Bagrach-kul.

The expedition, however, did not follow the usual route which leads from Karashar to Turfan. After having been rejoined by Kozloff, they went northwards and then south-east, in order to explore the narrow valley of the Algo river. They reached the Lukchun depression at Toksun on October 5, and then they went by different routes to Lukchun.

The Lukchun Depression.

This remarkable depression was made, for the next two years, a sort of basis for the expedition, and a meteorological station was installed in it at Lukchun. It covers nearly 100 miles from west to east, and from 50 to 55 miles from the southern foot of the Eastern Tian-shan to the Chol-tagh range. Its exact level cannot, of course, be determined with full certitude so long as no geometrical levelling has been made; but the two years' observations of the barometer show that its level is, beyond doubt, extremely low. It seems to be no less than 150 feet below the level of the ocean at Lukchun, and 330 feet at the little salt lake Bojaite. Its south-eastern part is now a true desert covered with salt clay and gravel, but numerous burial-mounds, all plundered by this time, testify of its former inhabitants and their wealth in gold. Its western part is watered by the water drawn out of the soil by means of the usual *kerises*. Many ruins are scattered in the neighbourhood: the fort of Assa-shari, another near Turfan, the

sand-buried ruins of Hosh-dyun, the old town Idigot, surrounded by a wall over 30 feet high, and containing many buildings and temples, now in ruins, and so on.

The population, governed by a Chinese functionary who resides at Turfan, is composed of Musulmans of Turkish origin, some Dungans, and some Chinese. They grow millet, winter wheat, some barley, cotton-trees which give excellent cotton, tobacco, melons, and vegetables. Their orchards contain peach, apricot, mulberry, walnut, pear, apple trees, etc., while at Tuyok they grow only vine-trees for currants.

The Hashun Gobi Desert.

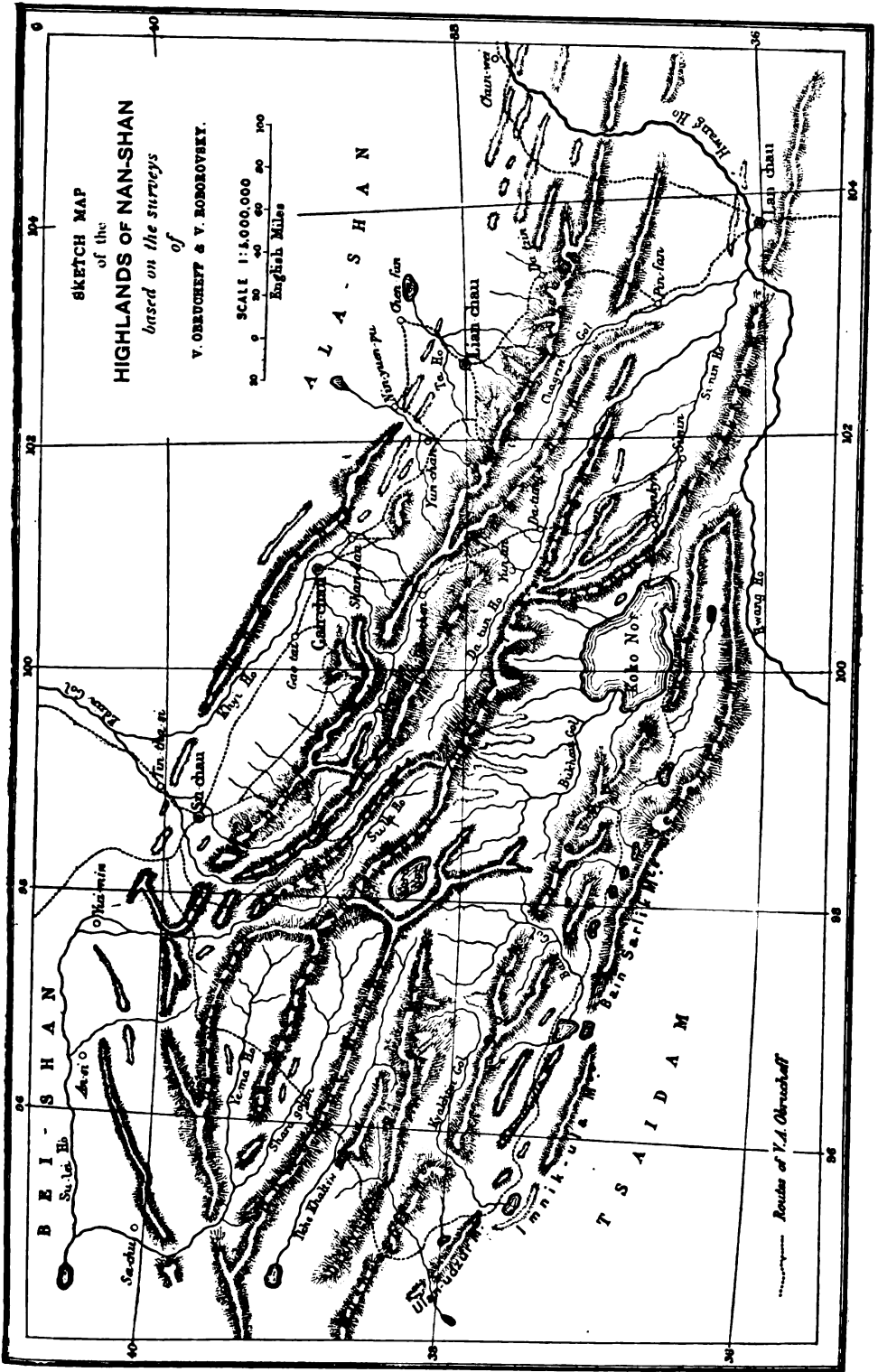
The next spot which it was proposed to reach being Sa-chu (at the northern slope of the Nan-shan), the expedition had now to cross the Hashun Gobi desert, which stretches west to east, and occupies the 250-mile-wide space between the Eastern Tian-shan and the Ala-tagh border range of the high plateaus of Northern Tibet and Tsaidam. The desert has been crossed twice by Prjevalsky on two different routes, and later by General Pevtsoff, and the expedition, dividing into two detachments, went by both routes. Kozloff, with two Cossacks only, went along the Konche-daria, a left-bank tributary of the Tarim, to Lake Lob-nor; and Roborovsky took the eastern route, *i.e.* from Turfan to Hami, and then due south to Sa-chu. Kozloff's journey was especially interesting. He crossed in the meridian of Turfan, the formerly unknown desert range Kuruk-tagh, whence he made an excursion into the depths of the desert, finding there an old route which used to lead from the ancient tower Empen to Sa-chu; he visited also the old bed, Kum-daria, formerly watered by the Konche-daria. He explored next the lowest parts of this last river, and from Lob-nor went eastwards, following a route to Sa-chu which lies to the north of the mountain route followed by Mr. Little-dale in 1893.

Roborovsky took the eastern route. He explored first a continuation of the Lukchun depression—also 300 feet below the level of the ocean—and, before reaching Hami, he turned southwards and reached Sa-chu, following with the bulk of the caravan the route of Prjevalsky in 1879. The two explorers thus obtained a full idea of the desert. It represents in its northern portion a plateau, about 100 miles wide, running west to east, and having in its middle a longitudinal valley about 4500 feet above the sea-level. It has in the north a row of low parallel ridges of hills, known as Chol-tagh ("waterless or desert mountains"), and in the south another row of hills, rising to about 6000 feet above the sea, and known on the Lob-nor as Kuruk-tagh ("dry mountains"). As to the Chinese names, Nafi syang, or Bei syang, *i.e.* southern or northern mountains, they are changeable according to whether the mountains are spoken of by people staying to the north or the south of them.

During this part of the journey, both Kozloff and Roborovsky succeeded at last in finding wild camels, and in securing specimens for their collections. A herd of these animals was met with by Kozloff on his way from Lob-nor to Sa-chu, and six of them went to enrich his collections. The winter journey, in December and January, was, of course, very hard. The frosts were severe, and still more so the snowstorms. Thirteen degrees below zero Fahrenheit were an habitual temperature at night in the travellers' tents.

Excursions from Sa-chu.

Roborovsky did not remain inactive during the winter which the expedition passed at Sa-chu. He went south-westwards to explore the Altin-tagh, and followed its northern foot for 175 miles. The great chain is, of course, fringed by a loess terrace, very fertile in a zone of from 7000 to 9000 feet of absolute altitude.



SKETCH MAP
of the
HIGHLANDS OF NAN-SHAN
based on the surveys

of
V. ORBUCHOFF & V. ROBOZOVSKY.

SCALE 1:4,000,000
English Miles

A L A - S H A N

B E I - S H A N

T S A I D A M

Routes of V.I. Orbuschoff

Countless *argalis* and *khulans* (wild donkeys) were seen; so also traces of the wild yak. The weather was terrible. When Roborovsky crossed the border range (Altin-tagh) on a pass having an altitude of about 12,000 feet, and reached the Lake Khuntei-nor (which lies on the just-mentioned route from Gas to Sa-chu, followed by Littledale), he was overtaken by snowstorms such as he had never before experienced. At midday it was as dark as after sunset, the whole air being coloured in brown-red. One felt as if he were in a photographer's dark room. The force of the wind and the noise made by it can be compared with nothing—they were terrific. Horses could not stand upright; the camels lay down. The tent was torn to pieces; fire and dinner were blown away in a moment; and the fine gravel and sand, blown by the wind, caused unbearable pain as they struck the face and neck. The frost was -12° Fahr.; the animals were emaciated. Three days in succession the party were thus kept without any means to move on. They went at last eastwards, along the route, past the lakes Khuitun-nor, Sukhain-nor (Ikhe-sirtin-nor), and Bulungin (Baga-sirtin-nor)—all three marked incorrectly on Pevtsoff's map. Great numbers of wild camels, *khulans*, and antelopes were seen around these three lakes. At Bulungin-nor Roborovsky turned north, crossed the border range at the Tangin-kutul pass (12,000 feet), and on April 12 returned to Sa-chu.

Three days later Kozloff started eastwards, *i.e.* from Sa-chu to the Chinese town Yui-ming-hsien, on the Sulei-ho river, and 200 miles up this river till its issue from the mountains.

The outer foot of the border range and of the Nan-shan system were thus explored and mapped during the winter on a length of 430 miles. May came, and with it the spring. Myriads of birds were flying northwards; the mountains tempted the travellers, and as soon as there was some grass in the mountain valleys they left Sa-chu, leaving there their collections, and carrying provisions with them on thirty camels.

The Nan-Shan Highlands.

The expedition spent the summer in these mountains, and, travelling as they did in a very thinly peopled region, they sent off no letters so long as they had not reached, in November, 1894, their *dépôt* at Kurlik, on the southern side of the Nan-shan (about 125 miles west of Lake Koko-nor).

In order to realize what has been done by the expedition of Roborovsky and Kozloff for the knowledge of the Nan-shan highlands, one ought to compare the map of Prjevalsky with the two sketch-maps given in the Russian *Izvestia* (1895, vol. xxxi. fascicule iii.), upon which the same highlands are covered with a close network of routes of the Russian explorers. Prjevalsky had only touched the western extremity of the highlands as he went from Sa-chu to Kurlik, and two big chains running north-west to south-east are all that appeared on his map. We now know that the Nan-shan highlands, which cover 4 degrees of latitude and 10 degrees of longitude, consist of a series of five to six parallel chains rising above the limits of perpetual snow, with a corresponding number of longitudinal valleys—Lake Koko-nor and its tributary (Bukhain-gol) occupying one of the broadest valleys of the highlands in their southern portion. And when the surveys of the Roborovsky's and Obrucheff's expeditions are embodied in a map, and the reports of the journey published in full, we shall have a complete geographical and geological picture of this interesting borderland between the high plateaus of Eastern Tibet and the Alashan plateau.

On May 23, when the expedition left the Sa-chu oasis, the wheat was already in ear, the onion orchards and the grass fields (*Medicago sativa*) were in full

bloom, and numbers of butterflies fluttered above the fields. They passed by the "Thousand Caves," *i.e.* spacious halls embellished with colossal statues, now much broken by the Dungans, and soon lost view of the last three poplars of the cultivated region. Moving south, they came to the spot where the Dan-ho river (which flows through the Sa-chu oasis) issues from the mountains. Prjevalsky had stayed at this spot (the well Blagodatnyi, or Welcome) about three weeks in 1879, and it was chosen as a basis for further excursions. M. Ladyghin remained there, while Roborovsky and Kozloff began their "excursions."

The high Humboldt chain rose in the south, running south-east to north-west, with its snow-clad peaks towering in the skies, and Roborovsky went across this range. The pass (Kuku-usunin, 13,000 feet above the sea) was of easy access, and from its top he saw the open flat valley of Sirtin, where the above-mentioned lakes Bulungin and Sukhain lie; the snow-clad peaks and the mighty glaciers of the Ritter chain; and, towards the west, the snows of the Anembar-ula mountains—a continuation of the Altin-tagh, which also runs west-south-west to east-north-east. The Sirtin is evidently the bottom of an old Alpine lake, now almost entirely desiccated. Numerous herds of the wild camel stay there in autumn, winter, and spring.

Crossing this depression, Roborovsky went south-east, along the valley which separates Ritter mountains (or rather its lower continuation, Dakhin-daban) from another lower chain, also parallel to the two main ridges, and named Mushketoff's range by Obrucheff. To the indigenes it is known under different names (Beljinula, Bomim-ula, Tsaidamin-ula, and Kyakhtin-ula), borrowed from the rivers which rise in the Ritter mountains, flow at its foot in a longitudinal valley, and then pierce the southern ridge, flowing south-west to the high plains of Tsaidam. This last range, decreasing in height, is continued to the south-east in the south Kokonor mountains, which consists of two parallel chains, and reaches Lake Koko-nor.

As to Ritter chain, it grows higher in its middle portion, and for about 95 miles consists of high snow-clad peaks, which send mighty glaciers to the north, and are separated from each other by passes 14,500 feet high.

The next parallel ridge, occupying the middle portion of the Nan-shan highlands, is Humboldt chain, separated from Ritter by the fertile valley of the Ikhekhaltin-gol, which flows west-north-west to the above-mentioned Sirtin plateau and Sa-chu. It also rises above the snow-line, but is intersected by several easy passes about 13,000 feet high.

The exploration of the Nan-shan was made in a systematic way. Taking their first station at Kuku-usu in the north, Roborovsky explored the Humboldt, Ritter, and Mushketoff chains and their valleys; while Kozloff explored the north-east portion of the highlands, *i.e.* the high outer ridges Da-syue-shan, and the chain which has received from the Russian Geographical Society the name of Alexander III. mountains, the valley of the Sulei-ho river at the southern foot of this last chain, and another unnamed chain which separates the Sulei-ho river from Lake Kara-nor.

After the two explorers had met at Kuku-usu, they transported their next station 65 miles further south-east, up the Shara-goljin valley, to Ulan-bulak, and thence both went out for further exploration of the middle Nan-shan. Their next station was at Yamatin-umru, at the head of the same valley, whence Roborovsky explored the south-east part of the highlands, reaching Lake Koko-nor, while Kozloff further explored the north-east slope of the highlands.

These two last excursions were made under very great difficulties. As there were no guides, the explorers had to find passes through high snow-clad mountains for themselves. Besides, after August 20 the weather became most inclement.

Snow and rain poured for days in succession, and as both Roborovsky and Kozloff travelled with one or two men only and two camels, they had to make shift with small tents only, and often to sleep under a pouring mixture of rain and snow in the open air. On returning from his second excursion Roborovsky was quite ill; still he undertook a new journey and reached Lake Koko-nor, whence he explored the lakes Sirkhe and Dulan in the west of it. It was only on October 13, 1894, that the expedition took their winter quarters at Kurlik (37° 15' N., 97° 6' E. long.), on the banks of the lake of the same name.

The rich zoological, botanical, and geological collections; the surveys covering altogether several thousand miles; the astronomical determinations made during these six "excursions," each of which was a journey which would have made the reputation of an explorer; and, finally, the meteorological observations made at the stations of the expedition, where Ladyghin remained, making rich natural history collections;—all these have made of the formerly unknown Nan-shan highlands a country now much better known than many of the Russian dominions in Turkistan and Siberia. The flora and the fauna of the Nan-shan have much in common with the flora and fauna of Tibet. The fauna is less rich in species than it is in individuals. The wild yak (*Bos gruniens*) is extremely numerous in the high valleys. The wild donkeys (*Equus kiang*, Mongolian *khulan*) are very numerous, and go to the lower valleys as well. The Mongols hunt them for their flesh and hides, which are used for boots. The antelopes are represented by the beautiful tiny *ada* antelope (*Procapra picticauda*), the *khara-sulta* (*Antelope subgutturosa*), and Cuvier's antelope (*A. Cuvieri*), discovered by Prjevalsky. The *argali* is also frequent, as also the *kuku-yaman* (*Ovis nahoor*); while the white-faced *maral* (*Cervus albirostris*), also discovered by Prjevalsky, is too much hunted to be numerous. The meadows are covered with dwellings of the *Lagomys ladacensis*, while the *Lagomys rutilus* is found here and there on the stony slopes. One marmot, *Arctomys Roborovski*, is very frequent on the Alpine meadows of Humboldt mountains. The hares are extremely numerous. Of the carnivores, the first place belongs to the bear, *Ursus lagomyarius*, which feeds on the *Lagomys*, and is as frequent in the Nan-shan as in Tibet. One almost quite white she-bear of this species has been secured for the collections. Wolves abound, and are extremely cunning. One night Roborovsky's encampment had been quite pillaged by them, without the explorers having the slightest suspicion of it. Foxes are relatively rare, while the *korsak* (*Canis Ekdoni*) is rather frequently met with. The leopard (*Irbis sp.*) and the lynx are also mentioned by the natives.

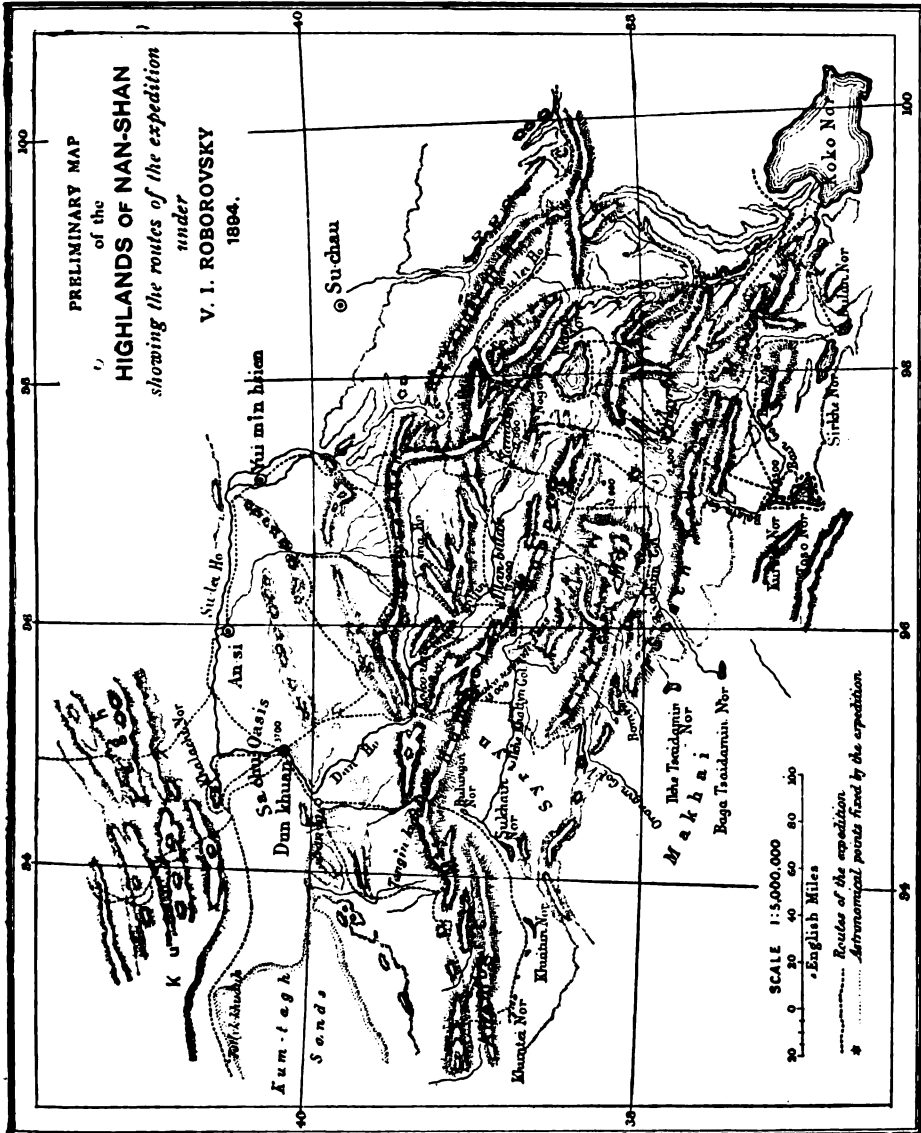
As to man, he is only represented by nomad Mongols in the north, by robber Tanguts in the east, and again by Kurlyk Mongols in the south and west.

From Kurlik to Si-chuan.

After a two months' rest, Roborovsky, not yet recovered from his illness, left Kurlik with Kozloff, Ladyghin, and four soldiers. Yaks had been taken for the transport of luggage and food. Their intention was to penetrate as far as possible south-east, and to reach Si-chuan; but Roborovsky's illness prevented the fulfilment of these intentions. The caravan started on December 13, and they had not covered 100 miles when the yaks began to die from an infectious disease, "khasa," and there was great difficulty in buying new beasts. They followed the Bain-gol, then took to the mountains and reached the north-east end of Lake Toso-nor. Continuing south-east, they followed the banks of the Kara-nor (these two lakes lie between the southern extremities of the third and the fourth journeys of Prjevalsky), whence, crossing the sources of the Churmin river, and following the

foot of the Amne-machin mountains, they came to a river which led to a pass across this ridge. This was on January 21, 1895.

Roborovsky wrote,* "The Amne-machin mountains are entirely snow-clad, and numbers of mighty glaciers creep down their slopes. This is the holy land



of the Tanguts. All gorges, wild and of difficult access, are covered with forests of *Juniperus pseudo sabina* and thickets of willows, and amidst these woods there

* Letter dated "Kurlik, April 8, 1895," in *Izvestia*, 1895, fascicule 5.

are scattered the many temples of the Tanguts, nearly forty in this locality alone. The lama who governs them stays in a temple amidst the snows of the Amne-machin mountains. The Tanguts are under the orders of chiefs (*Galyks*), who stay on the bend of the Yellow river up to its sources, as also on the lakes Jarin-nor and Orin-nor (Expedition's and Russian on Prjevalsky's maps). These Tanguts are all robbers, and are not subdued to China. They wear no tresses.

"The bend of the Yellow river is situated much further east than it is placed on General Pevtsoff's map. We had covered 335 miles (500 versts) from Kurlik, and we were told by our guide (who absconded at this spot) that there remained ten or twelve days' march more before we could reach the bend of the Hwang-ho. The snowstorms which we experienced at a height of from 13,000 to 14,000 feet, the frosts, and the absence of grass killed our beasts of burden. They perished also from the difficulties of the journey, several of them having fallen down the steep slopes. One mule tumbled down a precipice, and was killed on the spot. I had had a bad pleurisy and erysipelas; nearly all the men coughed fearfully. With all that we perseveringly progressed, in the hope of finally reaching Si-chuan. But this hope was not realized.

"On the night of January 21, when we were going to climb on the Mangun pass across the Amne-machin mountains, I had a stroke of paralysis which attacked all the right part of my body from head to the toes of the right foot; my tongue hardly obeyed my will. I lay in a disgusting and unbearable state for eight days. All this time small groups of Tanguts rode around our camp, and only looked for a propitious moment to attack us. To advance further, with one in such a state, would have been a folly which would have ruined the whole expedition, and, after a hard struggle against myself, I decided to return. On the ninth day after we had turned back (I could already stand upright, move my hands, or hold a rifle), we were attacked by great numbers of Tanguts belonging to two *hoshuns* (two 'flags' or divisions), but the gallantry and pluck of our men repulsed them. They were dispersed by the fire of our Berdan rifles, and suffered a heavy loss in men and horses. We had no casualties; only our tent was shot through in two places by the Tangut bullets.

"We followed the northern shore of Toso-nor and the Bain-gol (or Yograi-gol). Leaving this last, we crossed the Burkhan-buddha mountains, and reached Barunzasak in Tsaidam on April 6. Thence we went to Kurlik. Here we found spring. The marshes inundated their banks, the ice had disappeared from the lakes, masses of aquatic birds had already come; the first plants and insects were frequent.

"My health does not rapidly improve; I cannot move more than one verst (two-thirds of a mile), dragging my right foot. I have difficulty in writing you this letter.

"Our winter journey has added 530 miles more of surveys—we have covered over 660 miles both ways; four points have been determined astronomically. The usual observations were made and collections gathered. Interesting species of birds have been found in the forests of the Eastern Amne-machin mountains."

The Stay at Kurlik.

The next and last letter from Roborovsky, dated "Kurlik, August 10, 1895," gives interesting details of observations on the vegetation and animals at this station, as well as a description of an excursion made in the summer by Roborovsky to the Makhai plain; while Kozloff, in a letter dated from the Nan-shan mountains, gave an account of his journey to explore the region where the Nan-shan highlands meet with the mountains of the Kuen-lun system.

The spring was slow in coming at Kurlik. In April the Mongols began to work in their fields, and masses of people came in for this work. The field is

inundated first for a few days, and when the soil is well soaked, the water is allowed to run away; the seeds are then thrown on its surface in rows, and covered with the soil by the aid of a light plough dragged by a camel, or a horse, or a cow. Large quantities of the corn remain uncovered, and myriads of wild pigeons (*Columba rupestris*) feed upon them. Still, the crops on the loess-like clay are said to be very good.

In April the south Koko-nor mountains were continually covered again and again with snow; the water in the irrigation canals froze every night; and at daytime a strong north-west wind, which carried thick clouds of dust, often prevented the Mongols from working. On the bald dry clay surfaces whirling columns of dust rose, often to the clouds. Although it froze at night, the temperature rose to 77° Fahr. in daytime, and on May 16 it was 112° Fahr. on the surface of the clayey soil. The wind dried everything, and the night frosts destroyed what had grown during the day. The first grass, one inch high, was seen on April 14, and five days later the first leaves of a *Composita* were noticed, and only on May 19 did Roborovsky find the first flower of the aquatic *Ranunculus* in water warmed in daytime by the sun-rays. In the mountains, vegetation was, however, more advanced on the southern slopes. The first gnats were seen in the first days of May.

The birds were also late to nest—the more so as all old nests are filled during the winter with dust and sand, and the birds have to build new nests each year. The aquatic birds were not very numerous. At night the *Humenius*, *Tringa*, and *Limosa* were heard; also the two species of *Grus nigricolis* and *G. cinereus*, the *Casarca rutila*, the geese (*Anser cinereus* and *A. indicus*), the ducks, (*Anas boechas* and *A. crecca*), and so on. The first swallow (*Cypselus anus*) was seen on May 15. Many *Motacilla* flew about the encampment, as also wild pigeons and mountain sparrows. The black-fronted lark (*Otocorys* sp.) and the *Fregilus græculus* also visited the cornfields; while in the heights one saw a species of *Gyps* and the eagle *Hypaëtus barbatus*. A kite (*Milvus melanotis*), a crow (*Corvus corax*), and a species of magpie also visited the encampment; while in the bushes the *Podoces Hendersoni*, a species of *Lanius*, and a species of *Saxicola* were heard. In the mountains they saw many *Ullars* (both the *Tetraogallus tibetanus* and a new bigger species of the same genus), the *Turdus Kessleri*, a species of *Carpodacus*, and another of *Parus*. The Tibetan bear (*Ursus lagomyrius*), the *Moschus tangutica*, two species of deer (*Cervus albirostris*, and another not yet described), and the *khara-sulta* antelope (*A. subguturosa*) were also noticed, and their skins added to the collections.

The whole of Tsaidam, up to the western spurs of the eastern Altyn-tagh, or Anembar-ula, and all the Nan-shan region, are under the rule of the *beise* (prince of fifth degree) of Kurlik. He holds this power from the governor of Si-nin, and his two aids are also invested by the same functionary. All three are the judges in disputes arising among the Mongols, and simply ruin them by their greediness. The continual attacks on behalf of the Tanguts who stay on the Yellow river and about Koko-nor, have induced the *beise* to organize a sort of militia. All able-bodied Mongols under his rule, including the lamas, are bound to keep a horse and to provide themselves with a gun and cartridges. They are brought together in different parts of the country for exercise, and they say that since this militia has been introduced the Tangut raids are not so frequent as they were before.

The trade of the Mongols consists in the sale of various produce of cattle-breeding, the chief centre being Donkir, where they buy from Chinese traders copper, china and wooden vessels, tea, cottons, soldiers' hats, knives, guns, and corn, in exchange for wool, felt, salt, and some sheep and horses. The hunters sell musk, stags' horns, and fox and lynx furs. A few Chinese traders come also to Kurlik. The *beise* also keeps in stock some goods, and sells them to his subjects.

The Kurlik Mongols are not a fine race, as there are among them settlers from different Tangut and Tibet tribes, while the Mongols originate from Khalkha, Tarbagatai, and the Altai region. The settlers coming here are not the best sort of people, and their customs are very loose; there is much drinking going on.

Excursions from Kurlik.

On April 27 Kozloff, with two men and one guide, left Kurlik; they had eight horses. They went south-east, following the south-western foot of the south Koko-nor range up the Bain-gol (tributary of Lake Kurlik), and across a desert region to the Dzukhin-gol, which enters a small lake, Amtsin-nor, 9000 feet above the sea. Up this rather rapid stream they came to a spot, Dolon-turghin, where they saw the first spurs of the Tibet mountains, and entered these spurs, which struck Kozloff by the beauty of their slopes clad in forests of pine trees.

The Karagainin-gol, a stream which rises in the border ranges of the Tibet mountains, flows between high mountains, and, on entering the plain, it joins the Tsagan-usu, being separated by but low spurs from another river, the Tsasa-gol, which flows north-west from the same mountains, and whose upper course is infested by Tangut robbers. The Tamirtin-ula mountains (pass 12,500 feet high) separate the valley of this river from the little lake Sirkhe-nor, which lies at the foot of the south Koko-nor range. A little *khyrma* (fort), Koko-beile, has lately been erected there. The next valley in the mountains, watered by the Dulan-gol, was equally beautiful; and one cannot but be deeply impressed by Kozloff's admiration of the valleys on the slopes of the south Koko-nor ranges, thickly clothed with pine forests, and peopled with a rich fauna of mammals and birds. It was with regret that he left them, and, after having crossed the Sarlik-ula, he turned west, in order to return to Kurlik, where he joined Roborovsky on May 30. The weather, during his thirty-four days' journey, was cold in April, and warm—even hot in the daytime—in May. In April the atmosphere was full of dust raised by the north-west winds. It rained only twice; and only once during a whole day at Kurlik, on June 1.

As soon as Roborovsky felt better, he also undertook a new journey, to explore the Makhai plains. He started on June 13, following the northern shore of Lake Kurlik, whose water is almost sweet, owing to its tributary, the Bain-gol, its temporary affluent, the Balgin-gol, and numerous wells. Some fishes of the *Cobidae* family were seen in the lake. The lake Toso-nor lies close by, to the south of the former. At the spot where the two near each other, a chain of mountains, the Khabir-ghin-ula, begins, and stretches for over 50 miles north-west, parallel to the foot of the south Koko-nor ridge. Another chain, parallel to the former, runs in the same direction, varying in width and height, and assuming different names; it separates the northern Tsaidam from the southern, and in the meridian of the Makhai joins the Syrty-n-makhain-ula, or Oronghin-ula mountains. Along these two chains Roborovsky went, crossing the former (pass, 12,000 feet) until he came to the salt lake, Baga-tsaidamin-nor, nearly 20 miles in circumference and 10,000 feet above the sea-level, surrounded by meadows—the possession of the Kurlik *beise*.

The Angyrtin-ula mountains were crossed next, and the next lake, Ikhe-tsaidamin-nor, was reached. As its name shows, it is bigger than the former, and is about 35 or 38 miles in circumference; good salt is obtained from it. The Tsaidamin-munku mountains (Mushketoff mountains) raise their snow-clad tops on the north of it, and the Bomin-gol, which originates from the snow of Ritter mountains, pierces it, and, after having pierced another chain (Ichegin-ula), flows to the Makhai plain, to be lost in its gravelly soil. Roborovsky could not, however,

follow this gorge, and preferred to cross the Ichegin-ula chain; and he found that, some 13 miles below its issue from these mountains, the Bomin-ula was lost on the surface of the plain; another river, the Orongin, also flowing from Muahketoff chain, made its appearance, and also was partly lost in the plain, but a new river, Dzun-makhain-gol, flowing in a lake of same name (8500 feet of altitude), took origin from the underground waters. Only some thirty Mongol tents represented all the habitations of the Dzunmakhai plain, which is limited in the north by rocky and desert mountains, and has in the south another smaller plain, Barun-makhai, about 17 miles wide. From the Makhai plain Roborovsky went north, crossed the Sirtin (already visited in the beginning of the summer), and reached the Sa-chu oasis. His last letter hitherto published was dated "Dun-khuan (oasis Sa-chu), August 10, 1895."

Return of the Expedition.

The next news was a telegram, dated "Zaisan, December 3," in which he announced that Kozloff went from Lukchun, *viâ* Guchen, through Dzungaria to Urungu and Zaisan, while himself, with a caravan heavily loaded with collections, journeyed *viâ* Urumchi, Manas, and the waterless Dzungaria, following a new route, also to Zaisan. All were well, after having covered 10,600 miles with surveys, determined astronomically the positions of 30 points, and made during the whole journey meteorological observations. The natural history collections comprised 250 skins and 30 skeletons of mammals, 1200 birds, 450 fishes and reptiles, 30,000 insects, 25,000 specimens of plants (about 1300 species), 300 specimens of seeds, and 350 specimens of rocks. At Lukchun, meteorological observations were made for two years.

Roborovsky and Kozloff are now in St. Petersburg.

THE MONTHLY RECORD.

THE SOCIETY.

Report of the Sixth International Geographical Congress.—The *Report* of this Congress has been published in a single large volume, and distributed to all the members of the Congress who signified their desire to receive a copy. As a certain number of extra copies have been printed, any member who failed to apply previously, and now wishes to obtain a copy, is invited to apply to the Secretaries of the Congress, 1, Savile Row. These applications will be attended to early in October. A copy will also be sent on application to any geographical journal or society which has not yet received one. The volume is sold to the public, price £1, through the booksellers only, the publishers being Mr. John Murray for London, Messrs. Hachette for Paris, and Messrs. Dietrich Reimer (Hoeser und Vohsen) for Berlin.

EUROPE.

Meteorological High-level Station in the Carpathians.—Dr. Karl Pencker, of Vienna, informs us that the plan of the Hungarian Carpathian Club for the establishment of a meteorological observatory on the summit of the Great Schlagendorferspitze, at an elevation of 8066 feet, is about to be carried into effect. The Hungarian Academy and the Hungarian Society of Natural Sciences have promised annual grants, and the Hungarian Meteorological Service, in addition to a grant, will provide the necessary instruments. The cost of the establishment

is estimated at £800. The new station will be the first high-level observatory in the Hohe Tatra or in the Carpathians as a whole, and will be the most easterly mountain station in Europe.

ASIA.

Early Maps of Siam.—In the twenty-seventh volume of the *Annales des Musées Guimet*, which consists of the report by M. Fournereau on the results of his archæological mission in Indo-China in 1891, there is an introductory chapter by M. Gabriel Marcel dealing with maps of Siam from the beginning of the sixteenth century onwards, accompanied by facsimile copies of the same. These maps are interesting, not merely as elucidating the historic geography of Siam, but, since most of them include a large part of the coasts and islands of the far East, as throwing light on the progress of geography generally in these regions. Besides those by well-known cosmographers, several are from maps by less-known or unknown authors, in the collection of the French National Library. We can only allude to some of the earlier maps, which are naturally the most interesting. The first in the collection is Portuguese, and is attributed to Pero Reinel, and to the year 1517. It shows little accurate knowledge of the continental coasts beyond the extremity of the Malay peninsula, although Portuguese ships had already reached China; but as a result of the first voyages to the Moluccas (dating from 1511) the northern shores of the islands east of Java are drawn, although Java is made much smaller than Sumbawa. The planisphere of Diego Ribeiro (1529) shows much improvement, and the shores as far as the south of China are laid down, but are not closed in at the heads of the gulfs of Siam and Tongking. An anonymous map, said to be undoubtedly Portuguese, and apparently dating from the middle of the sixteenth century, shows for the first time (among the maps of this collection) some characteristics which are reproduced in later Dutch maps down to Hondius's 1613 edition of Mercator. The atlas from which this anonymous map is taken is said to possess interesting features in respect of other parts of the world. Among the Dutch maps reproduced are those of Van Langren * (1595), and Evert Gijsbert's son (1599), which are on the whole very similar. Some of the striking points in these maps are: the circular gulf running far into the land near Tenasserim, filled with islands which represent the Mergui Archipelago; the large island encircled by two branches of the Menam at the head of the gulf of Siam; the landward extension of the gulf of Tongking and its pointed shape; and (in most) the extensive shoal of triangular shape lying off the coast of Cochin China. After the date of Hondius, the coasts begin to take a more correct outline, but the common error of making the Menam rise from a very remote source in Tibet still occurs in Robert's map of 1751, although the river's source was more correctly placed by Gueudeville in 1713–1719.

AFRICA.

The Uganda Protectorate.—An official notice, issued by the Foreign Office on June 30 last, intimates that Unyoro and other districts west of that territory and Uganda, and within the British sphere of influence, are placed within the limits of the Uganda Protectorate. The territory administered by the Commissioner, therefore, now extends northwards to the Victoria Nile, and westwards to the shores of Lakes Albert and Albert Edward, and includes the greater part of the Ruwenzori range, together with the lower part of the Semliki valley. It will be remembered

* This map was one of those used for the Dutch editions of Linschoten. See Hakl. Soc.'s edition, I. p. xxxi. It is reproduced on a smaller scale in Pinto's voyages, 'Adventure Series' (1891).

that forts garrisoned by Sudanese troops had already been established in the new territory, both by Captain Lugard and by the officers engaged in the war with Kabarega, but that these were excluded from the Protectorate as originally defined. It is not quite clear from the official notice whether the southern districts (Ankoli, etc.) as far as the German boundary are also included. Eastwards the Protectorate is said to embrace "Usoga and the other territories to the east under the administration of her Majesty's commissioner," which again is somewhat indefinite, as the functions of the commissioner with respect to the territories between the Victoria Nyanza and the coast have never been very clearly defined.

Slatin Pasha in the Sudan.*—Slatin Pasha's account of his sixteen years' sojourn in the Sudan—eleven of them as a prisoner—is of special interest at the present time in connection with the military operations now being carried on in that country, which may be said to have their origin to some extent in his return to civilization. Although the book is necessarily not in any large degree connected with geography, the detailed information as to the state of affairs in the Sudan which Slatin's unique position enables him to give, is of the utmost importance for the study of the political relations of the countries with which it deals. The whole history of the Mahdi's revolt is clearly set forth in its pages, and we are now able to follow the events connected with the siege and fall of Khartum, as watched by an observer at the rebel head-quarters. The cruel and tyrannical character of the "Khalifa" and the deplorable results of his rule, in turning thriving districts into desolate wastes, are graphically drawn. The condition of the subject population is such that, in Slatin's opinion, the hold of the Mahdists over their present domain would at once be loosened in the event of help being brought them from outside. The importance of the fertile Bahr-el-Ghazal province is many times referred to, and the strategical value of its possession insisted on. The thrilling story of Slatin's flight, though already well known in its main outlines, will be read in its detailed form with no diminution of interest. Two maps are given, one showing the environs of Khartum and Omdurman on a large scale; the other embracing the whole Eastern Sudan, and showing the extent of Mahdist influence in 1895.

Expeditions in German East Africa.—Dr. Max Scholler, already known for his journey in Northern Abyssinia, has undertaken an expedition to the region between Kilimanjaro and the Victoria Nyanza, in which he intends, as far as possible, to avoid the routes of previous travellers. Lieut. Werther has also started on a geological expedition to the northern parts of the German territory (*Petermann's Mitteilungen*, 1896, No. 5). In March last an examination of the lower Rufiji as far as the Pangani falls was made by Lieut. V. Grawert, who reports (*Deutsches Kolonialblatt*, 1896, p. 287) that he found everywhere a depth of 6 feet, and generally more. Although the river was then above its mean height, he considers that even in the dry season light craft could ascend to the falls. If a steamer is placed on the river, he thinks it will be necessary to use coal or petroleum as fuel, owing to the general absence of wood from the immediate banks. The southern bank was found to be uninhabited for some distance, owing to a raid of the Mafiti. The Magwangwara have also been giving trouble of late on the caravan-route from Lindi to Lake Nyasa, lately followed by the chief of the station of Langenburg on his way to his post, and it is proposed to found a station to keep them in check (*Kolonialblatt*, p. 314). Early in the present year a short

* 'Fire and Sword in the Sudan.' By Rudolf C. Slatin Pasha, C.B. Translated by Major F. R. Wingate, C.B., D.S.O., R.A. Illustrated by R. Talbot Kelly, R.B.A. London: Arnold, 1896.

expedition was carried out by Captain Johannes from Moshi across the Masai steppe to Umbugwe, near Lake Manyara, for the purpose of coming to terms with the Masai chief Cendeo, who had shown a disposition to move with all his herds into British territory. Although it was the dry season, water was found throughout, though sometimes with difficulty. Both Great Amsha, by which the route led, and Umbugwe are much recommended for cattle-rearing, the former having the advantage in point of climate, for Umbugwe is completely flooded in the rainy season (*Ibid.*, p. 286). Preliminary studies and surveys in connection with the proposed railway from Dar-es-Salaam to Lake Tanganyika are being actively prosecuted, and it is said that the project has been virtually decided on, though a government guarantee of interest has not yet been obtained. According to the *National Zeitung* (quoted by the *Times*), Herr Rindemann has carried the survey as far as Tabora. It is apparently intended that there shall be a branch from that place to the Victoria Nyanza.

Geological History of the Congo Basin.—The probable course of events connected with the draining of the inland sea, which must once have occupied a large part of the central Congo basin, is traced by M. Jules Cornet in the *Bulletin de la Société Belge de Géologie* (vol. x. pp. 64 *et seq.*), in an article dealing with the superficial deposits and the results of erosion in that basin. As M. Wauters points out in the *Mouvement Géographique*, M. Cornet's conclusions agree well with those published by himself in that journal two years ago. The sedimentary deposits formed at the bottom of the ancient sea are represented, M. Cornet points out, by the important strata of soft sandstones found on the upper Congo. As the passage by which the waters found their way to the Atlantic Ocean became deepened, the sea shrank in area, and the streams which flowed down from the highlands on all sides cut deep channels through the sandstones laid bare round the margin, even removing them entirely from certain areas. The continued denudation, both of the older and newer formations, led to the deposit of the sands or sandy clays, often accompanied by rolled pebbles, which are generally found covering the soft sandstones; while the alluvial deposits which border the central Congo and lower Kassai are those formed during the final stage of the existence of the inland sea, of which Lakes Mantumba and Leopold II., together with the broad expansion of the Congo itself, are the last vestiges. The valleys of particular tributaries of the main stream have been subject to a similar process. The Kassai and Ubangi must have once flowed through vast lacustrine basins, which have been drained by the wearing away of their rocky barriers, still marked by rapids in the course of the rivers. On the upper Congo the process has not advanced so far, and some of the lakes still remain at the present day.

Trade of the Congo State.—The *Mouvement Géographique* quotes from the report of the Committee of the Belgian Senate figures which show the growth of the total trade of the Congo State during the last few years, as well as of the share taken by Belgium. While the exports have risen in the seven years ending with 1895, from 2,600,000 to 10,900,000 francs, the share of Belgium has risen from 9½ to 82 per cent. of the whole. Data are not available for the same length of time as regards the imports, which in 1895 were nearly exactly equal to the exports, having considerably exceeded them during the two preceding years. Only 57 per cent. of these are as yet supplied by Belgium. A considerable area has already been planted with coffee on the upper Congo, the yield being calculated at 300 tons, and it is expected that the area will be largely increased within the next few years.

The French in the Western Sudan.—Useful information respecting the French operations in the Western Sudan, including some details of geographical importance, and accompanied by maps, are published from time to time in the

Bulletin du Comité de l'Afrique Française, or in its supplement, which bears the title *Renseignements Coloniaux*. Besides the various expeditions in the region of the lower Niger, which have already been fully noticed in the *Journal*, the following are some of the principal reports which have been published during the past year. A summary (with map) of the mission of Captain Marchand* in the interior of the Ivory Coast, for the purpose of finding the best route to the Niger, appeared in the number for October, 1895 (p. 290). Captain Marchand is strongly in favour of the river Bandama—which debouches near Grand Lahu, and has a basin larger than that of the Comoé—as the natural outlet for the interior of the French Ivory Coast. He bases this opinion on the fact that the central plateau here sends a triangular projection southwards into the forest belt of the coast, with its apex at the point of junction of the two main arms of the Bandama, little more than 40 miles from the coast. On this point, therefore, the routes from the interior naturally converge. The report of Colonel Achinard, well known as the conqueror of Ahmadu, king of Segu, is given in the first number of the Supplement for 1896, and, though dealing primarily with the military operations of the campaign of 1892-93, it contains much information on the country passed through, and its political relations. A map is given, on which both Colonel Achinard's route and that of Colonel Joffre, on his successful expedition against Timbuktu, are laid down. Colonel Joffre's own report, with notes on the geography of the region of Timbuktu and a plan of the city, is given in the second number of the Supplement (p. 44). The same number also contains the report of the operations by Colonel Combes against Samory, which can be followed in a map of the French Sudan given in the *Bulletin* for August, 1895. After the departure of Colonel Achinard, the work of establishing the French authority in the region south of the upper Niger fell to Commandant Destenave, who, from his headquarters at Bandiagara, is said to have pushed southwards as far as Mossi (*Bulletin*, February, 1896, p. 41), and obtained for France a footing in that country. From Dahomé, also, French agents have made their way to the Mossi, and the same *Bulletin* contains a map of the route of M. Alby, from Carnotville to the vicinity of Wagadugu. In this journey, M. Alby several times crossed a stream known as the Gulbi-Kuma, which seems to be the head-stream of the White Volta. A full account of the journey of Lieut. Baud from Dahomé to the Ivory Coast seems not to have been published. Finally, it may be useful to note that all the French West African possessions, exclusive of Dahomé (*i.e.* the Senegal, French Sudan, French Guinea, and the Ivory Coast), have been placed under a governor-general, who controls the general political and military affairs of the colonies as a whole, and also governs that of the Senegal directly. The other colonies are under governors of their own, and retain their administrative and financial autonomy (Supplement, No. 3, 1895).

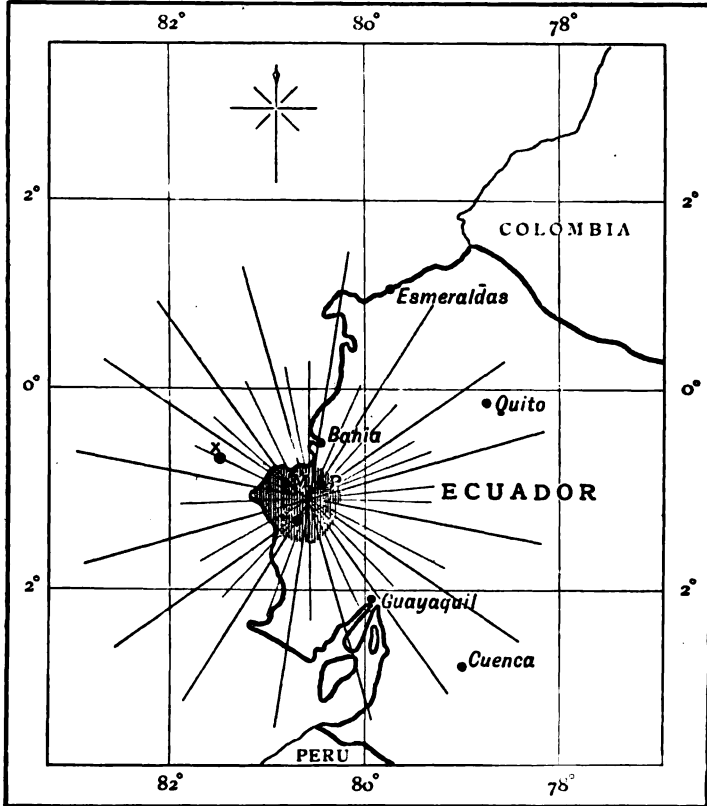
The French Somali Coast.—This is now the official name of the French territory on the Gulf of Aden, including the districts of Obok, Tajura, and Danakil-land. The head-quarters of the administration have been removed from Obok to the newly established port of Jibuti (*Mouvement Géographique*, 1895, No. 24).

AMERICA.

Recent Earthquake in Ecuador.—Mr. C. H. Dolby-Tyler, of Guayaquil, Ecuador, sends the following account of an earthquake which recently occurred there: At precisely 8.45 a.m., on May 3, 1896, the first and severest of a series of earthquake shocks was experienced at Guayaquil. The mean duration of the first attack was 48 to 50 sec., and, in the absence of a seismograph, I estimate it to

* Captain Marchand has been recently commissioned by the French Government to command an expedition to the upper Ubangi.

have been composed of three principal and a number of smaller waves. At 9.2 a.m., we experienced the second movement, which consisted of a single strong wave that lasted 7 sec. The third series was less formidable than the preceding two, lasted over 1 min. 15 sec., and comprised four long and gradually diminishing swells. Since that date scarcely a single night has passed without some slight tremor. The direction of the earth-waves has been invariably from north-north-west. From the accompanying sketch you will be able to see the distribution and relative intensity of the shocks over the whole earth-tremor area, which, allowing for radiation, must have embraced at least 55,000 square miles. The province of Manavi was the



Walker & Fontallé.

M = MONTE CRISTI. P = PORTOVIEJO. J = JIPIJAPA.

X PROBABLE SEAT OF PRIMARY VOLCANIC DISTURBANCE. TOTAL EARTH-TREMOR AREA, 55,000 SQUARE MILES.

principal sufferer, for there the towns of Montecristi, Portoviejo, and Jipijapa were destroyed, and everything in the immediate vicinity suffered to a greater or less extent. This central region embraced an area of about 1200 square miles. Beyond that district, and covering a circumferential area of 4000 square miles, the seismic motions were remarkably strong, but comparatively no damage was done. The limit of the earth-motions to the east appears to have been slightly beyond the 78° W. Greenwich, and they seem to have been confined exclusively to Ecuador. It is worthy of notice that the waves travelled evenly over the whole of the area mentioned in regular circles, and from their direction point to a common centre.

Thus, at Esmeraldas they are reported to have come from the south-west, at Quito their approach was more directly from the west, and at Guayaquil and Cuenca they arrived approximately from the north-north-west. Large landslips have occurred in the "Cerros de Hoja," a small isolated ridge of Tertiary formation, lying parallel with the coast, to the north-west of Portoviejo, and traces of a line of fault are reported near Jipijapa. At Bahia de Caraquez, which lies immediately outside the seat of these disturbances, enormous quantities of fish, in every stage of decay, have been washed ashore, and the sea-water is stated to have acquired an abnormally bitter (?) taste. I suspect the cause of the recent earthquake to have been of a duplex character. Primarily, volcanic; doubtlessly the early movements originated at sea, within 20 miles of the coast, and between $0^{\circ} 40'$ S. lat., and $1^{\circ} 20'$ S. lat. Secondly, "tectonic;" complementary to, and caused by, the impetus derived from the submarine volcanic agency to which I refer. The relative immunity we have enjoyed from earthquakes during the past three years, in a region where changes in the Earth's crust, due to denudation and other influences, are being rapidly evolved, would point to evenly balanced conditions of superior masses, which needed but the slightest volcanic propulsion to cause their disruption, and thus give rise to the formidable movements we have just experienced.

The Canadian Government and Admiral Markham.—The paper on "Hudson's Bay and Hudson's Strait as a Navigable Channel," by Admiral Markham, which was read at the evening meeting on June 11, 1888, was the subject of a Report by the Committee of the Privy Council of Canada on May 15 last. The Prime Minister recommended that, as the paper in question was highly important and of great value, the thanks of the Government of Canada should be conveyed to Admiral Markham, and that his services should be brought to the notice of the Imperial Government. This was done by the Earl of Aberdeen in a despatch to the Secretary of State for the Colonies, dated May 21, 1896, a copy of which was communicated to the Admiralty.

Local Maps in Rhode Island Schools.—In the June number of the *Journal* (vol. vii. p. 665), notice is taken of a paper by Professor W. M. Davis on the state maps of Connecticut as an aid to the study of geography in schools. We have now to notice a similar paper by the same author on the state map of Rhode Island. The map, in twelve sheets, on the approximate scale of 1 inch to the mile, has been supplied to all the public schools and libraries in the state, and the little handbook of sixteen pages is intended to guide teachers in the use of this new aid to practical geographical work. There are, as in the former case, hints as to the methods of teaching geography to school-children in the field and from the map, and also an account of the various geographical forms represented on the sheet, with instances of each type named. The relation of surface features to occupation by man is touched on, and general suggestions given for considering the map in that light.

POLAR REGIONS.

Lieut. Peary's Expedition.—Mr. Peary has sent us a newspaper cutting from the pen of Mr. Cyrus C. Adams, in which the main outlines of the programme of his new expedition are sketched. In addition to ethnological studies and scientific collections, the proposed work will include a survey of the coast, especially north of Cape Alexander. South of that cape as far as Cape York, Mr. Peary's former surveys have supplied material for the correction of the charts. The attempt to secure the large meteorite on the north shore of Melville bay is merely an incident in the enterprise, and may or may not be carried out. Mr. Albert Operti, an artist who accompanies the explorer, hopes to take casts of the Cape York natives for the purpose of making models of them. It is not proposed

to proceed north of Cape Sabine, but on the return route an attempt will be made to push into Jones's sound—explored by Inglesfield in 1852, but still little known—and Cumberland sound and Hudson strait may also be visited. Two parties of scientific men, headed by Prof. Tarr and Prof. Burton, are availing themselves of the opportunity to proceed north in Mr. Peary's steamer for geological and glacial researches, their destinations being respectively Melville bay and the Great Umanak fiord in South-West Greenland.

Name for North Greenland.—In recognition of the value of Mr. Peary's Arctic work, it has been proposed by the Geographical Club of Philadelphia to name the northern portions of Greenland, which he has done so much to explore, "Peary Land." The tract so named would lie between Independence bay and the 80th parallel.

Mr. André's Balloon Expedition.—According to the Central News, Mr. André was to begin filling his balloon in Dane's Island on July 22, and should the meteorological conditions be favourable, he was to start on July 27.

Sir Martin Conway's Spitzbergen Expedition.—News of Sir M. Conway's expedition has lately been published by the *Daily Chronicle*, giving details down to July 3. On June 23 the expedition left Advent bay, and, after many difficulties from thick snow-beds and deep bogs, crossed the watershed by Fox pass to Myen's bay, sleeping in the open air with a freezing wind and heavy rain. Fox peak was also climbed. After returning to Advent bay by another pass, the travellers ascended through deep bogs to Brent pass, descending to Sassen bay with sledges broken and ponies worn out. It was proposed, when new sledges had been procured, to cross the island to the east coast. A survey of the route, as well as geological investigations, had been carried out.

The Belgian Antarctic Expedition.—The sum of £4000 has been set apart by the Belgian government towards the expenses of the proposed Antarctic expedition, which, according to present plans, will start in September next, under the command of Lieut. Gerlache of the Belgian Marine. The steam whaler *Belgica* has been procured from Norway for the purpose. The region of Graham's land is to be first explored, after which the winter is to be passed in an Australian port. During the following summer Victoria land will be visited, and an endeavour made to ascertain the position of the southern magnetic pole. The expedition will attempt to advance as far south as possible, but its principal object will be to collect information relative to the meteorology, fauna, and flora, etc., of the Antarctic regions. The opening up of the southern whaling industry, and the supply of a stimulus towards the creation of a Belgian commercial marine, are mentioned as some of the general aims of the undertaking.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Researches of the "Pola" in the Red Sea.—We have received the following abstract of results of the Austro-Hungarian scientific expedition to the Red Sea, which sailed from Pola on October 6, 1895, and returned on May 18, 1896. The region explored was restricted to the northern part of the Red Sea and the gulfs of Suez and Akaba. Five lines of cross-soundings were traversed, and on these 1243 temperature observations were made, 691 water samples collected, 98 observations of transparency, and 254 estimations of colour of water recorded, and dredgings were made 96 times. Seventy-nine days were spent in the Red Sea itself, sixteen in the Gulf of Suez, and thirty in the hitherto unexplored Gulf of Akaba. Numerous soundings have brought out the general features of the relief of the sea-bottom between Jeddah and Suez and Akaba. The Gulf of Suez is shallow, and slopes regularly down to the northern extremity of the Red Sea basin, which has a maximum depth of 640 fathoms, and then over a shoal to 60 fathoms

goes down to 1200 fathoms in $22^{\circ} 7' N.$ lat., $38^{\circ} E.$ long. The Gulf of Akaba is separated from the Red Sea by a submarine bank only 70 fathoms from the surface, and in $28^{\circ} 39' N.$ lat., $34^{\circ} 43' E.$ long., attains the comparatively great depth of 700 fathoms. Its coasts are steep, and there are immense coral reefs, both on the east and west sides, which account for the difficulty in entering the gulf. Daily variations of temperature are observable to the depth of over 50 fathoms; a constant temperature of 70.7° Fahr. is recorded below 333 fathoms in the Red Sea and 273 fathoms on the Gulf of Akaba. Salinity increases with depth towards north and west; the water is less transparent than in the eastern Mediterranean, and is not of the same beautiful blue colour.

The Geological Aspects of Geography.—Two recent books, designed for popular instruction in practical geology, bear so closely on the detailed geographical descriptions of regions near home that they may well be noticed together. Mr. Greenville A. J. Cole, in his 'Open-air Studies: an Introduction to Geology Out-of-doors,' utilises a series of imaginary journeys, over districts which he knows well, in order to bring various kinds of geological structure and succession before his readers, and to serve as a stimulus and guide to their own observations. Introduced by a short chapter on the materials of the Earth, there follow nine descriptive essays involving all the main questions in geology, and in most cases bearing directly on geomorphology or the origin of geographical forms. These are entitled respectively, A mountain hollow; Down the valley; Along the shore; Across the plains; Dead volcanoes; A granite highland; The annals of the Earth; The Surrey hills; and The folds of the mountains. In all these the style is simple and vivid, the language free from technicality, and the reasoning clear and logical. The second book, although also the work of a geologist, is more distinctly geographical in form, being a second edition of Mr. H. M. Cadell's 'Geology and Scenery of Sutherland.' Provided with an orographical and a geological map of the district under consideration, it presents to the reader a remarkably clear account of perhaps the most tangled geological structures in the British Islands, and makes plain the problem which Sir Roderick Murchison misread so seriously. The influence of the different classes of rocks on the scenery, soil, and vegetation of Sutherland is shown with innumerable instances, and the bearing of the various questions on theoretical geology is fully pointed out. The region is remarkably interesting, on account of the ancient sedimentary and metamorphic rocks of the west folded and sheared along the huge thrust-planes, the discovery of which revealed a new instrument to the armoury of Earth-forming agencies, and equally on account of the secondary coal deposits of Brora and the goldfields of Kildonan. The contrast between the Sutherland and the Australian placer mines is centred in the fact that the alluvial deposits of the north of Britain have been so disturbed by the passage of the ice-sheet, that the segregation of gold-dust has been arrested, or the greater part of it swept into the sea, leaving the scattered grains too widely scattered to repay extraction.

The Gulf Stream and the Gulf of Mexico.—In *Petermann's Mittheilungen*, Bd. 42, No. 2, Herr A. Lindenkohl gives a forecast of what promises to be one of the most important contributions recently made to oceanography—a discussion of the numerous observations made in the waters of the Gulf of Mexico and the Gulf Stream by American surveying vessels during the last twenty years. The full memoir is to appear in the 'Annual Report of the United States Coast and Geodetic Survey for 1895,' and, to judge from the abstract under notice, we may expect it to be a model of sound and laborious investigation. Amongst the most important results may be mentioned the conclusion that, so far as it is possible to estimate, the water added to the Gulf of Mexico by rainfall, discharge of

rivers, etc., is about equal in amount to that removed by evaporation. The problem of circulation is thus narrowed down to keeping an account between the waters entering from the Atlantic by the Yucatan channel, and those issuing outwards by the Florida channel, and the balance is so far on the credit side that we are driven to assume the existence of an under reaction-current flowing outwards through the Yucatan channel, like that observed in the Strait of Gibraltar. The Gulf Stream proper is, in fact, but a narrow current of little velocity. It appears, further, from this, as well as from a discussion of the distribution of heat, that the "Gulf Stream," familiarly so called, really owes comparatively little to the Gulf of Mexico, the gulf being certainly quite unable to supply sufficient heat to affect the climate of Western Europe. In accounting for the occurrence of the immense warm drifts off the east coast of North America, vertical circulation is prominently brought forward, and its activity is ascribed to the mixture of waters of different temperatures and salinities somewhat after the manner suggested by the observations of Mr. Dickson on H.M.S. *Jackal* in the North Sea; but considerable stress is laid on the fact that the same change of temperature does not always produce a change of specific gravity corresponding to that produced by an equal amount of salt—the change depending on the actual temperature. It seems difficult to imagine that a secondary influence of this kind can have much scope near the surface directly along a great cyclone track, and we may accordingly look forward to the complete memoir as being likely, not only to furnish us with many new facts of the greatest importance, but to materially aid in elucidating the true relations between the wind and specific gravity forces acting in the establishment and maintenance of the great ocean currents. An English version of Herr Lindenkohl's paper, originally communicated to the Philosophical Society of Washington, appears in *Science*, N.S., vol. iii. No. 60, p. 271.

GENERAL.

Naturalist Travellers.—Under the somewhat sensational title of 'From North Pole to Equator,' Mrs. J. Arthur Thomson has produced a spirited translation of Brehm's most popular book of travel. It describes with a vividness that is perhaps tinged with extravagance the scenery and the life of the lands he travelled through, from the edge of the Arctic Ocean in Siberia to the upper waters of the Nile. An interesting preface by Mr. J. Arthur Thomson treats of naturalist travellers in general, and classifies them as if they were the objects of their own proper study. He distinguishes the Romantic type with Orderico de Pordenone and other originals of Sir John de Mandeville as specimens, the type culminating in Marco Polo. Then the Encyclopædist type of the sixteenth and seventeenth centuries, animated by "an omnivorous hunger for knowledge," and not very particular as to the material with which they satiated themselves. This gave place to the General Naturalist type of the eighteenth century, of which Pennant, Pallas, and Humboldt are cited as examples. The Specialist type succeeded and roamed the world in modern days in groups on *Challengers* or singly to solve special problems in particular cases. Out of these Mr. Thomson makes to emerge the fifth and highest type of naturalist traveller, the Biological type, dominated by Darwin, containing Wallace and Bates, and also Brehm. Some critics are inclined to class Brehm with the first or romantic class, for his style gives strong expression to the feelings of a nature which seems almost to have been too sensitive for a scientific explorer roughing it on the Tundra or in the African forest. The naive vividness of description is, however, likely to be attractive, and books like this are wanted to arrest the attention of the young and stimulate the love of adventure, which it would be a national misfortune to check. Disillusion will come soon enough in the field, but to the proper stamp of man

will only prove an added stimulus. Sir John Mandeville, or even his modern incarnation the journalistic tourist, is better than so monstrous a production as a *blasé* wanderer who can find no new thing under the sun. Mr. Thomson gives a short biography of Brehm, and a list, short but choice, of modern and recent books by naturalist travellers, to which the readers of Brehm may turn with the certainty of meeting with no disappointment.

German Colonies.*—In this number Forst-Assessor E. Krüger describes the forests and plantations of the Handei mountains. The plantations at Nguelo and Derema appear to be of considerable size, as there are some 200,000 coffee plants in the former, and 87,000 coffee and 4000 tea plants in the latter, not including those in the seed-beds. A few details as to the cultivation are given by Herr Krüger, who states that the vegetation at Derema consisted, three or four years ago, of a forest of very ancient trees of great size, under which was a dense undergrowth of small wood, from ten to thirty years old. Little streams penetrated the forest and kept the ground moist. When these woods were cut down, the heat of the sun and forest-fires destroyed all this undergrowth. This letting in of air and light dried up the soil, and greatly diminished the streams. The planters had cut a series of parallel trenches, with deep draining ditches at right angles; these assisted in the process of desiccation. Even after a torrent of heavy rain, which caused great damage to the plantations, the soil was perfectly dry one or two days afterwards. The planters urgently require better means of transport; they have made, or are making, a pack-animal track to the coast. Vanilla appears to have been a complete failure, probably owing to the absence of sufficient shade and moisture. H. Krüger describes the mountain forests as being generally destitute of creepers, and especially the rubber vine as being completely absent except in the valleys ("Bachthalern"). He also asserts that it is in these valleys only that we find an accumulation of rich humous soil. In both these assertions he contradicts Dr. Baumann, but it is obvious that the question entirely depends on how much of the ground is occupied by valleys. The timber does not appear to be used even by planters on the spot, who find imported wood cheaper, but this is probably due to the extremely unreliable labour and the absence of roads. Chinese and Japanese appear to be employed on most plantations, but the absence of roads is a much greater obstacle to development. Herr Krüger very fully discusses the question of utilizing the various rivers to carry off the timber, but as, according to his own account, most of the trees are too heavy to float, this does not seem practicable. He suggests the establishment of a forest department, which would cost, on a ten years' average, 120,000 marks annually, and might bring in two to three million marks a year. There is also a criticism of the Universities Mission. Herr Walbroth gives, in the same number, an account of the missions in the whole German protectorate. This is of a very detailed nature, giving the names of workers and extracts from the reports of, for example, the Basel, Liepzig, North German, and Beriin I, II, and III. missions. There are some of these extracts which might be of anthropological interest, but the majority are of a very familiar kind. The locusts have caused great sufferings in the East African protectorates. The industrial side of the German missions is much insisted upon in this paper. *The Kolonialpolitik im Reichstage* is of too political a nature to be reviewed here, but this number should be consulted to see the manner in which the Government is spending money.

Palmography and Palæogeography.—M. de Lapparent has called our attention to the fact that he does not propose the introduction of the word *Palæographie* as descriptive of the history of earlier geographical conditions, but the word

* 'Koloniales Jahrbuch, Achter Jahrgang,' Heft. 4. Gustav Meinecke, Berlin, 1895.

Paléogéographie. The footnote in p. 65 of the July number of the *Journal* was suggested by a printer's error on page xii. of the 'Leçons de Géographie Physique,' where the title of Lesson 15 is given as 'Principes de la Paléographie,' instead of 'Principes de la Paléogéographie,' the form which is used in the text.

OBITUARY.

Gerhard Rohlfs.

By E. G. RAVENSTEIN.

IN Gerhard Rohlfs, who died at Rüngsdorf, near Bonn, on June 2, Germany has lost one of the most enterprising and successful of her African explorers, and one who had won distinction long before the days when his native country could boast of colonial enthusiasts or African colonies. Born on April 14, 1832, at Vegesack, near Bremen, the son of a physician, Rohlfs was educated at the gymnasium of Osnabrück, and subsequently studied medicine at the universities of Heidelberg, Würzburg, and Göttingen. Fond of adventure—in 1849–50 he had fought as volunteer in the Schleswig-Holstein war—and doubtful of his prospects at home, he enlisted in 1855 in the Foreign Legion of Algeria, and took part, in the humble capacity of an apothecary's assistant, in the conquest of Great Kabylia. The knowledge of Arabic and of native customs which he thus obtained proved of great service in his subsequent travels in the Sahara.

On July 20, 1862, he started from Tangiers, disguised as a Mohammedan physician. His good fortune led him into the house of the enlightened Sherif of Wezzan, who subsequently proved his steadfast protector, and supplied him with letters to his representatives as far south as Tuat. Having visited Fez and Morocco, Rohlfs followed the coast as far south as Wadi Sus, and then, turning in an easterly direction, he reached Tafilet, which only one European, namely, René Caillié, had visited before him. Near a village of the Boana he was robbed by his guides and left for dead in the desert, but two Marabouts who came that way charitably took charge of the stranger, and he was enabled to reach Géryville and Algeria ('Mein Erster Aufenthalt in Marokka Bremen,' 1873; 'Adventures in Morocco,' London, 1874).

Scarcely recovered from his wounds, he once more, in August, 1863, started for the interior. It was his intention to reach Timbuktu, but owing to the disturbed state of the country, he returned from Abiod Sidi Sheikh to Oran, and embarked for Tangiers. He left that place on March 14, 1864, crossed the Atlas at the head of Wad Ziz, where Caillié had crossed before him, once more reached Tafilet (June 8, 1864), and thence proceeded to Tuat, which had never before been visited by a European. His projected visit to Timbuktu appearing impracticable, he ultimately proceeded through Ghadames to Tripolis, where he arrived on December 29, 1864. The expenses of this most successful expedition were partly covered by grants of £50 each from the Senate of Bremen and the Royal Geographical Society ('Reise durch Marokko,' Bremen, 1868).

After a short visit to Europe, Rohlfs returned to Tripolis. In March, 1865, he left that place with the intention of penetrating the highlands of the Ahaggar. Finding, however, the road closed against him, he turned back from Ghadames, stayed five months at Murzuk, and then crossed the desert to Kuka, in Bornu. He reached the Benue by way of Yakoba, descended that river to its confluence with the Niger, and finally reached Lagos (June 1, 1867) by way of Rabba and the Yoruba country ('Quer durch Afrika,' Leipzig, 1874).

In 1867–8 he accompanied the Abyssinian expedition, and on his return from

Magdala, visited the rock-churches of Lalibala and Sokota ('Abessinien,' Bremen, 1868). After a few months' rest, he returned to Tripolis with the presents intended by the King of Prussia for the Sultan of Bornu. Having intrusted these to Dr. Nachtigal, he travelled through Cyrenaica, Awjila, and Siwa to Alexandria, where he arrived on May 26, 1869 ('Von Tripolis nach Alexandrien,' Bremen, 1871). He then returned home, married, and settled down at Weimar. But this period of inactivity was of short duration, for already in 1873 he accepted the command of an expedition which the Khedive dispatched into the Libyan desert, and during which he was accompanied by Dr. Zittel, the geologist; Dr. Ascherson, the botanist; Dr. Jordan, a surveyor; and others. The scientific results of this expedition were of the highest importance. Siwa was reached in February, 1874, after a thirty-six days' march through a sandy desert ('Expedition zur Erforschung der Libyschen Wüste,' Cassel, 1875-6; 'Drei Monate in der Libyschen Wüste,' Cassel, 1875).

In 1878, the German Government intrusted Dr. Rohlfs and Dr. Stecker with an expedition to Wadai. They left Tripolis on December 18, and, after long delays, succeeded in reaching the oasis of Kufra; but, being attacked by Suya Arabs, on September 12, 1879, they were obliged to retreat in haste to Benghazi, where they arrived on October 25 ('Kufra,' Leipzig, 1881). Dr. Stecker was then charged by the German African Association with explorations in Abyssinia. Dr. Rohlfs accompanied him, but, having handed to the Negus Johannes a letter from the Emperor William, at Debra Tabor, he returned to Europe ('Meine Mission nach Abessinien,' Leipzig, 1883).

In 1885, Prince Bismarck, who had a high opinion of Dr. Rohlfs' abilities, appointed him German Consul at Zanzibar; but this experiment in the employment of untrained diplomatists proved anything but encouraging, and Dr. Rohlfs was recalled after having occupied his post for only a short time. He did not again visit Africa.

Dr. Rohlfs, in the course of his extensive travels, made known to us wide regions in Africa, of which, up to his time, we only knew from the reports of earlier Arab explorers or from native information. He never made any astronomical observations, nor seems his knowledge of natural history to have been very profound; but he furnished excellent accounts of the countries he traversed, and their inhabitants, laid down his routes from compass bearings, and kept a careful record of meteorological observations. He therefore fully deserved the Patron's Medal of the Society, which was awarded him in 1868, "for his extensive and important travels in the interior of Northern Africa."

Count Wilfrid von Wagner.

This young traveller, who set out early in 1895 for the Congo, in the hope of accomplishing some geographical exploration in the upper basin of the river, has, we regret to state, fallen a victim to fever without advancing further than Stanley Pool. Before starting for Africa, Count von Wagner had visited England and received instruction in mapping and photography from the Society's instructors, Mr. Coles and Mr. Thomson. He had also become a Fellow of the Society in 1894. We have received some details respecting his ill-fated expedition from his brother, who writes from the Schloss Verinsberg, in Bavaria. In September, 1895, the Count wrote from Kinshassa, on Stanley Pool, saying that he had then been waiting three months for the arrival of his goods, for the conveyance of which an arrangement had been made with the "Société Anonyme Belge." After another month's delay, rendered doubly trying by the risk of failure involved by it to his expedition, he

fell ill with fever, and, in spite of the care and attention of Drs. Carré and Sims of Leopoldville, died on December 23, 1895. Count von Wagner had studied medicine at the Munich University, afterwards devoting his attention to mathematics, and would, it was hoped, have done useful work in Africa, had his life been spared.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

Special General Meeting, June 22, 1896.—SIR CLEMENTS MARKHAM,
K.C.B., F.R.S., President, in the Chair.

THIS meeting was summoned to consider certain alterations in the bye-laws proposed by the Council, mainly for the purpose of bringing the bye-laws into conformity with the Charter and with actual practice, and to improve the construction of some of the sections. The alterations as proposed by the Council were substantially adopted by the meeting. An amendment proposed by Admiral Halliday Cave, and approved by the Council, was adopted. It was an addition to Chapter VI. section I, "Anniversary Meetings," and referred to the mode of electing the Council. It is as follows:—

"If the name of any Candidate is found to be simply erased in the majority of the balloting papers, without any name being substituted, as provided in paragraph 4 of this section, such Candidate shall not be elected. The vacancy thus created may either be left open till the next Annual Meeting, or be filled up at an adjourned General Meeting of the Fellows, as the Chairman may think best."

In compliance with what seemed to be the feeling of the meeting, the rule as to the order of business at the Anniversary Meetings was altered as follows:—

"The following shall be the Agenda for the Anniversary General Meeting:

- (1) The Presentation of the Gold Medals and other awards of the Society.
- (2) The Presidential Address.
- (3) An interval for the withdrawal of visitors, prior to which no discussion shall be allowed.
- (4) The presentation of the Annual Report of the Council.
- (5) The election of the Council and Officers for the ensuing year."

Fifteenth Ordinary Meeting, June 22, 1896.—SIR CLEMENTS MARKHAM,
K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*William Charles Heaton Armstrong, J.P.; Baron Benlinck; R. W. Crosse; Louis William Dane; Sir Charles Alfred Elliott, K.C.S.I.; George Savile Foljambe, J.P.; Colonel James Hayes Sadler; Charles Alfred Gordon Littington; Henry Simpson Lunn, M.D.; Angus MacLeod, R.N.; Thomas Edward Maddox; Captain W. P. Pulteney (Scots Guards); Captain Thomas Harrison Topham, R.E., D.S.O.; Robert F. W. Schmidt; Lord Wenlock, G.C.S.I.*

The Paper read was:—

"A Recent Eruption of Ambrym Island, New Hebrides." By Commander H. E. Purey-Cust, R.N.

The PRESIDENT said: As this is the last meeting of the Society before November, I should like to say, and I think you will agree with me, that this has been a very interesting session. We have had papers from most parts of the world, all of them of considerable merit, commencing with Mr. Montefiore's account of the proceedings of the Jackson-Harmsworth Expedition. From Asia we have had

the admirable paper describing Mr. Littledale's journey across the great plateau of Tibet, Prince Henri d'Orleans' account of a journey from China to Assam, and a most interesting paper on the Shan States by Colonel Woodthorpe. In Africa, we have listened to Dr. Donaldson Smith's paper on a journey to Lake Rudolf and back to the coast, and to two excellent papers on Hausaland by the Rev. C. H. Robinson and Mr. Wallace. We have been taken to the tops of many mountains. Besides this most interesting trip conducted by Mr. Cust to the top of Ambrym this evening, Mr. Howarth has led us to the summit of Popocatepetl, and Mr. Fitz Gerald has described the Southern Alps of New Zealand. We have had some interesting papers at our afternoon meetings, and the paper given us by Prof. Milne on the movements of the Earth's crust gave rise to a valuable discussion.

I sincerely trust that next session will be as fortunate as this session has been.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce, Commercial.
 C. Rd. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 J. = Journal.
 M. = Mittheilungen.

Mag. = Magazine.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue, Revista.
 S. = Society, Société, Selakab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria-Hungary.

Austria, including Hungary, Transylvania, Dalmatia, and Bosnia. Handbook for Travellers by Karl Baedeker. With 28 Maps and 25 Plans. Eighth Edition. Leipzig: Karl Baedeker, 1896. Size 6½ × 4½, pp. xiv. and 468. Price 7 marks. Presented by Messrs. Dulau & Co.

Baedeker.

Austria—Karst.

Globus 69 (1896): 302–306.

Moser.

Einst bewohnte Felshöhlen des Karstes im österreichischen Littorale. Von Prof. Dr. Karl Moser, Triest. With Illustrations.

Baltic Pilot.

Baltic Pilot, Part i., formerly published as the Danish Pilot. Originally compiled by the late Vice-Admiral Zahrtmann. Third Edition. London: J. D. Potter, 1895. Size 9½ × 6, pp. xx. and 534, index chart. Price 5s. 6d. Presented by the Hydrographic Office, Admiralty.

Channel Pilot—Supplement.

Supplement, 1895, relating to Channel Pilot, Part i. Eighth Edition, 1893. Corrected to July, 1895. London: J. D. Potter, 1895. Size 9½ × 6, pp. 70. Price 9d. Presented by the Hydrographic Office, Admiralty.

Eastern Europe.

Ann. G. 5 (1896): 305–308.

Tillo.

Carte hypsométrique de la partie occidentale de la Russie d'Europe. Par M. le Lieutenant Général Alexis de Tillo. With Map.

A sheet of this beautiful contoured map on the scale of 1 : 1,680,000, including

the whole Carpathian range, is reproduced in colours and without names, giving a striking picture of the configuration of the country.

France—Auvergne. *Ann. G.* 5 (1896): 277-296. **Boule.**

La topographie glaciaire en Auvergne. Par M. Marcellin Boule. *With Maps and Illustrations.*

An interesting and excellently illustrated account of the glacial land-forms of Auvergne, including several admirable examples of the type of scenery well known in Scotland as "Crag-and-tail." A map is given showing the probable position and direction of the ancient glaciers of Auvergne.

France—Glaciers. *C. Rd.* 122 (1896): 1158-1155. **Bonaparte.**

Mesures des variations de longueur des glaciers de la région française. Note du prince Roland Bonaparte.

France—The Faucilles. *B. Trim. S.G. de l'Est* (1895): 369-377. **Fournier.**

D'où vient le nom de Faucilles? Par A. Fournier.

France—Normandy. *Rev. Scientifique* (4 S.) 5 (1896): 620-624. **Thoulet.**

Les falaises du pays de Caux. Par M. J. Thoulet.

Germany. *Notizblatt Ver. Erdk. Darmstadt* (4) 16 (1895): 19-32. **Klemm.**

Ueber die Glacierscheinungen im Odenwald und Spessart. Von G. Klemm. *With Plates.*

Germany—Bavaria. **Gruber.**

Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirohnhof. Neunter Band. Heft 6. Der Hesselberg am Frankenjura und seine südlichen Vorhöhen. Von Dr. Christian Gruber. Stuttgart: J. Engelhorn, 1896. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [80]. *Map, Diagram, and Illustrations.*

An excellent piece of local geography, commencing with the literary associations of the district and the meaning of the name, then taking up the history of the various surveys and maps of the isolated hill-mass known as the Hesselberg, and entering into the geomorphological data of mean height, volume, structure, etc. Special topographical references to different parts of the district are given, two short chapters are devoted to springs, watercourses, and meteorology; and in conclusion there is a chapter on the economic characteristics of the district.

Germany—Colonies.

Jahresbericht der Deutschen Kolonialgesellschaft, 1895. Berlin, 1896. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 78.

Germany—Posen. *Petermanns M.* 42 (1896): 118-120. **Langhans.**

Die bisherige Thätigkeit der Ansiedelungs-Kommission für die Provinzen Westpreussen und Posen. Von Paul Langhans. *With Map.*

Statistics of the work of the Commission for German settlements in Prussian Poland, illustrated by a map on the scale of 1 : 500,000, or about 8 miles to an inch.

Italy—Alps. *Mem. S.G. Italiana* 5 (1896): 384-434. **Stefani.**

Studio idro-geologico sulla sorgente della Pollaocia nelle Alpi Apuane del socio Carlo de Stefani. *With Map.*

Italy—Cagli Earthquake. *Mem. S.G. Italiana* 5 (1896): 363-383. **Baratta.**

Sul terremoto di Cagli del 3 giugno 1781. Studio del Socio Mario Baratta.

Italy—Mont Herbetet. *Alpine J.* 18 (1896): 84-96. **Oliver.**

Mont Herbetet and its Southern Ridge. By F. W. Oliver. *With two Illustrations.*

Mediterranean Pilot.

The Mediterranean Pilot. Vol. ii. Comprising Coasts of France, and of Italy to the Adriatic; African Coast from Jerba to El Arish; Coasts of Karamania and Syria, together with the Tuscan Archipelago, and Islands of Corsica and Cyprus. Third Edition. London: J. D. Potter, 1895. Size $9\frac{1}{2} \times 6$, pp. xxvi. and 510. *Index Chart.* Price 5s. *Presented by the Hydrographic Office, Admiralty.*

Mediterranean—Sicily and Malta. **Erödi.**

Utazásom Sicilia és Malta szigetén. Irta Erödi Béla. Budapest: Lampel Róbert, [1895]. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 220. *Map and Illustrations.* *Presented by the Author.*

Montenegro. **Cozens-Hardy.**

The Frontiers of Montenegro. By W. H. Cozens-Hardy, 1894. Size $13\frac{1}{2} \times 8\frac{1}{2}$. MS.

- North-Western Europe.** *Quarterly J. Geolog. S.* 52 (1896): 331-406. **Geikie.**
The Tertiary Basalt-plateaux of North-Western Europe. By Sir Archibald Geikie, D.Sc., etc. *With Plates and Sections.*
- Norway.** **Richter.**
Geomorphologische Beobachtungen aus Norwegen. Von Dr. Eduard Richter. Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe; Bd. CV, Abth. I. Februar 1896. Wien, 1896. Size 10 x 6½, pp. 44. *Plates. Presented by the Author.*
- Norway.** **Bradshaw.**
Norway, its Fjords, Fjelds, and Fosses. By John Bradshaw. London: Digby, Long & Co., [1896]. Size 8 x 5, pp. 218. *Price 3s. 6d. Presented by the Publishers.*
This book, after three general introductory chapters, is simply a narrative of one of the pleasure cruises along the coast of Southern Norway. There are neither maps nor illustrations.
- Norway—Glaciers.** *Petermanns M.* 42 (1896): 107-110. **Richter.**
Beobachtungen über Gletscherschwankungen in Norwegen 1895. Von Prof. Dr. E. Richter.
- Russia—Ålands Islands.** *Deutsche Rundschau G.* 18 (1896): 193-202, 300-310. **Weis.**
Die Ålands-Inseln. Von Anton Weis. *With Map and Illustrations.*
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Bibliography—Marsh Library Catalogue.

University of Vermont. Catalogue of the Library of George Perkins Marsh. Burlington, Vermont: Published by the University, 1892. Size 11 × 8, pp. viii. and 742. *Presented by the University of Vermont.*

British Empire—Telegraphs. Contemporary Rev. (1896): 899-908. Hurd.

Our Telegraphic Isolation. By Percy A. Hurd.

Church Missionary Atlas.

The Church Missionary Atlas, containing an Account of the various Countries in which the Church Missionary Society labours, and of its Missionary Operations. New Edition (the Eighth). With Thirty-two Coloured Maps. London: Church Missionary Society, 1896. Size 10 × 6½, pp. 240. *Presented by Dr. R. N. Cust.*

A text-Atlas giving prominence to distribution of religions and to mission fields, showing not only the stations of the Church Missionary Society, but also those of most other religious agencies. See note, p. 76.

Health in tropical countries.**Cayley.**

Guide to Travellers on the maintenance of Health in Unhealthy Countries. By Henry Cayley. London: Horace Cox, 1896. Size 6 × 4½, pp. 20. *Price 1s. Presented by the Publisher.*

A slightly expanded letter of advice from a medical man to an officer ordered abroad. It contains practical hints on the preservation of health.

Measures.**Dickson.**

Mètre *versus* Pouce; or arguments in favour of a Decimal System of British Weights and Measures, founded on a 30-inch Base. By James Dickson. Glasgow: J. C. Erakine, 1891. Size 8½ × 5½, pp. 20. *Diagrams. Presented by the Author.*

Ocean Passages.

Ocean passages for the World. First Edition, 1895. Compiled for the use of seamen, as an aid for ascertaining the route to be followed in the general navigation of the several oceans. London: J. D. Potter, 1895. Size 9½ × 6, pp. 182. *Presented by the Hydrographic Office, Admiralty.*

The first issue of a selection of routes in all seas, and especially ocean passages, collected from the various volumes of sailing directions published by the Admiralty, and brought together for the convenience of mariners.

Smithsonian Institution.

An account of the Smithsonian Institution, its Origin, History, Objects, and Achievements. Washington, 1895. Size 10 × 6½, pp. [28]. *Portraits and Illustrations.*

Travel.**Lunn.**

Travel. Edited by Henry S. Lunn, M.D. Vol. i. No. 1. May, 1896. London: H. Marshall & Son. Size 10 x 7, pp. 58. *Illustrations. Price 3d. monthly.*
A new magazine of popular travel.

Travels.**Archduke Frans Ferdinand.**

Tagebuch meiner Reise um die Erde. 1892-1893. Zweiter Band. Wien: Alfred Hölder, 1896. Size 10½ x 7½, pp. 566. *Maps and Illustrations. Presented by the Publishers.*

This volume completes the account of the Archduke's voyage round the world, describing his impressions of Australia, New Guinea, the Malay Archipelago, the coast of China, Japan, the Canadian Rocky Mountains, the Yellowstone Park, and his return to Vienna *via* New York and Havre.

Units of geographical measurement.**Staggemeier.**

Le Millionième de la surface terrestre représenté comme une unité convenable pour l'estimation des étendues géographiques. Par Axel Staggemeier, Lieut. Col. Copenhagen: Lehmann & Stage, 1896. Size 8 x 5½, pp. 8. *Presented by the Author.*

NEW MAPS.**By J. Coles, Map Curator, R.G.S.****EUROPE.****Birmingham.****Bartholomew.**

Plan of Birmingham. Scale 1: 2542 or 0.31 stat. mile to an inch. By John Bartholomew, F.R.G.S. 1896. W. H. Smith & Sons, London. *Price 1s. on cloth. Presented by J. Bartholomew & Co.*

England and Wales.**Ordnance Survey.**

Publications issued since June 7, 1896.

1-inch—General Maps:—

ENGLAND AND WALES:—(revision), 301, in outline, 1s.

SCOTLAND:—(revision), 1, in outline, 1s. 9d.

6-inch—County Maps:—

ENGLAND AND WALES:—Devonshire (revision), 117 n.e. Cornwall (revision), 55 n.w. Lancashire (revision), 103 s.w., showing Manchester Ship Canal, 1s. each. Yorkshire, 21, 34, 2s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—Berkshire (revision), XLIV. 13; XLVI. 9, 13, 1s. each. Durham (revision), VII. 14, 15; XII. 6, 7, 8, 9, 10, 11; XIII. 6, 3s. each. Essex (revision), XLII. 6, 9, 10, 11, 14, 15; L. 10, 11, 15; LI. 6, 10, 14; LVIII. 4, 8, 12, 14, 15, 16; LIX. 1, 5; LXVI. 1, 3, 12, 14, 3s. each. Hampshire (revision), IV. 13; VI. 9, 13; XI. 13, 15, 16; XII. 5, 13; XVIII. 8; XIX. 4, 7, 11, 15; XXII. 12; XXIII. 10, 11, 14; XXX. 3, 4; XXXI. 8, 3s. each. Hertfordshire (revision), XLVI. 1, 3s. each. Kent (revision), XLIX. 3, 4, 7, 8, 12, 15, 16, 3s. each. Lancashire (revision), CXV. 13 (coloured), 11s. 6d., showing Manchester Ship Canal. Middlesex (revision), VII. 1, 2; X. 8, 11, 12, 15, 16, 3s. each. Northumberland (revision), LXXXIII. 9, 10, 12, 14, 15, 16, 3s. each. Surrey (revision), IV. 12, 16; V. 13; X. 6; XI. 1.; XVI. 15, 16; XVII. 8; XXIII. 2, 3, 8, 10, 14; XXIV. 4, 6, 7, 8, 10, 12; XXV. 1, 9, 10, 11, 3s. each. Wiltshire (revision), LXI. 3, 3s. each.

Town Plans—10-feet scale:—

ENGLAND AND WALES:—Newcastle, Gateshead and Environs (revision), 76, 86, 91, 111, 2s. 6d. each. Tynemouth, North and South Shields (revision), 60, 72, 2s. 6d. each. Wallsend, Jarrow and Environs, 1, 2, 3, 4, 5, 6, 7, 8, 15, 16, 17, 18, 26, 27, 32, 33, 34, 2s. 6d. each.

5-feet scale:—

London—Re-survey, XII. 17; XV. 75, 95; XVII. 5, 2s. 6d. each. The revised edition of London is now complete in 756 sheets, 2s. 6d. each. Index, 3d.

(*E. Stanford, Agent.*)

Germany.**Hickmann.**

Prof. A. L. Hickmann's Geographisch-statistischer Taschen-Atlas des Deutschen Reichs. Erster Teil. Verlag der Kartograph. Anstalt G. Freytag and Berndt. Leipzig und Wien, 1896. *Price 4 marks. Presented by the Publishers.*

This is a very nicely-got-up little school atlas, containing a large amount of statistical and geographical information. Care has evidently been taken to make it as attractive and instructive as possible, the graphic system of teaching by the use of sections and diagrams having been largely employed. Although intended for educational purposes, this atlas will prove useful for general reference, as regards Germany.

Ireland.**Bartholomew.**

The Tourists' Map of Ireland. Scale 1 : 633,000 or 10 miles to an inch. By John Bartholomew, F.R.G.S. 1896. Edinburgh: J. Bartholomew & Co. *Price 2s. on cloth. Presented by the Publishers.*

Manchester.**Bartholomew.**

Plan of Manchester and Salford. Scale 300 yards to an inch. By John Bartholomew, F.R.G.S. 1896. London: W. H. Smith & Sons. *Price 2s. on cloth. Presented by J. Bartholomew & Co.*

Rome.**Schneider.**

Das alte Rom. Entwicklung seines Grundrisses und Geschichte seiner Bauten, auf 12 Karten und 14 Tafeln dargestellt, und mit einem Plane der heutigen Stadt sowie einer Stadtgeschichtlichen Einleitung. Herausgegeben von Arthur Schneider. Leipzig: Druck und Verlag von B. G. Teubner, 1896.

This atlas contains maps, plans, and illustrations of Ancient Rome, from the earliest times to the fourth century after Christ. By an ingenious arrangement, a comparison of the ancient city at different periods and its present condition can easily be made. This is accomplished by placing one of the ancient plans, which are printed on tracing-paper, over a modern plan printed on cardboard, on the same scale. The illustrations are numerous, and have been selected to show, on each sheet, the public buildings that were erected at different periods. The whole is accompanied by explanatory letterpress.

ASIA.**China.****Villard.**

Map of the Yangtse-Kiang in 13 sheets, from its mouth to Chungking, and general chart from mouth to source, with plans of Shanghai, Chinkiang, Nanking, Wuhu, Kiukiang, Hankow, Ichang, and Chungking, Lights, etc. Scale 1 : 185,000 or 2.5 stat. miles to an inch. By R. A. de Villard. Shanghai, 1895. *Price £1 15s.*

The contents of this map are fully described in the title. One of the principal features is that the names of places are written in both English and Chinese.

India.**Survey of India Department.**

Chart (on Mercator's projection) of the Tidal and Levelling operations of the Survey of India Department, 1858-95, showing approximate cotidal lines. Scale 1 : 6,500,000 or 102 stat. miles to an inch. *Presented by Lieut. C. C. D. Morice, R.E., Survey of India Department.*

Indian Government Surveys.**Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Quarter-sheets: 9 n.w., parts of districts Shikarpur and Hyderabad, and of Khairpur Native State (Sind, Bombay Presidency); 21 s.e., parts of Palanpur and Mahi Kantha agencies, of Native State Baroda (Bombay), and of Oodeypore (Rajputana); 26 n.e., part of district Ratnagiri (Bombay Presidency); 49 s.w., parts of districts Delhi, Gurgaon, Rohtak, and Hissar, and of Native States Patiala Jind, Loharu, and Nabha (Punjab), Jeypore and Ulwur states (Rajputana); 50 n.w., parts of Native States Jeypore, Ulwur, and Bhurtore (Rajputana Agency), Patiala and district Gurgaon (Punjab); 69 n.w., parts of Gwalior and Bundelkhand (Central India Agency), and of districts Jalaun, Jhansi, Hamirpur and Etwah (N.W. Provinces); 126 s.e., parts of districts Noakhali, Chittagong, South Lushai Hills, Native State Hill Tippera (Bengal), and of North Lushai Hills (Assam).—Railway Map of India. Railways brought up to October, 1895, 1 inch to 48 miles, 4 sheets.—India, 128 miles to an inch, December, 1895.—Punjab and Kashmir, 16 miles to an inch, November, 1895.—Lower Provinces Revenue Survey, 1 inch to a mile, Sheets Nos. 3 and 4, district 24, Purgunnaks.—Bengal Survey, 1 inch to a mile, Seasons 1850-1894, Sheet No. 8, parts of Rewah State (Central India Agency), Sarguja and Koria of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces); No. 270 (Preliminary edition), districts Darjeeling and Jalpaiguri; No. 349, districts Mymensingh, Dacca, Faridpur, and Pabna; No. 377, districts Mymensingh and Dacca.—Bombay Survey, 1 inch to a mile, Seasons 1893-94. Sheets Nos. 334 and 335, district Dharwar and Native States Sangli, Miraj (Senior and Junior), and Savanur (Dharwar Agency).—North-West Provinces and Oudh Survey, 1 inch to

a mile, Seasons 1865-68-69 and 82-84. Sheet No. 187, parts of Rewah State (Central India Agency), Sarguja and Korla of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces).—Central India and Rajputana Survey, 1 inch to a mile, Seasons 1865-68-69 and 82-84; No. 483, parts of Rewah State (Central India Agency), Sarguja and Korla of Garhjat States (Bengal), and district Mirzapur (N.W. Provinces).—Central Provinces Survey, 1 inch to $\frac{1}{2}$ miles, Seasons 1862-65. Sheets Nos. 206, 207, 224, and 225 (on one), parts of district Raipur and its Zemindaries, Bindra-Nawagarh, Phingaswar and Khariar; also of district Sambalpur and its Garhjat States, Patna, Borasamar, and Phuljhar (Central Provinces).—Indus Riverain Survey, 1 inch to a mile, Season 1893-94. Sheets: No. 23, districts Shikarpur, Karachi, and Hyderabad; No. 24, districts Karachi and Hyderabad; No. 25, districts Karachi and Hyderabad; No. 26, districts Karachi and Hyderabad; No. 27, district Karachi; No. 41, district Shikarpur and Khairpur State; No. 42, districts Shikarpur, Hyderabad, and Khairpur State; No. 43, districts Karachi and Hyderabad; No. 45, district Hyderabad; No. 46, districts Karachi and Hyderabad; No. 47, districts Karachi and Hyderabad; No. 48, districts Karachi and Hyderabad; No. 68, district Hyderabad.—Upper Burma Surveys, 1 inch to a mile, Seasons 1889-93. Sheets: No. 166, districts Sagaing and portion of Lower Chindwin; No. 167, districts Sagaing and portion of Lower Chindwin; No. 168, district Sagaing; No. 213, district Sagaing; No. 214, district Sagaing; No. 215, district Sagaing; No. 216, district Sagaing; No. 259, district Mandalay and Shwebo; No. 260, districts Mandalay, Sagaing, and Shwebo; No. 262, districts Kyankae and Sagaing.—South-Eastern Frontier, 1 inch to 4 miles, Seasons 1853-61 and 1883-92. Sheet No. 2 n.w., parts of districts Chittagong (Bengal), of Northern Arakan and Akyab (Lower Burma), and of Chin Hills (Upper Burma).—District Almora, N.W. Provinces and Oudh, 1 inch to 16 miles, 1895.—Sub-division Chittagong Hill Tracts, Bengal, 1 inch to 8 miles, 1890.—District Hamirpur, N.W. Provinces and Oudh, 1 inch to 8 miles, 1896.—District Hoangabad, Central Provinces, 1 inch to 12 miles, 1895.—District Lucknow, N.W. Provinces and Oudh, 1 inch to 8 miles, 1895.—District Mymensingh, Bengal, 1 inch to 8 miles, 1892.—District Puri, Bengal, 1 inch to 8 miles, 1890.—District Tippera, Bengal, 1 inch to 8 miles, 1892.—Index to the standard sheets of Bengal additions to 1895.—Chart of Triangulation and Traversing Gujarat Survey, $\frac{1}{2}$ inch to a mile. Degree Sheets VIII. and IX., Seasons 1883-88. *Presented by H.M. Secretary of State for India through the India Office.*

AFRICA.

South Africa.

Johnston.

South Africa, constructed by W. & A. K. Johnston, Edinburgh and London. Scale 1: 1,480,000 or 23.4 stat. miles to an inch. *Price 12s. Presented by the Publishers.*

This map is drawn in a bold style suitable for use in schools. It shows accurately the present state of railway communication in South Africa, and a table is given of the electoral divisions of the Cape Colony. The map is not overcrowded with names.

Sudan.

Bartholomew.

Bartholomew's Special Large-Scale Map of the Sudan scale 1: 2,000,000 or 31.5 miles to an inch, with General Map of North-East Africa and enlarged plan of Khartum. John Bartholomew & Co., Edinburgh. *Price 1s. Presented by the Publishers.*

The large-scale map of the Sudan includes the valley of the Nile from Korosko to some distance above Khartum, and extends on the east to the Red Sea. All the caravan routes across the desert are shown. The general map extends from the Mediterranean to Lake Nyasa, and from the Upper Congo region to the Indian Ocean. It will be useful to all who wish to follow the course of events in the Nile valley at the present juncture.

AMERICA.

California.

Sierra Club.

Map of the Sierra Nevada Mountains of Central California. Publication No. 12 of the Sierra Club. Scale 1: 253,440 or 4 stat. miles to an inch. Berkeley, Cal., 1896. *Price \$1.50. Presented by the Sierra Club.*

The previous edition of this map was noticed in the *Geographical Journal*, August, 1893. The present has been compiled for the Sierra Club by Mr. J. N. Le Conte, from the latest published sources, and from observations and explorations made by himself and other members of the club. Insets on an enlarged scale are given of the Hetch-Hetchy and Yosemite valleys.

Venezuela.

Nördliches Venezuela von W. Sievers. I. Übersicht der geologischen und topographischen Verhältnisse. Scale 1 : 3,000,000 or 47·5 geo. miles to an inch. Petermann's 'Geographische Mittheilungen.' (Jahrgang 1896. Tafel 6. Presented by the Publisher.

GENERAL.**The World.**

The World-Wide Atlas of Modern Geography, Political and Physical. Contains one hundred and twelve plates and complete Index. With an Introduction by J. Scott Keltie. Third edition. W. & A. K. Johnston, Edinburgh and London, 1896. Price 7s. 6d. Presented by the Publishers.

This is the third edition of an atlas which has been favourably noticed on a previous occasion.

The World.**Saint-Martin and Senegal.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, avec un Texte Analytique. Ouvrage commencé par M. Vivien de Saint-Martin, continué par Fr. Schrader. 84 Cartes gravées sur cuivre sous la direction de MM. E. Collin et Delaune. Sheet No. 57, Afrique Physique. 1 : 20,000,000 or 31·5 stat. miles to an inch. Paris : Librairie Hachette et Cie.

This is a reduction of the three-sheet map of Africa which has already been published in this atlas on the scale of 1 : 10,000,000. Where necessary it has been corrected, use having been made of the work of all the more recent explorers. The map is orographically coloured in five tints, and the depths of the ocean shown, up to 100 metres, in seven shades of blue. Accompanying the map is a note in which the authorities consulted in its construction are mentioned.

CHARTS.**Chilian Charts.****Oficina Hidrográfica,**

Planos de la Costa Chile. No. 56, Caleta Esmeralda. No. 57, Croquis de Punta HARRISA, Bahía Porvenir. No. 58, Bahía de Conchalí i Puerto Vilos. Taller de la Oficina Hidrográfica de Chile, 1896. Presented by the Chilian Hydrographic Office.

Indian Ocean.**Admiralty.**

Monthly Current Charts for the Indian Ocean. Published at the Admiralty, 1896, under the superintendence of Rear-Admiral W. J. L. Wharton, C.B., F.R.S., Hydrographer. London. Price 7s. Presented by the Hydrographic Department through the Hydrographer.

A full notice of this important atlas will appear on a future occasion.

ASTRONOMICAL.**Star Chart.****English.**

Chart of Southern Circumpolar Stars, made in Sydney Observatory under the direction of H. C. Russell, Astronomer.

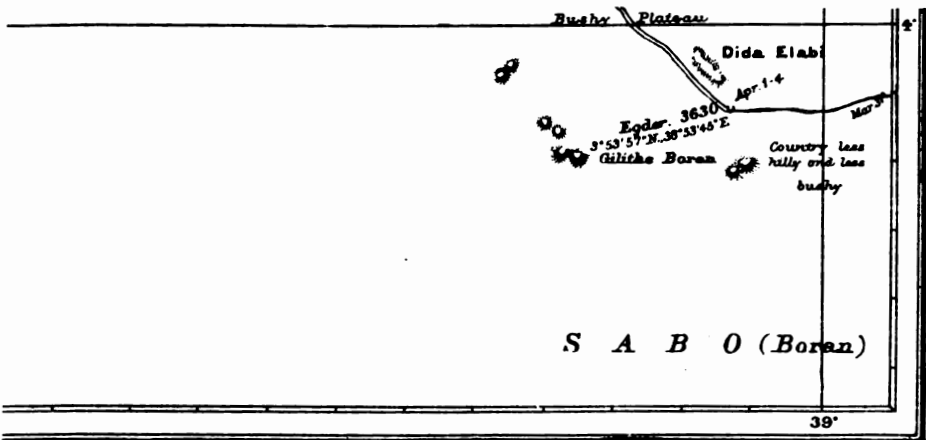
All stars down to the sixth magnitude, whose declination is greater than 45° are shown on this chart. Star-magnitudes are indicated by well-chosen symbols, as the chart is drawn in a clear and bold style, it should be useful to those who have occasion to observe southern circumpolar stars.

PHOTOGRAPHS.**India and Andaman Islands.****Whitehouse.**

Seventeen photographs of India and Andaman Islands, including enlarged photograph of Mount Everest from Sandakfu, taken by Lieut. Whitehouse, R.N. Presented by Lieut. Whitehouse, R.N.

This is an interesting set of photographs. They are all good specimens, and contain an excellent idea of the scenery. The view of Mount Everest from Sandakfu is particularly worthy of special commendation. It is a framed enlargement, and has been hung in the Society's house.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, the names will be useful for reference if the name of the photographer and his address are given.



S A B O (Boran)



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VOL. VIII.

THE HAUSA TERRITORIES.*

I. HAUSALAND.

By the Rev. CHARLES H. ROBINSON, M.A.†

BEFORE beginning to describe the country which I have recently had the pleasure of visiting, I ought perhaps to say something in regard to the use of the expression "Central Sudan." The word "Sudan," which means simply the black country, *i.e.* the country of the blacks, is applied by the natives themselves to the whole of the vast region, south of the Great Sahara and north of the equator, stretching from the river Nile on the east to the Atlantic Ocean on the west. To the Hausa States, which occupy about the middle of this immense area, may be most correctly referred the title Central Sudan. The Hausa States extend, roughly speaking, from lat. 8° to 14° N., and from long. 4° to 11° E. They include an area of about half a million square miles. The reason why this region, the most populous and fertile region in all Central Africa, has been so long, comparatively speaking, neglected is that it is shut off from intercourse with the sea, and thus with Europeans, by two obstacles of more than ordinary magnitude. Of the two possible ways by which this territory can be approached, the shortest and most obvious is to ascend the Niger for about 300 miles, and thence proceed overland; the distance to Kano, the most important town in the Hausa States, being about 400 miles from the river. The great drawback to this route is the extreme unhealthiness of the Niger delta, and the difficulty of obtaining any satisfactory transport through it. Moreover,

* Papers read at the Royal Geographical Society, May 11, 1896. Map, p. 316.

† Author of 'Hausaland; or, Fifteen Hundred Miles through the Central Soudan.' Sampson Low. Illustrated. 14s.

it is only within the lifetime of men still living that this route has been rendered possible at all, by the discovery of the mouth of the Niger. As late as 1788, barely more than a century ago, the African Association, which was afterwards incorporated with the Royal Geographical Society, sent out Ledyard as their representative, with instructions to go *viá* Cairo to search for the mouth of the Niger, thus clearly showing that they believed the Niger and the Nile to be the same river.

The other possible way in which Hausaland may be reached from the sea is by crossing the Great Sahara from the Mediterranean, the distance to Kano by this route being about 1800 miles, a considerable portion of which is across an almost waterless desert. After spending nearly a year in Tripoli and in Tunis, studying the Hausa language and making inquiries as to the possibility of crossing the desert from the north, I came to the conclusion that this route is for the present impracticable, and accordingly decided to go by way of the river Niger. Accompanied by two other Englishmen, Dr. Tonkin and Mr. Bonner, I ascended the Niger for 300 miles as far as Lokoja, and thence ascended the Binnú for 100 miles to Loko. Leaving the river here, we walked on foot for 350 miles to Kano, the direction being almost due north. The greater part of the country between Loko and Kano is forest, but it is so thinly wooded that it is usually possible to see from 50 to 100 yards on either side of the path. We took observations day by day with aneroids and boiling-point thermometer, in order to ascertain the altitudes, and a few observations for longitude. Loko itself, though 400 miles up from the sea, is only 425 feet above sea-level. A hundred miles north of Loko, Kaffi, a town of about 15,000 or 20,000 inhabitants, has an altitude of 1000 feet. On leaving Kaffi the ground begins rapidly to rise, till about 100 miles further north it attains an altitude, at a place called Katill, of 2530 feet above sea-level. This is the highest point we passed anywhere in the course of our journey, and, with the exception of a few isolated points, is the highest district in the whole of the Hausa States. North of Katill the ground gradually declines, Zaria, 50 miles north of Katill, and 250 north of Loko, being just over 2000 feet. From Zaria to Kano the country continues to decline, the level of Kano being 1690 feet. This last represents the elevation of a very large district for many miles around Kano. The question of elevation in the Central Sudan is one of considerable interest, as the comparative healthiness of different districts bears a close relation to their respective elevations. We shall refer to this again a little later on.

In maps of Africa which are drawn so as to illustrate the comparative density of the population in different districts, the Hausa States are usually marked so as to suggest that the population is denser here than in any other part of the continent, or, at any rate, of tropical Africa. The Hausa-speaking population has been estimated by travellers at

about 15,000,000, and though such an estimate must necessarily be extremely rough, we saw no reason for suggesting any great change by way either of addition or subtraction. Every day, as a rule, we passed two or more villages of considerable size, and about every 50 miles we came across a town containing from 10,000 to 30,000 inhabitants. The political capital of the whole country is Sokoto, situated in the north-western corner of Hausaland, a large portion of the inhabitants of which are not Hausas, but Fulahs. The commercial capital, and by far the most important town, is Kano. The market of Kano is, indeed, the most important in the whole of tropical Africa, and its manufactures are to be met with from the Gulf of Guinea on the south to the Mediterranean on the north, and from the Atlantic on the west to the Nile or even the Red Sea on the east. Any one who will take the trouble to ask for it will find no difficulty in purchasing Kano-made cloth at towns on the coast as widely separated from one another as Alexandria, Tripoli, Tunis, and Lagos. The market-place of Kano is probably the largest in the world. Colonel Monteil, who visited it four years ago, estimated the average daily attendance at the market to be from 25,000 to 30,000, and the estimate does not appear to be much, if at all, above the mark. It is the great meeting-place for traders from almost all parts of Africa north of the equator and west of the Nile valley. The Tuarek of the desert comes in touch here with the natives of Adamawa and the south; the Arab merchant meets here with traders from Lake Chad on the one side, and the Niger, or even the Atlantic seaboard, on the other. Here too are to be seen Mussulman pilgrims from far and near, on their way to or from Mekka. The walls of the town, which are kept in very fair repair, are 15 miles in circumference, and are entered by thirteen gates. The principal occupation of its inhabitants consists of the weaving of cloth from native-grown cotton, and in manufacturing it into garments of various kinds. As Monteil says, Kano clothes far more than half the population of the Central Sudan. The greater part of this cloth is dyed blue, the native indigo, which grows wild all over the country, being used for this purpose.

The most important article of commerce in the Kano market, on the supply of which the prosperity of the town to a large degree depends, is the kola nut, *Sterculia acuminata*. Though it does not grow in any part of the Hausa States, there is, nevertheless, no village or hamlet, however remote, in which it is not constantly used. The district from which it is imported lies at the back of the Gold Coast colony. It is of a brick-red colour, and about the size of a large chestnut, and its taste is peculiarly bitter. The natives believe that it keeps off the pangs of hunger, and enables them to work for long periods without food. I have frequently known our carriers start in the morning without any breakfast, and do a whole day's work with perhaps one or two kola nuts to chew as they went along. The fact that for generations past it has

been eagerly sought after by rich and poor alike, and that they will constantly spend the last cowries they possess in buying one to chew, seems clearly to show that it is something more than a mere luxury. As a stimulant it takes the place which tea and coffee occupy with us, neither these nor any other stimulant being here used.

The Hausa native is perfectly black, but he does not possess such thick lips or such curly hair as we are accustomed to associate with the ordinary negro. He is naturally a trader rather than a soldier, but when trained, as he has frequently been down on the coast, by English officers, he is more than a match for any other native. The Governor of the Gold Coast told me that in a battle the Hausas appeared utterly devoid of fear, and that the only difficulty was to restrain them. It would not infrequently happen that a small body of Hausas, having defeated the enemy to whom they were opposed, would pursue them to a considerable distance from the scene of battle, and perhaps stop to raid their village before returning to look after or assist their companions. It is hard for any one who has not actually seen Hausa porters to believe the weights which they are accustomed to carry. While staying at Lokoja, the officer in command of the Royal Niger Company's Hausa troops pointed out to me a mountain gun lying on the ground, and asked me if I could lift it. With considerable difficulty I succeeded in raising it about an inch off the ground. He then told me that one of their Hausa soldiers was regularly accustomed to carry this gun on his head. On my appearing somewhat incredulous, he had the man sent for, and told him to put the gun upon his head, which he proceeded to do, and walked for some little distance with it. The officer told me that on one occasion he had been known to carry this gun 22 miles in the day. During the course of our expedition we employed as carriers Nupes, Yorubas, and Hausas, and our experience was that the average Hausa would carry exactly double what any other native would carry. If you ask a Hausa why his people are so strong, he will tell you that it is because of the different food which he eats. The tribes in the Niger delta and near the sea-coast live for the most part on yams and bananas, which are produced with the minimum amount of labour. The Hausas live almost entirely on guinea-corn. Guinea-corn is a species of millet, and has a very minute and hard red grain. This is ground up by the natives, and, mixed with water, makes a sort of porridge, which has, however, a most disagreeable, sour taste. In Kano several other grains are procurable, including wheat. Bread is on sale during part of the year, but so much red pepper is used in its manufacture that it is scarcely possible for a European to eat it. On only one occasion were we reduced to any serious straits through lack of food. Having met with an unfavourable reception from a king who bore the high-sounding title of "King of the Sudan," who had refused to allow us to buy any food in his market, we were compelled

to march for four days, a distance, *i.e.*, of about 60 miles, through a district which this king had recently raided for slaves, and the food supply of which he had destroyed. The march through his territory occupied about four days, and it was with feelings of no ordinary relief that we emerged from the sphere of influence of this particular king.

There are two regular caravan-routes between Kano and the shores of the Mediterranean, by which a large amount of European goods are annually brought across the desert. I had fully intended returning by one or other of these routes. The most direct of the two leads directly north from Kano *viâ* Zindar, Asben, and Ghat. On making inquiries at Kano as to this route, we were informed that the Tuareks, through whose territory it would be necessary to pass, were so hostile to Europeans that it would be quite impossible for any one other than a native to go this way. Several Arabs, we were told, had been recently murdered by them because, owing to their light complexion, the Tuareks believed them to be Christians in disguise, and this notwithstanding their protestations of being orthodox Mohammedans. Finding this route closed, we turned our attention to the other *viâ* Lake Chad, Bilma, and Murzuk. This route, unfortunately, proved to be even more impracticable than the other, owing to the civil war which was then raging in Bornu, and which had put an end to all native trade for some time past. Rabba, an ex-slave of Zubehr Pasha, and a former lieutenant of the Mahdi, had overrun the whole province of Bornu, and had destroyed its capital, Kuka, a town of 60,000 inhabitants. It would have been impossible to find a single carrier willing to have attempted the journey to Lake Chad, and to travel without carriers or servants was of course impossible. Whilst still debating as to what we should do, my three companions, *i.e.* the two Europeans and the Tunisian Arab whom I had taken out with me, all became so extremely ill that it was obvious that if they were to reach the coast, which was nearly 800 miles distant, alive, it would be necessary to start without any great delay. The route which we followed on our return journey lay further to the west than the one we had taken on entering the country, and brought us down eventually to the middle Niger at a point a little above Egga, which is about 400 miles from the sea.

In looking forward to the future development of this country, there are three points which seem to claim special attention. I would name them in the order in which they will in all probability be attained: (1) the provision of a better currency; (2) the improvement of transport; and (3) the abolition of slave-raiding. Throughout the greater part of Hausaland, the only currency which is everywhere recognized consists of cowrie shells. When we remember that 2000 cowries on an average are only equal in value to 1*s.*, and that the equivalent of 10*s.* weighs something like 100 lbs., we can easily understand how great an obstacle to trade and enterprise the use of such a currency must necessarily be.

The only advantage that the native apparently derives from it is the unlimited opportunities which it affords him for cheating the white man, who has neither time nor patience to count his own money. Soon after our arrival in Kano, a present was brought to us from the king, part of which consisted of 100,000 cowries, *i.e.* about £3. The cowries were brought in baskets supposed to contain 20,000 each. It so happened that I owed the man who was responsible for bringing them 10,000 cowries. Noticing that one of the baskets which he had brought was very much underweight, some 2000 cowries having been abstracted from it, I asked the man if he were certain that this particular basket contained its proper amount. On receiving his indignant assurance that this was so, I told him to sit down and count from this basket the 10,000 cowries which I owed him. He did so with great alacrity, thinking, no doubt, that the white man was sadly lacking in sagacity to allow a creditor to count his own money. I noticed that he took full advantage of his privilege, and, so far as I could judge, the sum which he counted exceeded by at least 2000 that to which he was entitled. His work finished, I asked him again if he was quite sure that the basket as delivered by him had originally contained 20,000. On his replying in the affirmative, I suggested to him that, this being so, the amount which remained over, now that he had counted out his own 10,000, must therefore be 10,000. On his assuring me that my calculation was correct, I told him to leave me the 10,000 which he had just counted, and to take the other 10,000 as his due. He departed with a look of chagrin on his face which it was piteous to see, but doubtless with his opinion as to the white man's sagacity very considerably improved. The only coin which passes at all in the interior is the Maria Thérèe dollar which was coined in Austria in 1780. I took with me a considerable number of these coins, which through the kindness of the Royal Niger Company, I was able to procure from Vienna, and I found that in all important towns there was no difficulty in passing them. The continued importation of this dollar would, I believe, appreciably tend to develop the native trade of the interior.

The second point which claims special attention, in view of the development of this country, is the improvement of transport. At the present time, except during the dry season in limited areas, everything has to be carried on men's heads—a method of carriage, as has so often been pointed out, than which nothing could be worse. If the resources of this country are ever to be developed—resources which are probably greater than those of any other part of tropical Africa—it can only be by means of a railway. The remarkable progress which has recently been made in the building of railways both in South and in East Africa may well encourage the hope that the time will soon come when we shall see the far interior of West Africa connected with the coast, or at least with the river, in the same way.

The third, and by far the most important point to be considered in reference to the development of this country, is the suppression of the slave-trade and of slave-raiding. If it be true that the Hausa-speaking population of the interior numbers fifteen million, it is certainly the case that the Hausa slave population numbers at least five million, or, to put it in another way, that one out of every three hundred people now living in the world is a Hausa-speaking slave. Slave-raiding and the traffic in slaves, to which it ministers, is the great overshadowing evil of the Central Sudan. There is no tract of equal size in Africa, or indeed in the world, where the slave trade at the present moment is flourishing to so great an extent or so entirely unchecked by any European influence. Moreover, we cannot allow ourselves to forget that the whole of this country, where this slave-raiding is being carried on, has now been recognized, thanks to the action of the Royal Niger Company, as within the British sphere of influence, and that the responsibility of allowing this state of things to continue rests upon England, and upon England alone. By claiming for ourselves this vast tract of country, we have claimed one of the most important and most valuable sections of equatorial Africa, but we have at the same time claimed for ourselves a great and pressing responsibility. The great majority of the slaves in Hausaland are obtained not from foreign or outside sources, but from villages or towns, the inhabitants of which are of the same tribe and race as their captors. The practical result of this is that the country is subject to nearly all the evils of a perpetual civil war. There is no real security for life or property anywhere. At any moment the king in whose territory any town or village lies, may receive a message from the king to whom he is himself tributary, ordering him to send at once a given number of slaves on pain of having his own town raided. He thereupon selects some place within his own territory, and, without perhaps the shadow of an excuse, proceeds to attack it and to carry off its inhabitants as slaves. The attack is usually made in overwhelming numbers, so as to prevent any serious resistance. Any who attempt to resist are massacred on the spot; the rest are made to march in fetters to the town of their captors, whence they are either passed on to some central slave-market, or kept for awhile in order to be included in the annual tribute payable to the Sultan of Sokoto.

During the course of our march from Loko to Egga *via* Kano, a distance of about 800 miles, we had frequent opportunities of seeing something of the evil caused by slave-raiding, and of the insecurity to life and property to which it gives rise. Soon after leaving Loko we entered the town of Nassarawa, where we were compelled to wait till the return of the king from a slave-raid, on which he was then absent. On reaching a village a few miles further on, which bore the euphonious name of Jimbambororo, we were told that its king was not feeling sweet

owing to the fact that twenty of his subjects had that very morning been seized as slaves by the people of an adjacent town. On leaving this village we passed a spot where, two days before, fifteen native merchants had been carried off as slaves; and, again, shortly before reaching the town of Kachia, we were shown another point on our path where, within the two previous days, a similar fate had befallen five other travellers. On arriving at the town of Zaria, in the market-place of which we saw about two hundred slaves exposed for sale, we were once again informed that the king was absent on a slave-raiding expedition. During our stay in Kano, in the market-place of which five hundred slaves are always on sale, one thousand were brought in on a single occasion as the result of such an expedition. In the course of our march from Kano to Bida we passed towns and villages, literally without number, which had been recently destroyed and their inhabitants sold as slaves; and this not by any foreign invader, but by the king in whose territory the places themselves were situated.

Slaves are used in the country for two distinct purposes; first, as currency where any large amount is involved, and secondly, as carriers. No solution of the problem will be permanently satisfactory which does not take account of, and endeavour to supply in some more convenient way, these two needs. Of the tribute payable by all the Hausa States to Sokoto, at least three-quarters is paid in slaves, the total annual number being many thousands, probably even tens of thousands. All that has been done up to the present to check slave-raiding has been done by the Royal Niger Company without any direct assistance from the British Government. By means of one or two small armed launches they have endeavoured to prevent slave-raiders from crossing the rivers Niger and Benue; but even were they to succeed completely in effecting this object, it would but be touching the fringe of the difficulty. A chartered company, however philanthropic a body its directors may be, cannot, without considerable assistance from the Government, attempt to cope with so stupendous an evil. What is wanted in the first instance is to enlighten the public generally as to the existence of the evil, and so to prepare the way for some action to be taken with a view to its suppression.

I should like to say a few words, before concluding, in regard to the Hausa language, the study of which was one of the principal objects of our expedition. The language has special claims to attention from the fact that it is possibly the most spoken language on the continent of Africa. Its only rivals, from the point of view of numbers speaking the language, are Swahili and Arabic; but though either of these might claim to be understood over an almost equal area, neither of them is probably spoken by anything like fifteen million people, the number, that is, who are believed to speak Hausa within Hausaland itself. Looking forward, moreover, into the not very distant future,

four languages, and four only, will dominate the whole of the continent, and these are English, Arabic, Swahili, and Hausa. English will be the language of the south, Arabic will be the language of the north, while Swahili and Hausa will be the languages of eastern and western tropical Africa. In regard to the connection existing between Hausa and other languages, in so far as it is possible to form any opinion after only three years' study, it seems to me to be probably connected, not directly with Arabic or any Semitic language, but rather with the group of languages to which Berber and Coptic probably belong. It has been suggested that this at present ill-defined group represents an earlier stream of immigration into Africa than the Semitic, and that the resemblance between the grammatical structure of the two points to that prehistoric time when both races, or groups of races, inhabited a common Asiatic home. Should this theory ever be established, the interest from the philologist's point of view attaching to the study of what may, perhaps, prove to be the most important representative of this group, can scarcely be over-estimated. Hausa has been reduced to writing for at least a century, and possibly very much longer. According to the history now existing in writing, Kano has been occupied as a Hausa town for about 950 years. Prior to this the Hausas were collected near a town called Daura, a little to the north of Kano. On my inquiring from the most learned man I could find in Kano, as to what traditions the Hausas possessed in regard to their original home, he replied that in very early time, prior to their settlement at Daura, they had come from the very far east away beyond Mekka. It is hard to say what importance is to be attached to this tradition, the existence of which is specially significant in view of the possibility of the language having been Semitic, or allied to the Semitic, in its origin.

For those who are interested in the study of the Hausa language, I may add that within the next three months the Cambridge University Press will publish a volume consisting of the Hausa manuscripts which we brought back with us, reproduced in facsimile, with translation, transliteration, and notes added. It is hoped that an appeal for support which the Hausa Association is at present making, with a view to establishing at Tripoli a permanent centre for the study of the Hausa language and the training of Hausa natives, may enable further work of a similar kind to be attempted.

I have refrained from enumerating the natural products of Hausaland, which in the near future should make the country of so great importance from a commercial standpoint, as they will naturally be referred to in the paper which is to follow. I should like, however, to add a few words in regard to the future of this vast district, which, thanks to the action of the Royal Niger Company, has been secured for British influence. There are some, perhaps, to whom the extreme

unhealthiness of the West Coast would naturally suggest the reply that the advantage to be gained by the opening up of these regions can never be proportionate to the loss of life which it must necessarily involve. They would, in fact, be disposed to apply to these districts the Irishman's description of his own land, "It is a magnificent country to live out of." But there are others, and they are by no means few in number, who see in the opening up of fresh fields of trade and enterprise the best solution of social difficulties at home; to whom, moreover, the cry for help from unnumbered millions of slaves appeals with irresistible force, and who believe that to the Anglo-Saxon race has been committed a unique opportunity for civilizing and, it may be, for Christianizing the natives of Africa. To such the difficulties or dangers above alluded to will appear of but small account compared with the magnificence of the task which it is their privilege to undertake. At the Congress which met here in July last, the question was discussed at some length as to what extent tropical Africa was capable of being colonized by Europeans. The two conditions, as to which there was a general concensus of opinion, were, first, that the climate, as expressed chiefly by the diurnal and yearly range of temperature and the moisture present in the air, must approximate to those of countries already settled by Europe, and, secondly, aggravated malaria must be absent. To attain these conditions, it was stated that the elevation of the proposed colony must not be less than 5000 feet. Even if we place the limit 1000 feet lower than that suggested, it would still be the case that no part of the Hausa States, or of the whole of the Central Sudan, fulfils this necessary condition. When, moreover, we add to this that aggravated malaria is found with more or less frequency throughout the whole of this area, we are forced to accept the conclusion that the colonization of Hausaland by Englishmen is and must ever remain impossible. By colonization is, of course, meant the establishment of permanent homes and the rearing of families as opposed to more or less prolonged visits to the country followed by an ultimate return to Europe. In this the strict sense of the word, no part of Hausaland will ever be colonized from Europe. Fortunately, our empire, with its never-setting sun, provides us with no lack of colonies in which the above conditions are amply fulfilled. But if Hausaland cannot be colonized by Englishmen, it can none the less be governed and exploited by them to the mutual advantage of the governors and the governed. Two things will have to be done before we can confer any permanent benefits upon the natives, or obtain any definite advantage for ourselves. Slave-raiding must be stopped, and trade communications must be improved. The two go together, and it will be impossible fully to secure the one without the assistance afforded by the other.

A few years ago it would have seemed vain to discuss the possibility of suppressing the slave-trade in the very heart of Africa, and yet more

so to discuss the question of making a railway to a place 800 miles from the coast, in a climate almost as bad as could be conceived, but what would have seemed utterly impossible a few years ago is now well within the range of practical politics. The extraordinary interest which has been aroused in the Dark Continent within the last few years, and the great sacrifices which have been made and are now being made in order to secure the opening up of the eastern and southern portions of Central Africa, may well encourage us to hope that the day is not far distant when what has been done elsewhere will be done here, and the inestimable benefits of freedom and of good government may be conferred, even if they have to be forcibly conferred, upon this great country and people.

II. NOTES ON A JOURNEY THROUGH THE SOKOTO EMPIRE AND BORGU IN 1894.

By WILLIAM WALLACE.

It is not an easy matter to give in a half-hour paper any satisfactory description of an African journey extending over 2000 miles. Fortunately, before commencing these brief notes on my mission through the Fulah empire in 1894, I was told that a paper would be previously read by the student of the Hausa Association on his journey from the mouth of the Niger to Kano, and his residence there. I propose, therefore, to commence my notes at my departure from the town of Kano, and give such brief description as the time allotted to me permits of my journey thence to Wurnu, Gandu, and Boussa. I will remark, however, that while we were at Kano civil war held the entire province in its grasp. Every few days batches of prisoners were butchered in the market-place with the customary indignities to the dead, parts of the bodies being utilized as medicines and for poisoning arrows, and the remains left to the dogs and vultures. Numbers of women were strangled simply because they belonged to the rebel party without the town. All this, combined with the simultaneous destruction of Kuka, the capital of the neighbouring kingdom of Bornu, by Rabba—better known in Europe as Rabba Zubehr—caused an almost entire cessation of the movement of Hausa caravans both from the east and north. As I shall have frequent occasion to mention the *wuziri* or grand vizier of the Sokoto empire, I must also devote a few words to this important personage, who had been sent at that time to Kano by the Sultan of Sokoto to try and quell the civil war. It would have been useless, for the purposes of my mission, to proceed to Wurnu, the capital of the Sokoto empire, while the grand vizier was absent; so we arranged to travel thither together when his business in Kano was completed. The *wuziri* is a fine type of the ruling Fulah race. He is nearly

seventy, tall, vigorous, and highly intelligent. Owing to the seclusion in which the Sultan of Sokoto lives—somewhat similar to that of the Mikado of Japan in former days—the grand vizier practically rules the whole Fulah empire. When first I saw him, he was seated on a mat placed on the mud floor of the small house he occupied in Kano, quietly studying, through a pair of large horn-rimmed spectacles, an Arabic manuscript. It struck me as a curious contrast to see him sitting in the darkened house, without kingly garments or the least sign of state, while within a few hundred yards the emir of the province of Kano was seated in embroidered robes on a gaudy throne, and was surrounded by a courtly retinue dressed in all the tawdry imitation of Eastern courts. The wuziri's business in Kano occupying more time than he had expected, I decided, after a month's residence there, to move towards Wurnu, making stays at a few important places to acquire further information about the country, and thus enable him to overtake me. On May 7, 1894, I had said good-bye to Mr. Zweifel, who, accompanied by Mr. Widdicombe, had led a second expedition from the river Benue to Kano, and was then returning *via* Nupe to the Middle Niger. As Mr. Zweifel died last September, apparently unnoticed by the geographical world, I should like, in passing, to pay a tribute to his fifteen years' admirable work as an explorer. In 1880 he had discovered the sources of the Niger as the leader of an expedition which started from Sierra Leone. In 1884 he joined the Royal Niger Company, and for over ten years did valuable work as an explorer and cartographer. Mr. Zweifel was a native of Glarus, in Switzerland, and his untimely death was a great loss both to the company and to geographical knowledge.

On May 20, 1894, I left Kano, accompanied by Mr. Teed, and in three days reached Rogo, a frontier town in the province of Kano, some 60 miles to the west. Here we remained ten days, collecting information of every kind; and then travelled to Fawa, in the province of Katsena, about 70 miles from Rogo. The following description of the country traversed may be taken as applying generally to those portions of Hausaland which are not constantly devastated by marauders—a very wide exception.

Most of the land is under cultivation, with the exception of perhaps a fourth lying fallow in its turn. Much of the ground in the neighbourhood of the towns is divided into fields by raised earthwork dykes or hedges, mostly of cactus. Great numbers of the economic trees are left standing in the fields. Amongst these are the shea-butter tree, from which a good fruit is obtained, as well as a large quantity of vegetable butter. The latter is used for cooking as well as for lighting purposes, and many other uses. This tree is probably the most valuable tree in Hausaland, or, I may say, throughout the Sokoto empire. Next in importance comes the locust tree, from which a large quantity of food

is obtained. At the time of our journey thousands of the inhabitants were practically living on this diet, the locusts having devoured much of the green crops the previous year, thus creating a famine in the land. To avoid a repetition of this disaster, the natives had begun to grow large quantities of cassava, which the locusts will not touch. The next tree in importance is the gambier, the fruit of which is used for tanning hides. The tamarind tree is also frequently seen; its fruit is greatly praised. There are numerous plum-trees growing both in towns and in the fields, and, as in other parts of tropical Africa, the valuable kuka tree is left standing, for it yields both fruit and a capital fibre, while its leaves are used for making a nutritious soup. In the trees close to the hamlets great quantities of bees are reared, which produce excellent honey. Wild honey is also found in quantity. Quantities of silk-worms feed on the tamarind trees. Their silk is in great request when spun and dyed red or green. It is used for embroidering the native gowns, in decorating which a tailor will spend weeks. Fancy patterns for the women are also woven from this silk. The chrysalis is highly valued as a specific for ear-ache. It is first roasted and then ground into powder, which, when required for use, is mixed with water and dropped into the ear. In addition to the above trees, there are numerous and extensive forests of gum trees and other economic trees, valuable from the commercial standpoint.

As one passes through the fertile country after the first rains, it appears as if all the world and his wife had turned out to sow corn. From the wee toddler to the greybeard, all are busy in the sodden fields. The ground is not cleared; indeed, it hardly requires it, for undergrowth there is none, and, with the exception of such stumps of last year's crops as have not been pulled up and used for fuel, the ground is as bare as the palm of one's hand. I did expect, however, that the soil would in some manner get a turnover; but even this was not usually necessary, the old furrows being used again and again. The corn is sown on the top of them in the spaces between last year's stumps, which are, on an average, about 3 feet apart, while the width of the furrows is generally about the same; but this distance varies from 1 to 4 feet, according to the richness or poverty of the soil. The furrows are barred across with earth every 20 to 40 feet, to retain the rain, so that after a heavy shower the whole country appears as if covered with innumerable little reservoirs. One labourer walks with a light hoe, with which he lifts small clods out at the regulation distance. The sower follows him and drops six to twelve grains of the cereal into each hole, pressing back the clod on top of the grain with his foot. The grain ripens in from four to seven months, according to the variety, the Guinea grain taking longest; during this time the ground requires cleaning three or four times. All the population are farmers, with the exception of a few people in the larger towns. The principal crops

raised are Guinea corn, Indian corn, a small cereal called *gero*, wheat, cassava, rice, onions, cotton, indigo, peas and beans of various sorts, sweet potato, ground nuts, and various kitchen vegetables and herbs. The Guinea corn is most prolific, a good head yielding from three to four thousand grains. The corn is ground by the women of the household in the usual slow and laborious oriental style. Some years ago I explained the use of the corn-mill to some chiefs, and asked if they would buy hand-mills if the company sent them out. They looked horrified, and asked where the work for their women folks was to come from; they were wicked and vicious enough as it was, and wanted constant supervision; but without work! I at once changed the subject.

In the more secure portions of Hausaland, the roads are thronged with people, merchants journeying from town to town, trading a little as they go. All the women carry large loads on their heads, and, as a rule, a sturdy baby slung on their back. The bulk of the merchandize, however, is carried on the backs of asses, many of which have bells hung round their necks. When they fall under their loads at bad places on the roads, they lie perfectly still until relieved of their burdens by the drivers, who talk away to them as if they were human, alternately praying over them, entreating, or cursing the poor brutes. Mules, bullocks, and horses are also utilized as beasts of burden, and every farm has at any rate a few brood mares on it; but in the year of our visit, they and their foals were in a most emaciated condition, from the lack of fodder, there being no green grass, while corn was out of the question at the famine prices then ruling.

Fawa, where the grand vizier overtook us, is one of the chief towns of the province of Katsena, and deserves notice as the principal seat of the iron trade in the Hausa States. The smelting furnaces are built into the perpendicular face of an excavation 3 feet deep, the length of it depending, of course, on the number of furnaces. In the one we examined there were twelve. The furnaces are round, having a diameter of 18 inches, and the ashes, slag, and iron are drawn through large openings a few inches above the bottom of the furnace, the top being left open, and the furnace charged from there first with charcoal made from the shea-butter tree, then with the light sandy-looking ore from which the iron is extracted, and then with more charcoal. The blast is produced from two primitive bellows worked by one man. Once lit, the furnace is kept going all day, being continually recharged as the mass sinks down. About 3 cwt. of the ore is required to produce 28 lbs. of iron, each furnace turning out that amount in twelve hours. The ore is dug from mines close to the town, which have extensive galleries, but I did not see them, in spite of having engaged the principal iron-master as a guide, the fact being that he, like others, was afraid to show the white man too much.

At Fawa people had been congregating for a month, to take

advantage of the wuziri's escort through the robber-haunted district which lies between the provinces of Katsena and Sokoto. We started from here, a motley crowd of over two thousand persons, fully half of them women and children. The escort consisted of about three hundred horsemen and one hundred footmen. The latter mostly belonged to Fawa, but the horsemen consisted of detachments from the provinces of Zaria, Kano, and Katsena. The chief of Fawa, who is styled king of the road, took supreme command of these troops as far as Guzo, where the wuziri dismissed them, giving them valuable presents and his blessing, which they prized even more highly. This belt of country between Fawa and Guzo may serve as a type of those robber-haunted districts of Hausaland which contrast so strongly with the more settled regions I have previously described. It is a long stretch of uninhabited but for the most part beautifully timbered and fairly well-watered country, and was once very populous; but the emirs of the Katsena province, with their short-sighted policy and slave-raiding, ruined it, so that to-day it is used only as a retreat by the Ambutu and Maradi robbers. For the last seventy years these marauding tribes, although under the rule of Sokoto, have made their annual incursions in thousands, and, as most of them are mounted, move with great rapidity. A few years ago they, in the absence of the neighbouring emir of Zaria, had the audacity to invest his capital for a few weeks, and they have even marched within sight of the walls of Kano. The inhabitants of the smaller towns in Hausaland are thus kept in a state of continual terror during the spring. It may be a matter of surprise why the Sultan of Sokoto does not prevent these raids; and the explanation generally believed is that the founder of the Fulah dynasty, Othman Dan Fodio, left to his successors instructions, which they have found it expedient to obey, to allow these two tribes to continue their yearly raids in order to keep the unruly provinces occupied, and thus divert the minds of the Hausa inhabitants from an otherwise inevitable struggle to shake off the Fulah rule. Whatever truth there may be in this belief, it is certain that the northern Hausas have their hands full of these marauders. Even at Rogo, a fairly large and strongly walled town, I saw the terror that the mere cry of "Maradi" caused. We were camped out in the fields about a mile from the town when the cry was raised, early in the afternoon. A general stampede into the town took place, and until midnight people came flocking in from the outlying hamlets, carrying the most valuable part of their property with them. We ourselves thought it best to get within shelter of the walls. It turned out to be a false alarm, and in a couple of days the people became reassured and returned to their farms. The complete ruin of districts thus given up to robbers may be best shown by the fact that between Fawa and Guzo—a distance of about 70 miles—we did not meet a single human being.

On June 21, near Gandi—not to be confused with Gandu—we struck the course of the Sokoto river, a sluggish stream at this point, and we followed it more or less closely till our arrival at Wurnu, the capital of the Sokoto empire. This town is rather snugly situated in a deep valley running from east to west, but a more desolate-looking spot could hardly have been selected. Even at this time of year there is not a blade of grass to be seen on the sides of the hills, nothing but sand and black hard volcanic rock; the loose rocks and stones are placed in long lines built in dry dyke form on the sides of the hills, giving them the appearance of being terraced, and reminding one of the Canary islands. The corn is just beginning to sprout from the sandy fields, and looks poor indeed compared with that passed a few days ago, or even that of yesterday. We appear to have passed, in a few hours, from a green fertile country to a desert, from spring to tropic winter. At this rate the people can only have about four months spring and autumn, and a long eight months of barren dryness, the greater part of it with exceedingly hot days and bitterly cold nights, and without other fuel for fires than corn-stalks. Sultan Atiku's motive for removing from Sokoto and building his capital here in 1831 was to control more effectively the marauding Goberi and Maradi tribes which lie between Wurnu and the oasis of Asben. At the town gates numerous herds of milch goats were roaming about, but hardly any cattle were to be seen. I should judge the population to be only about 6000, the town having, like Madrid, been artificially created as "La Corte" for political reasons. The town has a good wall round it, and the compounds are mostly in good order; the market is quite a small one. On our arrival at Wurnu we were given good quarters, the same that Joseph Thomson and Sego occupied when here. The sultan at once sent to salute us, sending at the same time a present.

I am not, of course, at liberty to describe my business with the sultan, which occupied five days, beyond saying that I obtained all that the company required. The success and rapidity of the negotiations were doubtless largely due to the intimate friendship that had sprung up between the grand vizier and myself during our long acquaintance. The sultan, who is now about seventy-five years old, showed, when conversing with us, the highest possible mark of his consideration by removing the veil which he wears to hide his face from his subjects, who believe firmly in his divine mission.

It should be clearly understood that the Fulahs, who originally conquered the Hausa States by their military superiority and the advantage that horsemen have over undisciplined foot-soldiers in a level and scantily wooded country, now hold their vast empire of Sokoto through the superstitious dread which they have managed to instil into the Hausas. If it were not for the fear of the Fulah prayers calling down curses on them, the Hausas would at once struggle for

their independence. Both Hausas and Fulahs believe that the founder of the empire, Dan Fodio, possessed supernatural powers, that he ranks next after Christ, and that his power of blessing or banning has descended on his successors. But the Hausas believe also in a prophecy that only thirteen sultans will reign, after which the blessing will depart, and another power will succeed that of the Fulah. The present sultan is the eleventh of his race. The name of Dan Fodio is still invoked—people, when in extremity or great danger, calling out “Shifu.” The wuziris, or grand viziers, are descended from the female side of Dan Fodio’s family. They hold all real power, the sultans being so completely hedged in by formalities. I should estimate the number of the Fulah race at less than one-sixth of the whole population of the empire, even including those of only partly Fulah blood, who, however, always claim Fulah descent. Probably one-third consists of pure Hausas, and the remaining half of slaves; the latter being continually recruited from the wholly pagan races who live in the mountainous regions that lie within easy raiding distance from the capitals of most of the provinces. Each emir has his own preserves, on which his neighbour is supposed not to encroach. A breach of this etiquette has led to war between emirs in two instances within the last twelve years to my knowledge. This absence of joint action of the Fulah emirs has saved the pagan tribes from entire incorporation with the Sokoto empire. There might be little to regret in their loss of nationality, if they could be incorporated into such provinces as Sokoto, Gandu, or Kano, where, in spite of misgovernment and insecurity which Europeans would find intolerable, new towns are springing up, and the old ones are forced to extend their walls to allow for the increasing population. But the empire is not all ruled in the same manner as these three provinces in which the invading Fulahs found a people—the Hausas—at least as civilized as themselves, whom they conquered, but could not enslave, and where, indeed, the descendants of the old chiefs are often still left in charge of the towns. A very different state of things exists in the non-Hausa portion of the empire, where Fulah rule means the gradual conversion of populous and fertile districts into uninhabited wildernesses.

The question of religion in the Sokoto empire as a whole is too large and complex to be dealt with in these brief notes. I must content myself with remarking that while Mohammedanism, even in the Hausa provinces, is a very thin veneer, the people are extremely superstitious, attaching great influence to charms, of which hundreds are often sewn on their gowns and turbans, while strings of them are worn about the body.

It is well worthy of mention that the court language of Wurnu is not Fulah, but Hausa. This surprised me the more, as Fulah is the court language in provincial capitals, such as Zaria and Yola, the capital of the province of Adamawa.

Leaving Wurnu on June 28, we soon struck again the valley of the Sokoto river, and travelled to Sokoto, the former capital of the empire. Although its wall is $6\frac{1}{2}$ miles in circumference, penetrated by eight gates, its population is only about 10,000 souls, exclusive, of course, of the thousands who flock into its markets. Its only interest now is historical. The tomb of Dan Fodio, the founder of the empire, is just outside the principal mosque, and is preserved with great care, as is also the room in which he died. People are sent twice a year from Wurnu to attend to them. Sokoto is situated on elevated ground, with an extensive marshy plain to the north. Between Wurnu and Sokoto ostriches are plentiful in the farms; but they are a sorry sight at this time of year, as they have recently lost their feathers. We now see great numbers of camels, and we meet numbers of merchants from the oasis of Asben, in the Sahara, the northernmost possession of the Sokoto empire. These men from Asben (otherwise known as Air) wear black veils or turbans covering the greater part of the face. The trees in these regions are chiefly gum, dom palms, kuka, tamarinds, and plums. Looking from these confines of the desert, with a fine sandy soil and volcanic rocks, towards the south, we see, as far as the eye can reach, cultivated land divided into fields, and looking like a bit of the old country in the spring-time, while small streams meander through the valleys. Most of the fences are composed of the castor-oil plant. The town walls in this part of the empire are greatly neglected, proving that the inhabitants do not fear the incursions of marauding tribes. To one who, like myself, has lived the greater part of seventeen years in the southern portions of the Sokoto empire, the amount of cultivation in these more northern regions is astonishing.

We reached Gandu on July 3, but only needed to remain there two days, as the Sultan of Sokoto had given me letters for the subordinate sultan or emir of Gandu, containing explicit instructions as to the documents which he was to sign at my request. Our interviews with the Sultan of Gandu were therefore only of a friendly and formal character. He is a tall, imposing-looking man of sixty-five, with the true Fulah features, but a darker complexion than the average of his race. Having obtained from him the documents required in my instructions from London, we left Gandu on July 5, and reached Jega the next day. Workers in iron and leather abound here, and there are large pottery works and extensive dye works outside the town. The market is nearly as large as those of Kano and Sokoto. At the next halting-place, Zara, on the Sokoto river, our expedition divided—Mr. Teed taking canoes with many of the loads, and I continuing the journey to Gomba by land. I should mention that between Gandu and Gomba some five hundred persons, mostly women, took advantage of my escort to travel with me. On July 9 I reached Jiro, near which place, in 1885, some robbers seized a stragglng carrier, who, unfortunately, had on his

had most of poor Joseph Thomson's papers; but I was unable to obtain any information, as the inhabitants, though well remembering Thomson, had never heard of the robbery. On July 11 I struck the Niger and crossed to Gomba, on the right bank, the river being about half a mile wide at this point. Gomba belongs to the Gandu division of the Sokoto empire, the Fulahs having succeeded at this place in forcing their way across the Niger, and thus forming an *enclave* in the kingdom of Borgu, which with this exception possesses the whole right bank of the Niger from the frontier of Illorin up to and beyond Illo. The population of Gomba is about 3000, two-thirds of whom are pagans.

On July 13 I sent off most of my carriers and the Sultan of Sokoto's people overland to Leaba, in Borgu, and thence to Lokoja to await my return, and, Mr. Teed arriving in the afternoon, we started up-river in canoes, reaching Gere, the waterside town of Illo, on July 18. Both Gere and Illo are Borgu towns, the chief of Illo being the half-brother of the king of Boussa, the paramount ruler of Borgu; but this chief died on July 19, and it was not then known who would succeed him. On July 26 we left Illo and Gere by canoe for Boussa. I will refer here only to our visit to Yele, the capital of Yauri, with about 5000 inhabitants. It was the Yauri people who pursued Mungo Park down to Boussa, and caused his death. After passing through numerous rapids, we reached Boussa on August 5. The route between Boussa and the mouth of the Niger was described in a paper read to the Society last year by Captain Lugard, so at this point I will conclude these brief notes. I fear I have conveyed a very inadequate idea of the natural wealth of the region which I traversed, and the remarkable industry of its inhabitants under most adverse conditions. I do not hesitate to say that the only things needed to convert the Central Sudan into another India are peace and freedom.

Before the reading of the papers, the President said: We have this evening the pleasure of welcoming the return from the Niger country of our Vice-President, Sir George Goldie, governor of the Royal Niger Company. I am glad to say that he looks as well, if not better, than he did when he left England. I also have great pleasure in introducing to you the reader of the paper, Mr. Robinson. He went out for the Hausa Association, and reached Kano, the centre of trade in that densely populated Central African region. He has also brought back a mass of native manuscripts, and the material for a grammar and enlarged dictionary. He will read a very interesting account of his journey this evening; and we shall also have another paper by Mr. Wallace, who is still out in the Niger country, on the central portion of Hausaland, a little further to the north. I will now request Mr. Robinson to read his paper.

After the reading of Mr. Robinson's paper, Major Darwin, in introducing Mr. Wallace's paper, said: Mr. Wallace went to the country in 1878, and therefore knows its condition intimately. He is the agent-general of the Niger Company, and as the Niger Company is the representative of British authority over the whole region, therefore it is very clear that Mr. Wallace, the chief

executive authority of the Niger company, has a most important position. There are some chartered companies which have the habit of always bringing their affairs before the public; there are others which seem to keep them in the background; but we must not judge of the relative importance of the regions by the amount we hear about them. Some day the people of this country will wake up to the enormous importance of these Niger regions.

After the reading of Mr. Wallace's paper, the President said: I am sure the meeting will like to hear any remarks which Sir George Goldie will like to make on the paper just read.

SIR GEORGE GOLDIE: After the two interesting papers we have heard, which naturally occupied a rather longer time than most single papers, I shall not detain you more than a few moments. I have taken a particular interest in the papers to-night, from the fact that they emanate from two travellers who view things from distinct points of view. One of them, Mr. Robinson, who was an experienced traveller before he went to the Central Sudan, is a scholar and student; the other, Mr. Wallace, has lived for eighteen years, more or less, in the Niger region, and has been occupied almost entirely with learning, and afterwards carrying into effect, administrative duties there. Thus we have the views of two men on the same region from different points of the compass. I look upon papers such as we have heard to-night as chiefly valuable because they serve to dispel a common illusion about Africa. Some two years ago, a very eminent diplomatist, taking advantage of an after-dinner speech to address two European nations through the press, spoke of the swamps and jungles of tropical Africa as if that vast region, which is perhaps twice as large as Europe, consisted, at any rate mainly, of dense forests peopled by pigmies, or mangrove swamps inhabited by ferocious cannibals. Of course, it was a diplomatic speech for a diplomatic purpose, but it must have been uttered with a full and well-justified confidence in the ignorance of the general public. Now we learn from these papers that the Hausa regions are free of swamp and jungles. We learn that they are, in the first place, very fertile; we learn next that they have highly organized governments, although exceedingly bad ones, which I myself would place on a level with that of our country in the time of King Stephen, and that they possess dense populations, composed of a highly industrious race. This is the special point I wish to emphasize to-night. I would point out that there are probably very few of us—I can answer for myself—who, if we had to work under the conditions in which the natives of these ill-governed countries have to work, if we were uncertain as to what would become of the fruit of our labours, if the earning of wealth would call down upon us attacks which would cost us not only property, but liberty, would not become idlers, whereas these extraordinary people appear content to work for others, and not for themselves. This is worth emphasizing, partly because the ultimate value of tropical Africa must depend on the industry of its native inhabitants, especially where it cannot be permanently settled by Europeans, and partly because it has been the fashion in the press to speak of the insuperable indolence of the African (as if all Africans were alike) as the obstacle which cannot be overcome in developing the continent. I will make only one remark with regard to three points to which Mr. Robinson referred, matters which seem very wide apart, but which really hang together. He referred to the question of currency, to the question of transit, and to the question of slave-raiding. All three are very important points, seemingly unconnected with each other; yet none of them can be settled until European power is firmly established in that country. Those who have had to deal with these regions have long realized that there are only two practicable policies to follow. The one is the summary process which Mr. Robinson, with the generous

impulse of the humane man, intolerant of the horrible indifference to human suffering and of the cruelty he has seen, recommends to us, and which I hope he can recommend sufficiently strongly to the people of this country to induce them to obtain a vote for the necessary millions to carry out that policy; and the other is the policy which has already been followed, the policy of a gradual advance, cutting our coat according to our cloth, making an advance where we can, driving a nail where it will go, pushing ahead where we see a weak place, and drawing back where we find insuperable obstacles. That is the policy, the representative of which in Africa is now Mr. Wallace, and I venture to say, a more capable and more experienced representative could not be found.

The **PRESIDENT**: Hausaland, of which we have heard such a very interesting account this evening, is a region which has a peculiar interest for this Society. The attention of geographers had been very specially turned to the discoveries of Clapperton, who, I think, died in Sokoto in 1827, and the exploration of Hausaland in the years immediately preceding our foundation, and we may also remember that the first time our royal award was given, it was presented to Richard Lander, the discoverer of the mouth of the Niger, so that when we turn our attention to Hausaland, we turn it to an old love. I remember one of the very first papers I heard read at a meeting of this Society was by Dr. Baikie, F.R.S., one of the most daring explorers of Hausaland in former years, an abstract of whose papers Sir John Kirk, after carefully examining them, gave us some years afterwards. I very much regret that Sir John Kirk is unable to be present this evening. We must all rejoice, I think, that the continuation of work which was done so well by Dr. Baikie and his contemporaries has now fallen into such excellent hands, and we must congratulate Sir George Goldie on the admirable way in which he and Mr. Wallace, and his other coadjutors, have been carrying forward the labours of their predecessors, and doing most important service to their country. This Society has already expressed its sympathy for the objects of the Hausa Association, for which objects Mr. Robinson has been working for three years. I am confident, and I think we may assure Sir George Goldie and Mr. Robinson, that the papers we have heard this evening will certainly increase that sympathy amongst the Fellows of this Society. It now only remains for me to ask you to pass a cordial vote of thanks to Mr. Robinson and to Mr. Wallace for the valuable papers we have heard to-night, and to Sir George Goldie for his interesting remarks upon them.

EXPEDITION THROUGH SOMALILAND TO LAKE RUDOLF.*

By Dr. A. DONALDSON SMITH.

I accepted an invitation of the Amara chief to spend a night in his village, as I wished to study native customs. I and my ten boys occupied the chief's house. It was a very long wooden building, with a peaked roof covered with grass reaching to the ground. You had to stoop as you entered the one opening, and push aside the grass. Once inside you seemed to be in absolute darkness, but gradually your eyes became accustomed to this, and you could make out a double row of stalls on each side of a long chamber, and a small fire burning at the

* Paper read at the Royal Geographical Society, January 6, 1896. Maps, p. 200. Continued from p. 137.

further end. There were many small children running about with their mammas, wives of the chief. The stalls on one side contained a pony, goats, and chickens, while those on the other side were the private apartments of the household. It was raining heavily, and very cold, so I could not go out, but had to sit quietly and endure everything. A goat was killed inside the building at our feet, and a great mess it was cutting him up and cooking him. Bread and meal and honey were brought to be eaten with fingers, and huge pipes and tobacco and coffee. The atmosphere became abominable, and as the great variety of biting insects took possession of you, you hardly thought you were having a good time. I had to sit by the fire all night to keep warm, trying to wage war on the insects. The pony would continually be kicking, probably on account of nibbling rats; and some piccaninny would begin to bawl. Thereupon there would be a chorus of female voices in manly tones, and after a good sound whacking with a goat's leg-bone, the infant would be brought to a state of rest. To cap all, a cock fell from the loft overhead in the middle of the night, and all attempts to quiet his outcries only made him the more terrible.

Going farther on, I came to a large river (50 yards broad, with a current of 4 miles an hour, and $3\frac{1}{2}$ feet deep), which I afterwards found flowing into the northern end of Lake Stefanie, and I discovered that it arose partly from Lake Abaya itself, and partly from the mountains immediately about that lake. Leaving my caravan by the river, I took thirty boys across the high rough Konso range of mountains, where donkeys even could not get along. The Konso people inhabiting the western part of this range are the great weavers of this country, supplying their cloth to the Borans, and all the tribes of this district. We reached on the third day the lovely Lake Abaya, a clear, deep sheet of water 11 miles square, and surrounded on three sides by lofty mountains. The very arduous journey was nearly broken up by a rhino, as we were ascending a very narrow game path. The beast tossed the man just ahead of me, and severely mauled my gun-bearer, who was immediately behind me. I escaped by plunging into a thorn bush. I was obliged to leave five men behind to look after the two wounded fellows, and proceed with the small remainder of my boys, who were in a state of terror the whole time. During my journeys I had four boys hurt by rhinos, and two camels killed.

The elevation of Lake Abaya is 3430 feet. A range of mountains 8000 feet high runs from its western shore south, and connects with the Amara group. This range is inhabited by the Janjams; to the north of the Janjams live the Yero. The Janjams are the most powerful of these people, living up in a hill like the Amara. They weave cloth, and raise not only large crops of cereals, but excellent coffee and tobacco. I have never tasted better coffee than that grown there; they do not trim the plants, but let them grow naturally.

To the north of the lake live the Gonjabelo, the Busia, and Jeratu. All these tribes are agriculturalists, except the Busia, who live by plunder and the chase. From an elevation of over 5000 feet on the Konso range, I got a very extended view of the country to the north and north-west. I could count peak after peak rising up to the height of 9000 feet (about), but there was no great mountain, as has been reported, towering up to 16,000 feet. These highlands are the continuation of the great watershed I reached west of Sheikh Husein, and form a broad high wall between east and west as they run down towards Lake Rudolf.

With regard to the weighty question of the course of the Omo river, which has been seen by Borelli about 70 miles to the north of Lake



NEAR ASEBA, UNINHABITED PART OF BORAN COUNTRY.

Abaya, and on the eastern aspect of the great saddle-backed wall, I cannot imagine that there could be any fissure deep enough to permit a river to take a sudden bend to the west and cross the mountain chain. The Omo must flow east, and I believe it to be identical with the Jub river. From what information I could collect, I gathered that the river Dana rises immediately north of the Janjam. My opinion with regard to the Omo was much strengthened when I explored the river Nianam a long way north of Lake Rudolf.

After collecting some fishes and other zoological specimens, and surveying the lake, we returned to camp, and tried to follow the river west; but after three marches we had to abandon the river valley, and make our way up to the Tertala plateau lands. Passing through a

lovely grazing country covered with cattle, from an elevation of nearly 5000 feet to a little less than 1700 feet, we found ourselves by Lake Stefanie on the last day of May. The upper end of Lake Stefanie is a marsh, and a long line of reeds extends for a distance of 5 miles into the lake near the western shore. The lake resembles a boot in shape. On its eastern and western sides it is surrounded by lofty mountains; the Tertala range on its eastern side ends abruptly about a mile and a half from the shore, but a low line of hills is continued from the range to what we may call the heel of the boot. Immediately off this are eight islands, mere rocky masses which form sanctuaries for millions of aquatic birds. I took several soundings far out in the lake, but did not find the water over 25 feet deep in any part. There are no people living immediately on the lake except at the north-west corner, but the mountain range on the western side is inhabited on its higher slopes by a part of the Amar tribe. The lake is 37 miles long and 15 miles wide.

The river flowing into the northern end had such muddy banks that we concluded that the longest way round was the shortest way across, so down the lake we marched, and up again on the western side. I must say that we were rejoiced to find the water of the lake quite fresh. Besides the ubiquitous rhinos, there were a few naked savages living about the mountains to the west of the lake, who would make a sudden rush with the idea that they could frighten us. They would turn, however, and bolt, after threatening us with javelins and bows and arrows in an amusing fashion. They belonged to a division of the Amar. We found a little lake, 10 miles long and very narrow, extending north from the north-western extremity of Lake Stefanie, and probably connected with this during the rains. I have named this "Lake Donaldson."

We were to undergo another uncomfortable bit of excitement. We came to a large and warlike tribe called the Arbore, inhabiting half of the valley above Lake Stefanie. We had no guides, and were most anxious for the Arbore to let us have one of their number to help us north. They pretended they would do so, and kept us waiting for some time; but, instead of getting guides, they were preparing for a great attempt to loot our caravan. On the third day we found ourselves surrounded on all sides by a yelling, dancing crowd, throwing javelins and letting fly their arrows. Like the Borans, they had but simple weapons, and now hearing for the first time the whizzing of the bullets and the terrifying sound of the firing, they soon fled. In great contrast to the Arbore, the many little tribes we met as we went further north received us with every show of friendship. They were the Burle, Dume, Mali, and Borali in succession towards the north, and then the Bunno, Dime, Ario, and Amar to the west.

The Burle are the next powerful race to the Arbore. They are

agriculturalists, besides owning many flocks of sheep and goats. The chief of the Burle was also head of the Dume, or tribe of pigmies, his warriors having conquered the little people about eight years ago. The Mali and Boralí live to the north-east of the Duma, and number about eight thousand. They are great fighters, and continually waging war on their neighbours. Like all the tribes of this region, they are naked and very black, but they are not burly like the Seedy Boys; they use poisoned arrows. Their average height is about 5 feet 7 inches. They do not possess beads or brass to any extent. The Bunno occupy a long narrow valley 30 miles to the north-west of Lake Stefanie. Two-thirds of these people are very small and resemble the Dume, but the other third are of the ordinary height. It would seem that the race



LAKE STEFANIE, FROM NORTH-EAST CORNER.

was originally a pigmy tribe, but that intermarriage with their neighbours has partially destroyed this characteristic.

I can only attempt this evening to give you a short account of one of these tribes, the Dume, although they were all very interesting. These Dume are dwarfs, their average height being only 5 feet—we saw none over 5 feet 2 inches—woolly-haired, and very black, with flat noses and large lips. They resemble other dwarf tribes found in Africa, but they have very graceful, well-formed bodies. They are quite naked, and do not even care to wear sandals. Bows and poisoned arrows are their principal weapons. Beads were scarce among them; but they had managed to possess themselves of some zinc, out of which they had cut large discs to hang from their noses and over their ears and foreheads. They lived in little hamlets composed of about fifty small huts each, and scattered among the mountains. The huts were low conical structures made of stocks, and covered with grass. They owned goats and sheep, and raised a little millet. We got to like these little people exceedingly, as they were very amiable and jolly. The interest

they took in the two white men was very amusing. They wondered at our curious method of eating; at our method of catching insects and snakes to live upon, as they thought; and at our washing, when we had already scrubbed all the black skin from our bodies.

The rough mountainous country presented every obstacle to our progress. There were no roads, and we had to make paths over ridges 2000 feet above the surrounding country. On July 4 we found ourselves without guides in such a bushy country, that we were obliged to make five long marches in the bed of a river knee-deep in water the whole time. As our boots were wearing out, we were forced to walk barefooted; but our spirits ran high—Lake Rudolf was near, and we were to be the first to reach it from the east. As Prince Boris said to me, "I believe the ghost of Prince Rudolf has been guarding that lake since Count Teleki's expedition. How many have tried to reach it, and none succeeded!" A little bit more pushing, and our joy was complete! After more than a year's wanderings in all sorts of country, and under most diverse circumstances, we found ourselves at the goal of our ambition. We reached Lake Rudolf on July 14, 1895, and camped among the Reshiat, a tribe living at the north-east corner of the lake. The expedition had been a hard one, but we had achieved all we had set out to do, and more.

The Reshiat people were not in the same thriving condition as they were in 1888, when Count Teleki discovered them; a disease had killed off all their cattle, and the Borans had seized their donkeys. There was much more water in the lake, and, except at its southern end, we could detect no salty flavour whatever.

Lake Rudolf does not appear like a long sheet of water lying in an abrupt cut or fissure in the Earth's surface, as I had anticipated. On the contrary, it is very much spread out, except at its southern end. It lies in a shallow sort of basin in an open country that slopes very gradually towards the Tana river from its south-east end and the mouth of the Jub, and there is continued in a north-westerly direction as an almost level plain to the valley of the Nile. The river Nianam cannot be said to flow in a valley for a distance of more than a degree north of the lake, but it pursues a very even course through a flat country cut at rare intervals by low narrow mountain chains running towards the south-west. The fall is only 400 feet in 70 geographical miles. The southern end of the lake, however, marks the rather abrupt termination of the great mountain system extending north from Mount Kenya, while 20 miles to the north-east the highlands running down from Abyssinia begin to disappear rapidly. A narrow mountain chain is continued up from the south along the western shore of the lake to near its northern end, and this is the only thing that relieves the monotonous and flat appearance of the upper lake region. There are few trees, and the open grassy plains seem to vie with the water and the barren rocks in producing a

most disagreeable glare as long as the scorching sun is above the horizon. I found the lake to vary in depth from 2 to 25 feet; its elevation is 1240 feet above sea-level. There was no broad sandy beach as Count Teleki had found in 1888, for there had been plenty of rain a little while before our arrival, and the water was high up among the bushes.

About midway down the eastern shore is a little group of mountains called Longendoti; and just to the north of these is a large bay, where some 300 Elmolo, or fishermen, are living on little islands near the shore. The main body of the Elmolo, numbering about 700 souls, are living on the mainland not far from Mount Kulol. There are many people of Reshiat who have been obliged to support themselves entirely by fishing since the cattle disease which some four years ago



BRIDGE MADE BY MELA ACROSS NORTHERN TRIBUTARY OF THE MIANAM.

devastated the country, and hamlets of two or three huts are common along the lake-shore. I will mention that, although these people live entirely on fish, I did not see a case of leprosy among them. The only two cases of leprosy I saw on my journey were among people who never touched fish—one at Bari on the Shebeli river, and the other in the Boran country.

Passing on to the south, we get into very rough country. At the south-west end of the lake there is an active volcano, and all around are evidences of volcanic action. We had to make our way over great masses of volcanic *débris*, and over a country cut up by countless fissures, where there is scarcely a blade of grass.

And now we come to Mount Kulol, the most remarkable mass I have ever seen. It is nearly 6000 feet high, and cracked from top to bottom. The fissure is only about 20 yards wide, and from the bottom

one can scarcely distinguish individual trees at the top, so high are the vertical walls on each side of you. There is one island near the lower end of the lake, 10 miles long, which contains many craters, just as if it had been intended as a gigantic sieve for the products of the terrific subterranean combustion that has cracked and tossed the earth and rocks about into chaotic masses all over this section of the country.

It had been Count Teleki's intention to explore the valley of the Nianam, supposed to be the Omo river; but he had been deterred, owing to the hostile attitude of the natives. Reports that reached my ears were not reassuring, but they were not so bad as to preclude reasonable hopes of success. We had got so accustomed to rushing about in all sorts of unknown parts, that we had no nerves left. Leaving the caravan on July 19 at the Reshiat, in charge of Dodson and my head-man, I set out for the north, with twenty-nine rifles and a few donkeys. We only reached as far north as the Murle, an agricultural people numbering some ten thousand souls, living 20 miles above the lake. I was seized with such a severe attack of fever, that I had to be brought back to the caravan. Recovering almost immediately, I made a second attempt to ascend the river valley, with successful results. The journey lasted a fortnight, during which we were on the march ten hours daily, and a rough and exciting time we had. From Reshiat to the Gumba, a distance of 50 miles, we passed village after village in rapid succession. Many of the tribes would don their war-paint and feathers to receive us. For a few hours, while we were among the Kere people, the situation looked very serious for our little caravan. Over a thousand warriors seemed on the point of attacking us; but our friendly, and at the same time confident, demeanour had the effect of quieting all hostile desires. I attribute our success more to the absolute confidence we displayed in ourselves than to anything else. The very idea of thirty men marching straight along through a country teeming with hostile tribes seemed nothing less than miraculous to the native mind. To the Gumba people we had fairly good roads, but now our troubles began. The natives told us that beyond them there was nothing but bushes, marshes, and forests, through which none of them had been able to pass. They could not give us guides, as they said there was no possibility of our going on. They knew of no tribes whatever to the north.

For three whole days, working from daylight until night, we had literally to push our way along. The Nianam kept to a straight course north and south, and did not make a great bend to the west, as had been supposed. At one time we would be forcing our way through dry weeds 8 feet high, that would be continually casting showers of irritating seeds in our eyes; at another time we would have to crawl through forests so dark that we could not recognize faces a few feet away. There were two

rivers to cross that emptied into the Nianam from the east, and several marshes shedding forth great clouds of mosquitos. It was with the greatest difficulty I could get my boys to follow me, and when on the third evening we had lain down exhausted in a little opening among the bushes without having seen a sign of human life, the prospects seemed poor indeed. We were not to get any rest that night, however. No sooner had our camp fires been started, than war-horns were sounded on all sides. Every instant during the night we expected an attack, but the morning came, and we were able to continue our journey slowly and guardedly through the bushes without having seen a native. To our surprise, we suddenly found ourselves at the commencement of a lovely open valley, where the ripe durrha was waving to and fro, and goats were nibbling at the soft green grass, and noises, too, from a score



RIVER NIANAM AND MOUNT SMITH, LOOKING NORTH FROM HILL ABOVE MELA.

of villages reached our ears. Two old men and a woman were waiting to receive us. After a long shauri conducted by signs only, and some loud calls on the part of the old woman, hundreds of warriors emerged from the cornfields, and, casting aside their weapons, advanced to make peace with us. Everything went smoothly; we found these natives—who called themselves the Mela—the most sociable and hospitable black people we had yet seen. I cannot enter into detailed description. They were very black and of medium height, and naked like all the people of this country, but they were far above the average in civilization. Their ornaments and articles of daily use were wonderfully well made; having come into contact with no native traders, they possessed nothing in the way of beads or brass. They almost fought with one another to sell us anything they had for a string or two of the cheaper sort of beads. We bought supplies of coffee, meal, and tobacco, and some ivory.

We were now 70 geographical miles north of Lake Rudolf, so I

determined to ascend a mountain range a little west of the Mela, and see what I could of the surrounding country; but we had to cross the second tributary of the Nianam to do so. I observed the river Nianam, now only 35 yards wide, rushing down from the highlands of Kaffa, 40 miles to our north. It does not require a great extent of high mountainous country, where there is almost a continuous rainfall, to produce a river of this size. The origin of the Nianam must be in those mountains 9000 feet above the sea, and lying 120 miles north of Lake Rudolf. We were at the western edge of the great watershed, around which we had been circling for so many months. The country to the west was a great undulating, grassy, and almost treeless plain, with only two mountain chains visible: one running north-east by south-west, with its nearest point 35 miles off, and another further south and 70 miles off, running in the same direction. They were not more than 4500 feet high, or 2700 feet above the surrounding plain. The country to the west is inhabited by the Merdu, or Meritu, while to the north live the Galo, Mega, and Mala. Having gained much information regarding the surrounding country from personal observation and from reports of our friends the Mela, we retraced our steps to Reshiat.

A journey round the northern end of Lake Rudolf, which I made by land, and Dodson accomplished in our little collapsible Berthon boat, disclosed the fact that the Nianam is the only river emptying into the lake, and that there is no river Bass, as supposed by Count Teleki.

We left Reshiat August 8, and marched 200 miles south along the eastern shore to Mount Kulol. Here we rested the camels and donkeys for a few days preparatory to exploring the unknown country to the east. Teleki volcano sent up great clouds of smoke, and seemed to be very active, from the glow of the lava at night-time. When we started again, we little knew what sufferings we and our poor animals were soon to endure. Marching consisted in scrambling over rocks stuck on end, and almost lifting our animals over great masses of volcanic *débris*. Our Elmolo guides deserted, and we did not find water on the second day as we had expected. For four days this sort of thing continued, and, in spite of all our care, the last day was spent in continuous labour without a drink for any one. If we had not found water in the middle of the fissure which splits Mount Kulol in two, we should certainly have been lost. As it was, many of my boys hid themselves, expecting to die, along the road, and were not found till late in the night. One poor fellow was picked up the following day, but he recovered after a short time, as did all the others. Many of the animals had died, and the remainder were in a frightful condition. On September 6 we were among the Rendile, a nomadic tribe, we first found 60 miles east of Lake Rudolf. They were very light-coloured, and resembled the Somali, except that

they were more stoutly built. It was fortunate that, when we needed assistance most, we discovered this lot of good people. They had camels by the thousand, and camels of a far superior breed to the Somali animal. But what was most astonishing, they were willing to part with them. We exchanged all our older camels, with some cloth and beads, for thirty-three excellent fresh beasts—enough to last us to the coast. I believe one reason why the Rendile welcomed me so heartily was because they had heard of the kindness shown by Mr. Astor Chanler towards the natives when that gentleman had passed along the Guaso Nyiro, a river flowing eleven marches to the south.

The country was generally flat, with here and there a low hill



ALONG LAKE RUDOLF.

and isolated rocky mountains; but there were two mountain groups to the east, rising 3000 feet above the surrounding country, covered with forest and sloping green pastures that made a striking contrast to the dried-up appearance of the plain. One of these was called Koroli, and the other Marsabit. Water is to be had at rare intervals only in this country, it being much worse than Somaliland in this respect.

After leaving the Rendile, the next water to be obtained was in the crater on the top of Mount Marsabit, 30 miles south-east. According to European ideas, nothing could be more charming than this Marsabit. Surrounded by a large forest, and lying at the top of the mountain, is a lake a mile square, clear and deep. The jagged walls of the crater form a semicircle about it, while from another side a broad road leads out through the forest to the open meadows beyond. The atmosphere is moist and cool. In the early mornings dense clouds are swept along by invigorating blasts of cold air, and with the dew of night freshen up

the plants and trees. Outside the forest the view is superb. For 5 miles there is a series of green meadows sloping gradually downwards, on which are grazing many sheep and goats; while far off to the west beyond the yellow plain rises rugged Kulol, and a still greater mountain below it—Mount Njaro. Living on Marsabit were many Masai as well as Rendile.

On leaving Marsabit, we were destined to travel many days through a dreary, monotonous country; the only people we met were Wandorrobbo, or poor people living entirely by hunting. Water could only be found at long intervals. Finally, after marching 150 miles south of Marsabit, we reached the Guaso Nyiro river on September 23, and joined our line of march with that of Mr. Astor Chanler, who had passed along at right angles to us, and followed the river to its termination in the Lorian lake or swamp. Here one of my boys was so injured by a crocodile that I was forced to amputate his arm. After following the river a short distance east, we again turned south across the same barren, bushy sort of country we had just left—only worse. For six days we kept zigzagging around bushes with no guide or path, working from three o'clock in the morning till two or three in the afternoon daily, and on October 7 found ourselves on the banks of the Tana river by Korokoro. We were out of the unknown regions, but still the country was very wild. The natives fled from us at first, and we could get neither guides nor canoes. There were no roads, and the country in many places was very bushy. I expected it would take us a month before we could accomplish the 300 miles of marching yet before us.

Again the good fortune that had followed us in our journeys did not desert us. The eighth white man that had been up the river to Korokoro now appeared; the Rev. Robert Ormerod, an English missionary who had been making a journey in canoes, was just passing on his homeward course. Thanks to his assistance, we were able to procure canoes and canoeemen. Mr. Ormerod told me there would be a steamer at Lamu about the last of October. There was little time, but I determined not to have to wait a month in Lamu; so, bundling many of the loads in canoes to lighten the camels, we started for a race. In a fortnight we were on the coast, having made our long journey along the river in that time. We reached Lamu October 25, 1895, and had two days to wait for the steamer that was to convey us all to Aden.

I wish to state that the English officials, as a rule, both at Aden and on the coast, treated me most courteously, and that I feel especially indebted to Captain A. L. Rogers, Resident at Lamu, for his kind hospitality and assistance.

I would like to tell you of all the natural-history specimens collected on the expedition, but they have not had time to be completely classified. Of the seven hundred birds that I brought back, twenty-four have

been described by Dr. Bowdler Sharpe of the British Museum as being new to science. Many new specimens of plants, reptiles, and batrachia, fishes and myriopods have also been described. Besides these, the collection included about 3000 species of insects, many mammals, and some interesting geological specimens. I have presented the types of most of the new species to the British Museum of natural history, and I also intend giving a good collection to the Academy of Natural Sciences at Philadelphia.

Besides being very pleased with the results of my expedition, both from a geographical and natural-history standpoint, I am most gratified to think that only six of my faithful followers died during the sixteen months we were in the jungle, and that when we landed in England a month ago, Mr. Dodson was in even better health than when he had started for Aden a year and a half previously. In spite of the 4000 miles of marching, and all the trouble we had had to undergo, we could not say adieu to Africa, but *au revoir*.

Before the reading of the paper, the CHAIRMAN (Sir GEORGE TAUBMAN GOLDIE, K.C.M.G., Vice-President) said: I am informed that there is likely to be a considerable number of speakers after Dr. Donaldson Smith's paper has been read, and I think we shall have to enforce a five minutes' rule, in order that we may get home to-night. Your chairman, therefore, ought to set the example of brevity, and I propose to make no preliminary remarks, but call on Dr. Donaldson Smith to read his paper.

After the reading of the paper, the following discussion took place:—

The CHAIRMAN: In following our usual practice, and inviting discussion upon the remarkable paper which we have just heard read, we can have no question as to whom we should first turn. We have present to-night his Excellency the Ambassador of the United States. Now, Dr. Donaldson Smith is a member of that Western half of the English-speaking people, to whom we here in Great Britain are united by the strongest, by the most powerful ties that can bind man to man. Common speech, common literature, which lead to identical modes of thought and identical views of life, are too deeply embedded in human nature to be shaken or even seriously impaired by any passing disputes as to material interests. His Excellency is well aware that distinguished American explorers like Dr. Donaldson Smith are welcome here, not only as representatives of science, which in a minor degree "makes the whole world kin," but also as "bone of our bone, and flesh of our flesh." I beg to call upon the American Ambassador.

Mr. BAYARD: I am most fortunate that the accident of my representing my country brought me here to-night. It has been a most interesting occasion. What we have heard has come to us as from another planet. A new country has been suddenly expanded to our eyes, and a campaign has been opened, a campaign of mind against matter. It is not a campaign of profit; there is not one word that has been said to-night, not one word in the proof-sheet placed in our hands, that is degraded by the suggestion of profit, or mere utility. It has been something higher and far nobler; it has been an effort to develop to our limited knowledge a better understanding of the world in which we live. There has been no thought of trade by my countryman, whom I am so glad to find the expositor of such thoughts. He has not uttered one thought of injustice or

oppression, of personal selfishness, or of any lower or more cruel motive. It has been, upon his part, an honest, brave, modest endeavour to let all the world know something of distant regions of which nothing seems to have been known before. In such a struggle, and for such an end, I am rejoiced to find my countryman, an American, a pioneer and an expositor. I have been much impressed by what I have heard; I have rejoiced to find you citizens of Great Britain welcoming here, with an honour which is well deserved, the enterprise and courage of our race on the other side of the Atlantic. Ladies and gentlemen, there perhaps has been no time better than this for every man who cares for the great objects of our civilization, to rejoice, when the hearts of the people on both sides of the Atlantic beat together in a common cause, and that cause the elevation of our race and the higher civilization of humanity. The story told in this simple adventure is eloquent beyond words. The fact of this handful, this little handful, of men of our race, whom you may count upon the fingers of one hand, starting into the unknown continent, and marching bravely under the banner of intellect, cultivation, and education, into regions where neither intellect nor cultivation nor education had a place, and yet, by virtue of these things, feeling themselves in the mastery, not for gain or conquest, as I have said, but for the purpose of unfolding a knowledge of the world in which we live. I beg pardon that I have said so much, but I have spoken just what I felt, and I believe what you have felt. I am glad, and you will permit me to say I am proud, that an American has spoken here to-night, and that I, as a representative of his country, am here to thank him for it, and to express my obligation to you for having listened to him.

The CHAIRMAN: While we are living in the present, we must not forget the past. Ten years ago, Somaliland was first attacked by an expedition of the late Mr. Frank James. There is present Mr. Lort Phillips, one of those who were with Mr. James, and I think he is a proper person to speak to us to-night.

Mr. E. LORT PHILLIPS: We have all listened to-night with the greatest interest to Dr. Donaldson Smith's account of his most successful journey through the totally unknown region lying between Bari, on the Webi Shebeli, and Lakes Stefanie and Rudolf. I can scarcely believe that ten years have elapsed since my late friend, Mr. F. L. James, stood on this platform and read an account of our journey through the then unexplored country between Berbera and the Webi. Great changes have taken place since then. We found the country inhabited by roving tribes of nomads, possessing large flocks and herds, and whose greatest idea of happiness seemed to be a cattle-lifting raid. Seeing that we were strong and well armed, they naturally thought at first that we had come to enrich ourselves at their expense, and prepared to resist us accordingly. However, when they found that, notwithstanding our strength, we took nothing from them except what we paid for, their hostility turned to welcome, and now every shooting expedition that has since visited the country is received by the natives with the greatest joy. They gladly bring all they have to sell, and seem anxious to show sport. So dangerous was the country considered only ten years ago, that a special message was sent from the Foreign Office to the authorities at Aden to forbid our going into the interior. Luckily for us, however, the message did not reach us till we were already some distance in the interior, so we chose to misunderstand it. That was the first year of the British occupation. Since then great changes have taken place for the better. Previously no caravan dared to move without a strong escort, and even then they were liable to be looted in the rocky passes of the Gulis mountains, when the men's whole time was taken up in assisting the laden camels up and down what were then little better than rocky "staircases." Now beautiful roads have been engineered, down

which one might almost ride a bicycle, while the feeling of security is so great that I have seen owners of caravans strolling along with a small stick in their hands, their spears and shields being tied in a bundle on the camel's back, a fact that hardly a Somali would have thought possible ten years ago. Early last year I started, accompanied by my wife, Miss Edith Cole, Mr. Aymer, and Mr. Gunnis, and spent three delightful months among the Gulis mountains, which will, I feel confident, at no distant period, become a sanatorium for the garrison at Aden, or even for those with weak chests; a charming country which I consider as safe, if not safer than Piccadilly in the season.

Sir WILLIAM H. FLOWER: The last time I had the pleasure of attending a meeting of this Society, towards the close of last session, I was called upon by the President to make some remarks upon the paper which had been read. I hardly knew why, and was obliged to confess that I had nothing to say, because the gentleman who read the paper had not given an opening for a word upon any subject of which I was cognisant. He had certainly made a most interesting exploration, and had brought before us much valuable information upon geographical and archaeological subjects, but had told us nothing of natural history, nor brought home a single specimen. On this occasion, it is quite different, because Dr. Donaldson Smith, before starting upon his expedition, had equipped himself in an admirable manner, not only for geographical, but also for zoological exploration. He very wisely took with him a successful and accomplished taxidermist, Mr. Dodson, and we take some credit to ourselves at the Natural History Museum for having recommended him, for he proved not only an agreeable companion, but also a most hard-working and skilful preserver of the various animals of different kinds. Dr. Smith was able to collect on the journey. A large number of these specimens you will see after the meeting, exhibited in the adjoining room. The collection is a valuable one from many points of view. It has as yet been only very partially worked out; indeed, a considerable part of it was only unpacked a few days ago.

The chief anthropological interest in Dr. Donaldson Smith's paper is the mention of pigmy tribes further north than they have hitherto been met with. They, however, appear to differ from the true pigmy races of Central Africa in their perfectly black colour and considerably greater stature, and are therefore probably a mixed race. Among the mammals brought home is a new species of ichneumon, and an example of the very rare crested rat (*Lophiomys*).

Of birds, there are over 700 specimens. These have been examined by Dr. R. B. Sharpe, who has found no less than 24 species among them which were previously unknown to science. Of reptiles and batrachians, there are 300 specimens, of which, according to Mr. Boulenger, 11 are new. The fish, about 75 in number, belong to 18 species, of which 4 are new. Dr. Günther, who has examined them, remarks upon the great similarity of the fish fauna of Lakes Rudolf and Stefanie to that of the upper Nile. Of 8 species from these lakes, 6 are identical with Nile fish. Of insects an immense collection has been brought home, including as many as 6000 specimens. Some of the butterflies have been described by Miss Sharpe, but the rest have not been worked out.

I am happy to be able to add that Dr. Donaldson Smith has very liberally presented the types of all the new species of birds in his collection to the British Museum, as well as some other specimens, including an interesting collection of plants containing several quite new forms, which will shortly be described by members of the staff of the botanical department of the museum.

A collection of this kind must not be valued only by the number of new species it contains, but also by the number of specimens of known species in good preservation, with carefully recorded localities and dates, as this makes the collection

important from a geographical as well as a zoological point of view. Each animal and plant has a distribution of its own, dependent, no doubt, upon some physical conditions of the Earth's surface, at present most imperfectly known to us. The study of these conditions is part of the geographer's work, and it can only be fully accomplished when the exact range of distribution of all animals and plants has been determined. Such collections as those made by Dr. Donaldson Smith are essential factors in obtaining this knowledge, and therefore, as I said before, are as important to geographers as they are to zoologists.

Dr. BOWDLER-SHARPE: I think Sir William Flower has said almost everything that need be said upon the subject of the geographical discoveries of my friend Dr. Donaldson Smith. At the same time, I would just like to say one or two words with regard to the birds. One very important new fact which I think he has established by this collection is of great interest, concerning the natural regions into which Africa can be divided. It is certainly very curious to find that, in Somaliland, the nearest affinities to the birds of the country are not as you might expect, belonging to North-East Africa, Abyssinia, or East Africa, but Somaliland proper contains numbers of species and genera which find their closest allies in the fauna of the Cape—a most extraordinary and, to me, unexpected discovery. When Dr. Donaldson Smith crossed the Shebéli river, he tapped the East African flora, and the birds brought from these wonderful journeys by Lake Rudolf and down to the Tana have not yielded anything like the new results which his explorations in Somaliland did. It was not altogether unexpected by me that, when he got to the lakes, he would find the same fauna as on the other lakes; but to find twenty-four new species in Somaliland was—coming on the new species discovered by Mr. Lort Phillips—certainly wonderful. You have got to travel a long way, and work very hard, to get twenty-four new species in a collection, which the British Museum does not possess. Dr. Donaldson Smith did this, and, though it has not been mentioned, I think it should be, that he has very generously presented to our national museum the type specimens of his new species, in return for what he is pleased to call our hard work on his behalf—we rather think, of his hard work on our behalf.

Mr. JOHN COLES: I have very great pleasure in saying a few words about the observations taken by Dr. Donaldson Smith for fixing positions along his route. When Dr. Donaldson Smith determined to make this very interesting journey, so successfully performed, he made up his mind that it would be no good trying to make a mere itinerary without being able to fix his positions, to show us where he had gone, and, having made the determination, he set to work in a most hearty manner. I can bear witness, from the time he came to me, both in observing the stars at night and in surveying the country, that he gave his whole and undivided attention to the subject, and, if he had not done so, he could not have produced these very excellent results. The instruments he used were a sextant and artificial horizon, and a 6-inch transit theodolite. His observations for latitude by meridian altitudes of the sun and stars, and for longitude by the sun and stars east and west, throughout the journey, are most creditable. It is very interesting to find that the rate of his watch, when he handed it to me, after allowing for a small temperature correction, agreed with the rate obtained by Dr. Smith by observation during his journey. I can say, after looking over his work, that I have seldom seen any better work done by any traveller. It is an example of good, honest, painstaking work, recorded in such a manner that any person who understands computation can at once judge of the value of the observations. I have followed him right round from Bari to Lamu, and day by day his work places him in the correct position. What is more, on arriving at the coast he made his longitude agree, within a very few minutes, with that fixed by the Admiralty. I don't think I

will take up any more of your time, but I may say that the example set by Dr. Smith is a very good one. If travellers will only take observations and record them in the same manner, we shall find their work more valuable and reliable. Your work, Dr. Donaldson Smith, is very creditable to you, and it is extremely encouraging to me, your instructor.

Mr. F. W. A. H. GILLETT: I wish to express my admiration for the persevering way in which Dr. Donaldson Smith mapped out the country, in spite of the broiling and enervating climate, tiring marches, and the inaccurate reports given by natives, unaccustomed to precision. Before leaving this platform, in case you are going away with a too exalted idea of the advantages of the theodolite, I will give you a short story to show you the disadvantages in a country where the natives give it powers of information which we glean from the maps. A native came and offered to take me to shoot elephants. I journeyed for twenty-five miles, and the following day he took me out to show me the track of an elephant two months old, and told me to look at it with my instrument and see where the elephant was. At first I felt inclined to annihilate him, but, seeing from his face that he was in earnest and there was no humbug, I told him it was no use my looking at it. He said, "The doctor looks into his instrument, and afterwards he says, 'What do you call a place 100 miles in that direction? How many days does it take to reach a large lake in that direction?'" Not wishing to lose the man's respect, I set up the camera, and, turning to him, said very gravely, "This elephant has bad tusks, and one is broken, and as he is very far away, I will return to camp." So, owing to Dr. Smith's theodolite, I had a journey of 50 miles for nothing, except the pleasure of telling you the story to-night.

Dr. H. G. SCHLICHTER: Among the results of Dr. Donaldson Smith's journey there is, ethnologically, none of greater interest and importance than his discovery of the Dume dwarfs, in the region north of Lake Stefanie. Dwarf tribes have recently been discovered, as you know, in many parts of the Congo basin, as well as on the West Coast of Equatorial Africa and in the Upper Nile regions. Moreover, some of them have been found west of the Upper Zambesi, and I think I have shown that the genuine Bushmen of South Africa belong likewise to them. All these pigmies live scattered among the other native races (Bantu, Nuba, etc.), and are totally different from them as regards the principal ethnological features. The average height of the African pigmies is, of course, a question of great importance. I have carefully collected all the available measurements and critically compared them as regards their trustworthiness, the number of individuals measured, etc., and I have come to the definite conclusion that, the whole of our present knowledge of the African pigmies taken together, we must give them an average height of between $4\frac{1}{2}$ and 5 feet. Numerous observations of our best authorities point to this fact. Nevertheless, the pigmies generally give the impression of well-proportioned and strong men. Their mode of living varies according to the character of the country which they inhabit, but their principal occupation seems to be hunting, and their characteristic weapons are bows and poisoned arrows. They live in small conical or beehive-like huts of the most primitive construction, and they invariably inhabit mountainous or forest-covered or similar parts of the country, difficult of access.

The colour of the different dwarf tribes varies considerably. Some of them are described as brown, others as black; and Stuhlmann, as well as myself and others, came to the conclusion that in certain cases the race is not pure. Now, before Dr. Donaldson Smith's journey no dwarf tribes had ever been discovered in the vast territories east of the Nile, although they were found to be pretty frequent west and south-west of this river. But in the course of my own studies on the African

pigmies, I found scattered in the reports of various reliable travellers—for instance, Harris, Avanchers, Krapf, d'Abbadie, and Hartmann—information about hypothetical pigmies living south of Abyssinia, and when I came to compare and criticize the reports of the different authors and their trustworthiness, I became convinced that these reports could not be without some actual foundation; and as the exploration of the countries south of Abyssinia proceeded, my information on these not yet discovered dwarfs became supplemented, and the limits of the area where they might be found more restricted and definite. Thus I was enabled, in a paper which I published four years ago, to distinctly predict the existence of these East African dwarfs, and to fix their probable locality as lying between 5° and 6° N. lat. and between 36° and 38° E. long. Greenwich. I said at that time, "I feel confident that I shall not be committing any serious error in affirming that these regions are inhabited by pigmies, who are probably scattered among other tribes of different race and customs, similarly to their relatives in West and Central Africa."

From what we have heard this evening from Dr. Donaldson Smith, it is clear that he found his dwarfs, the Dume, exactly on the spot indicated by me. It is impossible to under-estimate the importance of Dr. Donaldson Smith's discovery. It lies in the fact that we must now make a very large addition to the area over which the pigmy tribes are scattered, and it greatly strengthens the theory, that the African pigmies are by no means degenerate specimens of the tribes among which they live, but that they are the last remnants of the first and original population of the Dark Continent. Dr. Donaldson Smith's observations are in complete accordance with the views of our other authorities who have studied the African pigmies on the spot, and who have all strongly objected to the assumption that we have in the pigmies degenerate Bantu or other tribes before us. But it is, of course, quite natural that we do not always find the *pure* aborigines. Such a mixed race are, e.g., Casati's Monbuttu Tiki-Tiki, and many difficulties which puzzle us at present about the Bushmen, Akka, and others, are doubtless the result of this fact. Who would have thought twenty years ago that pigmy tribes exist all over Central Africa, from the Ogowe to the Omo, and from Lake Stefanie to the Kalahari desert?

Mr. E. G. RAVENSTEIN: It is very late, and I will be short. We are greatly indebted to Dr. Donaldson Smith for the excellent manner in which he has done his work. He has not only gone far beyond his Italian predecessors as an explorer, but he has likewise laid down his route by careful astronomical observations. He has been among tribes, such as the Dume, Aro, and Konso, of whose existence we hitherto only knew from hearsay; and he has been among a people of pigmies, of which specimens only had hitherto been observed by European travellers. It is, however, to the question of the course of the Omo to which I wish to address myself to-night. The head-stream of that river, the Gibe, figures for the first time on the famous map of Fra Mauro, who makes it flow, as "River of the Gallas," to the Indian Ocean. More recently, from native information collected by M. d'Abbadie, Dr. Beke, and many others, the Omo was supposed to flow either to the Nile or to Lake Rudolf, Lake Stefanie, or Lake Abala, which is certainly distinct from Lake Abaya. Dr. Smith is inclined to believe that it is the upper Dana, but that river, at the highest point reached by M. Bottego, is comparatively a small stream, with sources apparently not far distant. I confess that, with the information at present in our possession, I am inclined to think that the Omo, after all, takes its course to Lake Rudolf. Going southward from Kafa, we are told, that that river has to be crossed, and that we then reach the country of the Dime and other tribes whom Dr. Smith has, for the first time, definitely located. Lake Rudolf covers an area of 4000 square miles; it lies almost wholly within a rainless

district, and the evaporation from its surface must be immense. This loss could never be made up if the Nianam were the only perennial river which enters the lake, and if its drainage basin were restricted to the area proposed. I may observe that neither Dr. Smith nor Count Teleki saw the Nianam at its best, for the rains in Kafa, where its sources lie, last from June or July to the beginning of November, and it is therefore during the latter month that the river would carry the greatest volume of water. This question of the course of the Omo is perhaps the most interesting problem to be solved in connection with African hydrography, and it would redound to the honour of America if Dr. Donaldson Smith went out again and settled it.

Dr. DONALDSON SMITH: I wish to thank the gentlemen who have spoken this evening for their very complimentary remarks, and all of you for the kind manner in which you have received me.

The MAPS (1-5) which accompany this paper are reduced from Dr. Donaldson Smith's own drawings, adjusted to the 59 latitudes and 41 longitudes determined by him in the manner explained above by Mr. Coles. The meridian differences are dependent upon Gagap (Milmil) and Bari, as determined by Colonel Paget and Captain Swayne, and Lamu, taken from the Admiralty Chart.

The altitudes result from aneroid and boiling-point observations, the mean pressure at the sea-level being estimated from the charts of Dr. Buchan and Dr. Hann. They are, as a matter of course, merely approximations.

THE PAMIRS AND THE SOURCE OF THE OXUS.*

By the Right Hon. GEORGE N. CURZON, M.P.

PART III.

Before finally leaving the question of the Pamirs, there remains for me to redeem an earlier pledge by giving a list of the travellers of various nationalities who, from the commencement of the Christian era, are known to have visited or crossed that region. I will divide them into three classes: I. Pilgrims and travellers, Asiatic and European, down to the beginning of this century; II. English, Indian, and European explorers in the present century; III. Russian explorers in the same period.

I. The great Central or Seric route across Asia from Bactria to China was first discovered to Europe by the expedition of Alexander the Great. The first detailed description of it was supplied by a Macedonian trader, Maes Titianus, in an account of a journey made by the factors in his employ. From this information Marinus of Tyre (A.D. 150), the predecessor of Ptolemy, determined the route which was reproduced by the latter in his great work, and which, though the identification has long been a matter of dispute, in all probability passed across the northern

* Paper read at the Royal Geographical Society, February 18, 1895. Map, p. 96. Continued from p. 119.

or central Pamirs. In the early Middle Ages, when intercommunication became more frequent, the main line of connection, which was followed by European and Asiatic embassies, and was described by Arab geographers and historians, was transferred by Turkish and Tartar ascendancy to the valleys of the Jaxartes (Syr Daria) and Narin. But a few bold travellers, voyaging to and from India, kept up the knowledge of the southern or Pamir route, and at intervals through the dark ages lifted the corners of the curtain that had settled so impenetrably down upon the heart of the Asiatic continent. Among these we possess the written records of several Chinese Buddhist pilgrims, who, in their ardour for the faith which their country had adopted, undertook long and perilous journeys from China to India, to search for the sacred scriptures and commentaries of the Buddhist Canon. Their journeys have, in the revival of geographical interest which distinguished the opening of the present century, been annotated and fought over by learned scholars. But not until more recent years has it been possible to apply the test of personal knowledge and local investigation to supplement or to correct the *a priori* disquisitions of the library. These are in many cases invalidated by such an inquiry, while the credibility of the original authors, subject to inevitable deductions for Oriental exaggeration, emerges on the whole with increased credit.

The first of these pilgrims whose record has been preserved was Shih Fa-hian, a native of Wu-yang, in Shansi, who in 399 A.D. started from his native province, in company with other priests, for a quest of the Scriptures in India. Upon his return, in 415 A.D., he wrote the 'Fo-kwo-ki,' an account of his travels.* Fa-hian's journey is easily traced as far as Khotan. From this point it is disputed whether its further progress to Northern India led him over or near to the Pamirs, or by a more easterly route. The following is the passage in the 'Fo-kwo-ki': †—

"From Khotan they pressed onwards to the Tseu-ho country. They were twenty-five days on the road, and then they arrived at this kingdom. . . . Having stopped there for fifteen days, they went south for four days, and entered the Tsung-ling (Onion) mountains. Arriving at Yu-hwui (or Yufai), they kept their religious rest; which being over, they journeyed on twenty-five days to the

* This was first translated into French from the Chinese and edited by Abel Rémusat, with commentaries by Klaproth and Landresse, under the title 'Foue-Koue-Ki ou Relation des Royaumes Bouddhiques' (Paris, 1836). It has been translated into English from the French by Laidlay; by the Rev. S. Beal, 'Travels of Fah Hian and Sung Yun' (London, 1869); and 'Buddhist Records of the Western World' (London, 1890), vol. i. p. xi. and xxiii.-lxxxiii.; and by J. Legge, 'A Record of Buddhist Kingdoms' (Oxford, 1886). *Vide* also the introduction to General A. Cunningham's 'Ladak' (London, 1854); Sir H. Yule's 'Cathay and the Way Thither' (Hakluyt Society), 1866; Introduction to Wood's 'Oxus' (1872), p. xl.; and Major H. G. Raverty's 'Notes on Afghanistan' (1888), pp. 181, 298, 299.

† Beal's translation in 'Buddhist Records,' vol. i. p. xxvii.-xxx.

Kie-sha country. . . . This country is in the middle of the Tsung-ling mountains. From there, going onwards towards North India, after being a month on the road, we managed to cross Tsung-ling. In Tsung-ling there is snow both in winter and summer. Moreover, there are poison-dragons, who, when evil-purposed, spit poison, winds, rain, snow, drifting sand, and gravel-stones. Not one of ten thousand meeting these calamities escapes. The people of that land are also called Snowy-mountain men. Having crossed Tsung-ling, we arrive at North India. On entering the borders, there is a little country called Toli. . . . Keeping along Tsung-ling, they journeyed south-west for fifteen days. The road was difficult and broken, with steep crags and precipices in the way. The mountain-side is simply a stone wall, standing up 10,000 feet. Looking down, the sight is confused, and on going forward there is no sure foothold. Below is a river called Sintu-ho. In old days men bored through the rocks to make a way, and spread out side ladders, of which there are seven hundred in all to pass. Having passed the ladders, we proceed by a hanging rope-bridge, and cross the river. The two sides are something less than 80 paces apart. Crossing the river, we come to the country of Uchang, which commences North India."

Upon the identification of the line here sketched no two writers have agreed, while several have at different times adopted contradictory explanations. Klaproth identified Tseu-ho with the Chinese Chu-ku-po of Sung Yun and the modern Kugiar, in the district of Yangi-hissar, or Yarkand. Yu-hwui he supposed to be Ladak.

Beal, in his first edition, supposed Tseu-ho to be the Yarkand river; the Yu-whui country to be the Chiltung pass (Tangetar of Benedict Gœs); Kie-sha to be the Kartchou or Kie-pan-to of Hwen Thsang, and the Han-pan-to of Sung Yun (*i.e.* Sarikol and Tashkurghan); and he added (p. 18), "It would appear that Fah Hian crossed the Tsung-ling mountains near the Great Pamir plateau, and then, instead of keeping along the Teng-i Badakshan of Gœs, he pursued a more southerly route towards Kitaur or Chitral." Having taken his traveller to "the headwaters of the Gilgit river" (p. 68), and having identified To-li with the Ta-li-lo of Hwen Thsang, Beal then identified this with Dhir, near the river Tal (p. 18). In the same edition, on p. 70, he identified the Sinto river with the Gilgit river, and on p. 21, with the Indus—a proof of the geographical confusion into which his reasoning had led him. Wu-chang, or Uchang, he accepted as Udyana. In his second edition, however, Beal finds Toli to be "the valley of Darail in the Dard country," while the Sinto has now become the Swat river (p. 15).

Cunningham, on the other hand, argued strongly for an entirely different and more easterly line, taking Fa-hian over the Karakoram mountains, and identifying Kie-sha with Ladak. He then conducted the pilgrim down the Indus valley to To-li, *i.e.* Darel, and so on to India. Yule accepted this line of reasoning, and denied that Fa-hian ever entered the Oxus basin at all.

Raverty, after asserting that "Fa-hian without doubt reached the present Kashgar territory, and traversed the Karakoram Pass," declared

his belief that Kie-sha was not Ladak, but the adjoining district of Balti, often called Little Tibet. To-li might, he thought, be Baltistan, Hunza, or Yasin (p. 298), though in another place he had identified the same name with the Tal or Panjkora river (p. 181). The Sinto he found to be the Gilgit river, and Uchang the Dangrak river or upper course of that stream, though elsewhere on the same page he seems to regard it as equivalent to the district of Swat. How, if Fa-hian crossed the Karakoram, he could have avoided Ladak, or how, if he passed through Baltistan to Gilgit, he could have passed Hunza, or why any of these identifications should be accepted, does not appear.

I do not agree with any of the last three writers, nor, in most particulars, with the first. It is to be observed that the pilgrims travelled slowly, whichever was the route that they adopted, and that their measurements, even if correct, which may be doubted, cannot be expected to correspond (any more than do Marco Polo's) with the distances of modern itineraries; that the Tsung-ling mountains is a name applied by the Chinese to the entire mountain mass, including the Pamirs, the Hindu-Kush, and the Mustagh range, as well as the mountain belt south of them extending from Badakshan on the west to Chinese Turkistan on the east; that Ladak, which is on the extreme eastern fringe, could scarcely be described as in "the middle of these mountains;" that Fa-hian's description of the Tsung-ling climate and conditions exactly accords with those of the Pamirs; that he employs the same name, "Snowy mountains," as is unmistakably applied by his successor Sung Yun to the main Hindu Kush range, south of Wakhan; and, that a month after leaving Kiesha he speaks of having *crossed* Tsung-ling, which he could only have done if coming from the north, and which he would nowhere be said to have done if coming from Ladak or Baltistan. It is further to be noted that the remaining Chinese pilgrims, of whose similar journeys the records have been preserved, all travelled, on their outward or return journey, by the Pamir line; and that there is no contemporary witness to a Karakoram route. I hold, therefore, that Fa-hian did traverse some portion of the Pamir region, though what track he followed, or by what passes he crossed the main range, we have no means of ascertaining. Proceeding from the north, it is not unnatural that he should strike the valley of Darel (which is probably his Toli, and the Ta-li-lo of Hwen Thsang) on the right bank of the Indus; while the latter must almost certainly be pronounced to be the Sinto of his narrative. This is the name that is elsewhere applied to the Indus by both Fa-hian and Sung Yun, and that is always given to it by Hwen Thsang, who in the 'Si-yu-ki' describes in almost identical language the same route as that taken by Fa-hian, only in the inverse direction:

"Going north-west (*i.e.* from Uchang) we re-ascend the Sintu river. The roads are craggy and steep; the mountains and the valleys are dark and gloomy. Sometimes we have to cross by ropes, sometimes by stretched iron chains. There are foot-bridges suspended in the air, and flying bridges across the chasms, with wooden

steps let into the ground for climbing the steep embankments. Going thus 1000 li or so, we reach the river valley of Ta-li-lo."*

It will be seen from this passage that Uchang must lie to the east of the Indus river, an inference which is also borne out by the narrative of Sung Yun.† I do not see, therefore, how Uchang or Udyana can be identified, as it has been by Yule and others,‡ with Swat, which is on the western side. Swat is apparently the Suhoto of Fa-hian, and the Swat river is the Su-po-fa-su-tu of Hwen Thsang (which is the Subhavastu of the Rig Veda and the Σούαστος of Ptolemy).

There is less obscurity about the track of the next Buddhist pilgrims to India, of whose journey a record has been preserved. These were Sung Yun, a native of Tun-hwang, in Little Tibet, who was sent by the Empress of the Wei country from her capital Lo-yang (Hunan-fu) in 519 A.D., to search for sacred books in India—and his companion Hwei Sang. They returned in three years with 170 volumes of the Great Development Series, and their travels were preserved in the Chinese History of the Temples of Lo-yang.§ Sung Yun also journeyed by way of Khotan, after leaving which he thus described his movements:

"In the 2nd year of Shan Kwai, and the 7th month, 29th day, we entered the kingdom of Chu-ku-po. . . . The limits of this country can be traversed in about five days. During the first decade of the 8th month we entered the limits of the country of Han-pan-to, and, going west six days, we ascended the Tsung-ling mountains. Advancing yet three days to the west, we arrived at the city of Kinah-you (or Kong-yu), and after three days more, to the Puh-hoi mountains. This spot is extremely cold. The snow accumulates both by winter and summer. In the midst of the mountain is a lake, in which dwells a mischievous dragon. . . . From this spot westward the road is one continuous ascent of the most precipitous character; for 1000 li there are overhanging crags 10,000 fathoms high, towering up to the very heavens. . . . After entering the Tsung-ling mountains, step by step we crept upwards for four days, and then reached the highest part of the range. From this point as a centre, looking downwards, it seems just as though one was poised in mid-air. The kingdom of Han-pan-to stretches as far as the crest of these mountains. Men say that this is the middle point of heaven and earth. . . . To the eastward of the capital of this country there is a rapid river (or a river Mang-tsiu) flowing to the north-east towards Sha-leh. The highlands of the Tsung-ling mountains do not produce trees or shrubs. At this time, the 8th month, the air is very cold, and the north wind carries along with it the drifting snow for 1000 li. At last, in the middle decade of the 9th month, we entered the kingdom of Poh-ho. The mountains here are as lofty and the gorges deep as ever. . . . The land is extremely cold—so much so, that the people occupy the caves of the mountains as dwelling-places, and the driving wind and snow often compel men and beasts to herd together. To the south of this country are the Great Snowy mountains, which, in the morning and evening vapours, rise up like gem-spires."

* Beal's 'Buddhist Records,' vol. i. p. 133.

† Beal, *Ibid.*, p. 102.

‡ Yule's 'Marco Polo,' vol. i. p. 173.

§ *Vide* Beal's two works as before; Yule's 'Cathay,' vol. ii. p. 542; and 'Introduction to Wood's Oxus,' p. xli.; Raverty, p. 299.

There has been a general agreement among commentators, although neither the name of the Pamirs nor any possible equivalent of it is mentioned, that Sung Yun's narrative describes a march across that region. There have, however, been different identifications of the various localities named. Yule identified Chu-ku-po with Yarkand, and Han-pan-to, the Kie-pan-to of Hwen Tshang (or Khavandha, according to the restoration by Stanislas Julien), with the Chinese district bordering on the Eastern Pamirs, and now known as Sarikol, whose chief town is Tashkurgan. He supposed Poh-ho to be Wakhan, but did not attempt to specify any particular passes or route, though he inclined to identify the latter with Marco Polo's track.* Beal followed Yule's interpretation, but identified Poh-ho with Bolor.† Raverty (pp. 181 and 299) said the Dragon Lake of the pilgrims was the Chatiboi lake (which, as I have before pointed out, in a footnote, is not a lake at all, but a glacier), at the source of the Yarkhun river,‡ and that the Great Snowy mountains were the main range of the Hindu Kush, including especially Tirach-mir.

For my own part, I believe that Sung Yun approached and crossed the Pamirs from the direction of Yarkand, though by what passes he travelled it would be mere guess-work to conjecture. The Dragon Lake, which appears from his identification to be in the middle of the Pamirs, and to lie to the north and north-east of Poh-ho (Wakhan), must be one of the Pamir lakes previously described, probably Lake Victoria—an identification which is the more likely if, as I shall show, this was the lake to which Hwen Tshang, 120 years later, gave the same name. The crest of the range, to which the pilgrim climbed with so much labour, appears to be one of the Pamir dividing-ridges, which, though of lower elevation than some of the Hindu Kush passes, seem to have uniformly impressed all the ancient travellers with a sense of superior altitude, and of being, so to speak, the apex of the world. Sung Yun's movements, after crossing the Hindu Kush, are more difficult to trace, and I will not here pursue them.

The most famous of all these pilgrims was, however, Hwen Tshang, a native of the province of Hunan, who in 629 A.D., in the reign of Tai Tsung, the second emperor of the Tang Dynasty, set out for India, upon his own initiative, with a similar object in view. He returned successful with twenty-two horse-loads of Buddhist literature in 645 A.D., and, at the command of the Emperor, then wrote or compiled from the Sanskrit books which he had brought back with him, the 'Si-yu-ki,' or

* Yule's 'Marco Polo,' vol. i. p. 184.

† This could hardly be, since Sung Yun speaks a little later of Po-lu-lai, which is obviously Bolor.

‡ Another argument against this identification is the statement of Sung Yun, that from the lake westward the road is a continuous and precipitous ascent. I followed it, and it is a descent the whole way.

'Records of the Western World.' This work contains a narrative of his own experiences, as well as a mass of additional information upon the countries which he either visited or heard about; and was further supplemented by a life of the author, written by some of his pupils after his return, which corroborates and throws fresh light upon his travels.* With the outward journey of Hwen Thsang, which was by Tashkend, Samarkand, Balkh, and Bamian, I am not here concerned. It was on his homeward march, in the summer of 642 A.D., that, after passing through Badakshan, he came to the country of Tamositieti bordering on the Oxus, then to the country of Shang-mi, after which—

"On the north-east of the frontier of Shang-mi, skirting the mountains and crossing the valleys, advancing along a dangerous and precipitous road, after going 700 *li* † or so, we come to the valley of Po-mi-lo. It stretches 1000 *li* or so east and west, and 100 *li* or so from north to south; in the narrowest part it is not more than 10 *li*. It is situated among the Snowy mountains. On this account the climate is cold, and the winds blow constantly. The snow falls both in summer and spring-time. Night and day the wind rages violently. The soil is impregnated with salt, and covered with quantities of gravel and sand. The grain which is sown does not ripen; shrubs and trees are rare; there is but a succession of deserts without any inhabitants. In the middle of the valley is a great Dragon Lake; from east to west it is 300 *li* or so, from north to south 50 *li*. It is situated in the midst of the great Tsung-ling mountains, and in the central point of Jambudvīpa. The land is very high. The water is pure and clear as a mirror; it cannot be fathomed. The colour of the lake is a dark blue, the taste of the water sweet and soft. In the water hide the *ku-ki* fish, dragons, crocodiles, tortoises. Floating on its surface are ducks, wild geese, cranes, and so on. Large eggs are found concealed in the wild desert wastes, or among the marshy shrubs, or on the sandy islets. To the west of the lake there is a large stream, which, going west, reaches so far as the eastern borders of Tamositieti, and there joins the river Po-tsu (*i.e.* Oxus), and flows still to the west. So on this side of the lake all the streams flow westwards. On the east of the lake is a great stream which, flowing north-east, reaches to the western frontiers of the county of Kie-sha, and there joins the Si-to river and flows eastward; and so all streams on the left side of the lake flow eastward. Passing over a mountain to the south of the valley of Po-mi-lo, we find the country of Po-lo-lo. Here is found much gold and silver; the gold is red as fire. On leaving the midst of this valley and going south-east, along the route there are no

* The European literature upon Hwen Thsang is voluminous. I may instance Abel Rémusat's translation of the 'Po-koue-ki,' with notes by Klapproth and Landresse, Paris, 1836; Stanislas Julien's translation of his life, 'Histoire de la Vie de H. T.,' Paris, 1853; and of the 'Si-yu-ki,' 2 vols., Paris, 1857; Ritter's *Erkunde*, vol. vii., Berlin, 1837; Major W. Anderson, *Jour. of As. Soc. of Bengal*, vol. xvi., 1847; Sir A. Cunningham, *ibid.*, vol. xvii., 1848; V. de St. Martin, 'Mémoire Analytique sur la Carte de l'Asie Centrale et de l'Inde,' Paris, 1858; Sir H. Yule, 'Notes on H. T.'s Account of the Principalities of Tokharistan,' 1872; 'Cathay and the Way Thither,' vol. i. p. 184; *Jour. R.G.S.*, vol. xliii., 1872; and 'Introduction to Wood's Oxus,' p. xi.; Sir H. Rawlinson, *Jour. R.G.S.*, vol. xliii., 1872; J. B. Piquier, 'Le Pamir' (Paris, 1876), p. 34-45; Edkins, 'Notices of Buddhism in China,' and Rev. S. Beal, 'Life of H. T.,' London, 1888; and 'Si-yu-ki,' 2 vols., London, 1890.

† The *li* was a Chinese measure of distance, which varied somewhat at different times. Roughly speaking, however, we may reckon 5 *li* as the equivalent to one mile.

men nor villages. Ascending the mountains, traversing the side and precipices, encountering nothing but ice and snow, and thus going 500 li, we arrive at the kingdom of Kie-pan-to."*

With the narrative of the traveller himself may be compared the description of his biographers, who add a few more details. According to them the Dragon Lake is 200 li in length, and—

"The animals that dwell in it are of infinite variety; the noise of their ten thousand cries is like the tumult of a hundred workshops. We see here birds 10 feet or so in height; eggs as large as a round water-jar, probably the same as were formerly called the *ku-ko* of the Tiu-chi. . . . This lake, moreover, is one with the Anavatapta Lake, in its north and south direction."†

They further add that the great river on the east actually issued from the lake (which might be inferred from Hwen Thsang).

It is clear that there are in these two narratives many exaggerations, particularly of distance and dimensions. There are also serious inaccuracies, such as the easterly outflow from Victoria Lake (supposing this to be meant) or the westerly outflow from Chakmak Lake (supposing that to be intended).‡ Nevertheless, the salient features of the account stand out as an unmistakable picture of the Pamir country, as it has already been portrayed in this paper, and leave a doubt only as to the particular valley or Pamir by which the traveller crossed it. Klapproth, Landresse, St. Julien, St. Martin, Paquier, Beal concur in identifying this with Wood's route up the main valley of the Panja to Victoria Lake. Rawlinson in his earlier writings, and Yule, prefer the more southerly track to Lake Chakmak through the Little Pamir. I entertain very little doubt of the correctness of the former hypothesis. Reasons have before been given for supposing both that Victoria Lake may once have been much larger than it now is, while in any case it is more than double the size of Lake Chakmak, and that it was also the Dragon Lake of the earlier Buddhist pilgrim Sung Yun. The stream flowing out on the west is, of course, the Pamir river, or middle confluent of the Panja. Neither the eastward-flowing drainage from the watershed beyond the eastern extremity of Victoria Lake, nor the Aksu issuing from Lake Chakmak, flow, as Hwen Thsang imagined, into the basin of the Yarkand river; but this was an error which the learned Chinaman committed in company with later and better-equipped travellers. That Victoria, and not Chakmak,

* Beal, 'Buddhist Records,' vol. ii. pp. 297, 298.

† Beal, 'Life of H. T.,' pp. 197, 198.

‡ Sir H. Rawlinson, in the later part of his life, wrote an essay (*Proc. R.G.S.*, 1887, p. 69), in which he argued, mainly from Mr. Ney Elias' report of his visit to Rang Kul, that the latter was the Dragon Lake of Sung Yun and Hwen Thsang. I do not think this can possibly have been the case, since Rang Kul is neither situated in the middle nor in the highest portion of the Pamirs. Above all, it has no river exit on either side, and no river anywhere near to its eastern extremity, much less flowing out of it.

Lake is alluded to is further demonstrated by the direction, viz. south-east, taken by the pilgrim, after passing the lake on his way to Kiepan-to (assuming the latter, with Yule, to be Sarikol with its capital Tashkurghan). If he had been marching by the Little Pamir route, he would have had to proceed north-east from Chakmak to Aktash. Po-lo-lo is the mysterious country so often designated Bolor.* By some critics its very existence, as a geographical reality, has been denied. Cunningham erroneously narrowed its identification to Baltistan or Little Tibet. I have not space here to argue the question,† but it can, I think, be demonstrated that Bolor, or Bilaur, was the name applied throughout the Middle Ages to the elongated belt of mountain country south of the main range of the Hindu Kush, including the valleys of Kafirstan, Upper Chitral, Yasin, Gilgit, and Hunza-Nagar (and in the pages of some writers having an even wider application). The reference to the existence of gold in this region is a further instance of accuracy. The dust is still procured by washing from the streams.

After the passage of the last of the recorded Buddhist pilgrims, there is a hiatus of six centuries in our acquaintance with Pamir topography. At the end of this time we encounter the ubiquitous footstep and the marvellously reliable pen of the great Venetian. It was in about the year 1274 A.D. that Marco Polo, his father Nicolo, and his uncle Maffeo, on their journey to the court of Kublai Khan, passed through Badakshan and then, in Marco's words—

“At the end of twelve days you come to a province of no great size, extending, indeed, no more than three days' journey in any direction, and this is called Vokhan.‡ . . . And when you leave this little country, and ride three days north-east, always among mountains, you get to such a height that it is said to be the highest place in the world. And when you have got to this height you find [a great lake between two mountains, and out of it§] a fine river running through a plain clothed with the finest pasture in the world; in so much that a lean beast there will fatten to your heart's content in ten days. There are great numbers of all kinds of wild beasts; among others, wild sheep of great size, whose horns are good 6 palms in length. . . . The plain is called Pamier, and you ride across it for twelve days together, finding nothing but a desert, without habitations or any green thing, so that travellers are obliged to carry with them whatever they have need of. The region is so lofty and cold that you do not even see any birds flying, and I must notice also that because of this great cold, fire does not burn so brightly, nor give out so much heat as usual, nor does it cook food so effectually. Now, if we

* *Vide* Hwen Thsang's account of it in another part of his work. Beal's 'Buddhist Records,' vol. i. p. 135.

† It is discussed in Elphinstone's 'Caulbul,' vol. i. p. 118; Sir H. Yule, *Jour. R.G.S.*, vol. xlii. (1872), p. 473, 'Marco Polo,' vol. i. pp. 187, 188, 'Introduction to Wood's Oxus,' p. lv.; R. B. Shaw, *Jour. R.G.S.*, vol. xlvi. (1876), p. 292; Sir A. Cunningham, 'Ancient Geography of India,' p. 84; S. Beal, 'Buddhist Records,' vol. i. p. 135. But by far the most learned and authoritative dissertation is that of Raverty, 'Notes on Afghanistan,' pp. 295-308.

‡ *i.e.* Wakhan.

§ The words between brackets are found in Ramusio's Italian edition.

go on with our journey towards the east-north-east, we travel a good forty days, continually passing over mountains and hills, or through valleys, and crossing many rivers and tracts of wilderness, and in all this way you find neither habitation of man, nor any green thing, but must carry with you whatever you require. The country is called Bolor.*

Here again the main question to be determined is the identity of the lake, and as a necessary consequence of the route, indicated by the traveller. Pauthier, Rawlinson, and the majority of critics suppose the former to be Lake Victoria, and the latter the line followed in 1838 by Wood. Yule seems to have hovered between two opinions, for whereas in the text of his second edition of *Marco Polo* (1875) he says, "There is nothing absolutely to decide whether Marco's route from Wakhanlay by Wood's Lake or by the more southerly source of the Oxus in Pamir Kul," in his map appended thereto he marks the track along the shores of Victoria Lake; while three years earlier he had in two independent writings † expressed the opposite opinion, and pronounced for Lake Chakmak. Paquier alone (as far as I know) has argued in favour of a third hypothesis, viz. that Polo went by neither lake, but ascended the valley of the Shakh-dara, and somehow or other crossed the Pamirs in their centre. His argument appears to me quite unintelligible, and is in almost every point at variance with the results of recent exploration.‡

I have at different moments been favourably inclined towards both the Victoria Lake and the Chakmak identification, and I cannot even now feel positive certainty in deciding between the two. On the whole, however, I incline to the former, or Great Pamir route. Polo evidently assumes a smaller Wakhan than the territory at present bearing that title, which begins in the bend of the Oxus at Ishkashim and extends to Sarhad, a distance of about 120 miles. Seemingly, he only extends it as far as Kala Panja, about half that distance. The three days' ride north-east will then be the journey up the valley of the Pamir-confluent of the Panja from Langar Kisht to Victoria Lake, upon which Wood, both in coming and returning, spent four days in the dead of winter. The Venetian's lake is then Victoria Lake, and the river the Pamir river.§ This also may be said for this hypothesis, that although the actual elevation of Lake Victoria is only some 300 feet higher than that of Lake Chakmak, yet its situation and surroundings supply a greater excuse for the illusion that it was the highest place in the world. The twelve days' ride across the Pamir can hardly be employed

* Yule's 'Marco Polo,' vol. i. p. 180.

† *Jour. R.G.S.*, vol. xlii. (1872), p. 475, and 'Introduction to Wood's Oxus,' p. lxxiv.

‡ 'Le Pamir,' pp. 48-62.

§ Conversely, it is possible to argue that the three days among the mountains describe the march from Sarhad to Lake Chakmak, that the river flowing from the lake is the Aksu, and that the Pamir is the Little Pamir. But in this case the error about Wakhan attains inexplicable dimensions, and the fertility of the Little Pamir seems inordinately exaggerated.

as an argument for one hypothesis or the other, since we have no clue as to where Polo conceived the Pamir to begin or to end. The reference to the *Ovis Poli* in the passage above quoted (from which it received its modern name) is obvious. As regards Beloro or Bolor, Marco Polo apparently protracts the area ordinarily so described to the north of the Hindu Kush, and brings it round in a great north-easterly sweep at least as far as Sarikol, if not to the borders of Kashgar territory.

Another three hundred years elapsed before we have any further record of a Trans-Pamir journey, and on this occasion, with an unconscious reciprocity that is one of the romances of history, India turned the tables upon Far Kathay, which a thousand years before had despatched its agents and pilgrims to study at Indian shrines, by herself sending out the evangelist of a newer though non-Indian faith, to reconnoitre for possible action the ground of her former conquest.

Benedict Goetz, a lay Jesuit, who, though born in the Azores, had passed in the service of Portugal to India, and had there joined the mission of Jerome Xavier to the court of the great Akbar at Agra, was despatched from that place by the Provincial of his Order, with the consent of the emperor, at the beginning of 1603 A.D., upon an expedition of missionary inquiry to the fabled kingdom of Cathay (Khitai). Travelling by Lahore, Peshawur, and Kabul, in the disguise of an Armenian, and in the company of a *kafilā* of merchants, he crossed the Hindu Kush into Badakshan, and, passing through the Teng-i-Badakshan—one of the mountain defiles leading into the Oxus valley—came to Ciarciumar (Char Chenar?).

"From this in ten days they reached Serpanil (Sir-i-Pamir?). But this was a place utterly desolate and without a sign of human occupation; and then they came to the ascent of the steep mountain called Sacriethma.* None but the stoutest of the horses could face this mountain; the rest had to pass by a round-about but easier road. . . . And so, after a journey of twenty days, they reached the province of Sarcil (Sarikol), where they formed a number of hamlets near together.† . . . Then in two days more they reached the foot of the mountain called Ciacialith (i.e. the Chichiklik pass). It was covered deep with snow, and during the ascent many were frozen to death, and our brother himself barely escaped, for they were altogether six days in the snow here. At last they reached Tanghetar (now Tangitar), a place belonging to the kingdom of Cascar (Kashgar). . . . In fifteen days more they reached the town of Jakulish (Yakir-i-Kurghan?). . . . After five days more our Benedict reached the capital, which is called Hisschan (Yarkand)."

* I cannot suggest an identification for this name, unless it be the Sarkhorn pass, by which it is conceivable that Goetz, if he travelled, as I think, by the Agra-Punjab and Little Pamir route, may have crossed from the Agra valley on to the Tagarumindan Pamir. Yule, on the other hand, described his route with Wood's.

† Probably at or near to Yarkulghana.

; Yule's translation of a work by Iringak, based upon a Koko's recollection of Benedict Goetz' notebook, entitled 'Le Christianisme Espagnol dans l'Asie Centrale ou la Way Thimer' Hakluyt Society, vol. II, pp. 229-232. Compare the version of Wood's Oxus, p. 127; and Pauthier, 'Le Pamir,' pp. 150-1.

The above narrative, the successive stages of which cannot, I think, be mistaken, is further supplemented by some fragments of letters from Goetz—who died in China—which were preserved by the Jesuit Jarric in a collection or *thesaurus* published in 1615. In one of these, dated from Yarkand, Goetz spoke of the great difficulties and fatigues encountered in crossing the desert of Pamech (Pamir), the cold of which was so great that animals could scarcely breathe the air, and often died in consequence. As an antidote to this, he said that the men used to eat garlic, leeks, and dried apples, and the horses' gums were rubbed with garlic. This desert took forty days to cross—the same as Marco Polo's measurement—if the snow was extensive.

II. Nearly two and a half centuries elapsed before we meet with the next record of a journey to or across the Pamirs. This was the famous expedition of Lieut. (afterwards Captain) John Wood, of the Indian Navy, whose name fitly inaugurates the long list of British, Indian, and European explorers who, in the fifty years that have passed since his day, have familiarized us with that which was then an impenetrable mystery, not as yet irradiated by the translated records, save that of Marco Polo's journey, to which I have already, in chronological order, referred. Sent on a mission with Dr. Lord by Burnes from Kabul to Murad Ali, the Beg of Kunduz, in November, 1837, Wood proceeded from the latter place *viâ* Khanabad, Talikhan, Faizabad, Jerm, and Zebak, till at Ishkashim he touched the stream of the Oxus on February 4, 1838. Ascending the river to Kala Panja, he followed its northern confluent, the Pamir river, to its source in Victoria Lake, which he reached on February 19. His discoveries and his book reawakened public curiosity in a subject which had almost faded out of human interest, and have provided the background for the whole of our subsequent knowledge. Nor is their value in any appreciable degree impaired by the fact that the true source of the Oxus has since been found to lie elsewhere, or that Wood's scheme of the hydrography of the Pamirs was in almost every respect erroneous.* As the pioneer of modern exploration in these interesting regions, his name will always be held in honour. His route, as I have already argued, was in all probability identical with that which had been taken by the Chinese pilgrims Sung Yun and Hwui Sang 1300 years, by Hwen Thsang 1200 years, and by Marco Polo, 550 years, earlier.

Next upon the scene appear a number of native emissaries of the

* He wrote (p. 233): "The hills and mountains that encircle Sir-i-kol give rise to some of the principal rivers of Asia. From the ridge at its eastern end flows a branch of the Yarkand river, one of the largest streams that waters China; while from the low hills on the northern side rises the Sirr, or river of Kokan, and from the snowy chain opposite both forks of the Oxus, as well as a branch of the river Kuner, are supplied." These propositions are uniformly incorrect. The mountains encircling Victoria Lake give rise to no drainage save that of the Oxus and its main confluent the Aksu.

Indian Government, who, owing to the difficulty or impossibility of exploration by British officers in regions so habitually disturbed or lying so far outside the then borders of the Indian dominions, were despatched on missions of a diplomatic or scientific character in the neighbourhood of the Pamirs. Of these, the first was Abdul Mejid, a *mulla*, who was sent in 1860 with a letter and presents to Mulla Khan, ruler of Kokand.* Starting from Peshawur, he proceeded *viâ* Kabul and Khanabad, in Kunduz, following upon Wood's footsteps to the Oxus valley in Wakhan. At Langar Kishit he commenced the ascent of the Pamir river towards Victoria Lake, but at Yangalik (called also Yumkhana) he diverged from Wood's track, and made the first recorded passage of the Pamirs from south to north, *viâ* Khurgoshee (Khargosh Kul), Susugh Kol (Sasik Kul), Chadur Tash (Chatir Tash), Kurra Soo (Kara Sû), Moorghabee (the site of the Russian post), and Ak Baital to Kurrah Kol (Great Kara Kul), whence he proceeded by the Kizil Arut (Kizil-art) Pass to the Alai. It was in these words that he described his crossing of the Pamirs :

"From Lungur Wakhan, fourteen weary days were occupied in crossing the steppe. The marches were long, depending on uncertain supplies of grain and water, which sometimes wholly failed. Food for man and beast had to be carried with the party, for not a trace of human habitation is to be met within these inhospitable wilds."

Of about the same date is the itinerary of a journey from Chitral and Mastuj *viâ* the Baroghil Pass, Sarhad, Langar (identical with the route which I followed in the inverse direction), Chakmak Lake, and the Little Pamir to Aktash, and thence across the Neza-tash pass to Tashkurghan — which was compiled by Mohammed Amin, a Yarkandi merchant, who acted as guide to the murdered Adolph Schlagintweit, and subsequently gave the itinerary to the unfortunate Hayward, who experienced a similar fate. The report, though brief, is singularly accurate, and was published by the Indian Government in 1862.† A second, but more obscure itinerary, furnished by him to Pundit Manphul, a Hindu in the service of the Punjab Government, is contained in the same collection.‡ From Jangalik, on the Pamir river, it proceeds *viâ* Hamdamin and Kotal-i-Aghajan (which I cannot identify) to the valley of Tashkurghan.

It was in the same decade that the Survey Department of the Government of India began to despatch in many directions beyond the northern barriers of the Himalayas and the Hindu Kush those nameless explorers who, often under obscure generic titles, or beneath the disguise of their

* His itinerary was published in 'Selection from the Records of the Government of India, Foreign Department, No. xxxix. Calcutta, 1863.' *Vide* also Davies' Report, Appendix XX. C.

† *Vide* Davies' 'Report on the Trade Routes of the North-West Frontier,' Appendix IV. B. Compare *Jour. R.G.S.*, vol. xlii, 1872, pp. 440-448.

‡ Appendix XXXI.

initials alone, have added so much to our geographical knowledge of the trans-frontier regions. One of these, known as the Mirza, started from Kabul in October, 1868, with instructions from Major T. G. Montgomerie, Deputy Superintendent of the Great Trigonometrical Survey, to penetrate to the upper Oxus, and to cross the Pamirs from west to east on his way to Kashgar.* Reaching the Oxus valley by way of Bamian, Khulm Tashkurghan, the Kokcha river, and Ishkashim, he ascended the river to Kala Panja, from whence, instead of diverging, as his immediate predecessors had done, up the Pamir river to Lake Victoria, he continued his exploration of the main valley of the Oxus, until he arrived, in January, 1869, at Lake Chakmak, which he designated Pamir Kul. Here all the streams were frozen, and the entire ground was under snow—a condition which led the Mirza into the mistake of supposing that the little confluent which I have described as flowing into the Ab-i-Panja at Bozai Gumbaz, actually issued from the west end of the lake. The Mirza appears also to have thought that the Aksu, instead of flowing north-west from Aktash, pierced the Neza-tash range, and flowed into the Sirikol or Tashkurghan basin, across which he himself pursued his path to Yangi Hissar to Kashgar.

The former of these errors was rectified by Ibrahim Khan, an assistant in the same government department, who, in the summer of 1870, approached the Pamirs from the opposite quarter, being sent by Forsyth from Kashmir, in anticipation of the contemplated journey of the unhappy Hayward. Proceeding *viâ* Gilgit and Yasin, he crossed the Darkot and Baroghil passes to Sarhad; and from thence made his way, by the route which I have previously described in the inverse direction, to Langar, Bozai Gumbaz, and Lake Chakmak (which he denominated Kalsar Bam-i-Dunya), where he reported the Aksu as flowing out on the east, but no outlet as existing on the west. Thence he proceeded *viâ* Tashkurghan and Yangi Hissar to Yarkand.†

In the same year a more northerly track across the Pamirs was pursued by Faiz Baksh, a native who was employed by Sir D. Forsyth to travel *viâ* Badakshan and the Pamirs to meet him at Yarkand on the occasion of his first mission to Yakub Beg, the Atalik Ghazi of Kashgar. Marching from Kabul by the familiar route (Bamian, Balkh, Kunduz, Faizabad, Zebak, Ishkashim) to the Oxus valley, he ascended *viâ* Kala Panja and Langar Kisht to Jangalik. Thence the stages of his journey, as given by himself, were Dasht-i-Khar-gachi (Khargoshi?), Yolmazar, Dasht-i-Khargoshi, Mazar-tepe, Bash Gumbaz Pass, Dasht-i-Kol Hauz Kalan, Buztere, Istik, Aktash, Shindi, Tashkurghan.‡ It is evident

* *Vide* report of his explorations in *Jour. R.G.S.*, vol. xli. 1871, pp. 139-918. Compare Yule's 'Introduction to Wood's Oxus,' pp. xlvi., lxxiii., and 217; Paquier, pp. 113-116.

† *Proc. of the R.G.S.*, vol. xv., 1870-71, p. 387.

‡ *Jour. R.G.S.*, vol. xlii., 1872, pp. 464-466; Yule's 'Introduction to Wood's Oxus,' p. 1.

from this description that the traveller confused two entirely distinct itineraries. Had he gone by the route indicated in the earlier names, his Kol Hauz Kalan (*i.e.* Lake of the Big Pool) might have been Sasik Kul, which, from its petty dimensions, could not conceivably have been so called. The later names, showing that he proceeded *viâ* Istik to Aktash, leave it clear that he transferred to his itinerary stages which he never actually traversed, but which lay to the north of his route, and that in reality he proceeded by Lake Victoria (which is his Lake of the Big Pool) and the oft-trodden route to Aktash and Tashkurghan. This confusion does not appear hitherto to have ever attracted attention.

In the same year (1870) I have found the traces of a similar journey across the Pamirs, starting from Kabul, and proceeding *viâ* Kunduz, Badakshan, and Wakhan to Yangi Hissar and Kashgar, of a Greek named Dr. Potagos, whose travels were translated into French and published fifteen years later.*

Next in chronological order comes the first really scientific expedition to the Pamirs undertaken by British agents, *viz.* the journeys of Captain (now Colonel) Trotter, Lieut. (now Sir Thomas) Gordon, Captain (now Colonel) J. Biddulph, and Dr. Stolicza, who were detached from Sir D. Forsyth's second mission to Kashgar in 1874, to make a detailed exploration of what was still at that time universally designated the Pamir Plateau. The records, in the shape of reports, books, and papers, that were left by the various members of this expedition have been cited in the opening portion of this essay, and constituted the first serious British contribution to the scientific knowledge of the entire region. Marching *viâ* Sarikol and Tashkurghan, they reached Lake Chakmak on April 5, 1874, finally setting at rest the disputed questions as to the river outlet or outlets from that lake. Thence Gordon, Trotter, and Stolicza went north to Lake Victoria and the Istik river, while Biddulph marched southwards by Sarhad to examine the Baroghil Pass, and ultimately returned *viâ* Lake Chakmak to rejoin his companions. Meanwhile Trotter had despatched Abdul Subhan, a native assistant surveyor, to investigate the course of the Oxus through Shighnan and Roshan; to whose report upon the respective volumes of the Panja and the Bartang (Murghab) at Kala Wamar I have previously referred.

A different route was taken, at the expense of a fresh geographical error, by a native *employé* of the Indian Survey Department, in 1880. This was one M. S., a Pir, who ascended the Bartang valley from Kala Wamar, in September of that year, as far as Sarez, where, from some inexplicable error, he reported that the source of that river lay, thereby throwing once again into confusion the as then unsolved question of the three-in-one Aksu-Murghab-Bartang.†

* Dr. Potagos, 'Dix Années de voyages dans l'Asie Centrale,' etc. Traduction: Paris, 1885.

† Report of the Indian Survey Department, 1881-82.

In 1885, Mr. Ney Elias, already famous for his Asiatic travels, was despatched by the Indian Government upon a special mission to Chinese Turkistan, included in his orders being an instruction to explore and report upon the Afghan districts of the upper Oxus. With characteristic intrepidity, he sketched out for himself and followed an entirely original track from east to west across the Pamirs, with the results of which the public has only been made familiar by hearsay. Starting from Kashgar in September, 1885, he proceeded by Little Kara Kul and Rang Kul (being the first Englishman to visit those lakes) to the Alichur river and Yeshil Kul, whence he descended the Ghund valley to Kala Bar Panja, on the Oxus. Following that river northwards to Kala Wamar and the boundaries of Darwaz, he then struck eastwards up the Bartang basin to the base of the Kudara valley. Returning thence, he ascended the left bank of the Oxus to Ishkashim, whence, *viâ* Zebak and Badakshan, he proceeded westwards through Afghan Turkistan to join the Anglo-Russian Boundary Commissioners, whom he encountered near Herat, in January, 1886. His journey, though inaccessible in its published form to the public, added greatly to the geographical and political knowledge in possession of the Indian Government, and has contributed substantial additions to all subsequent maps.

In the following year, *i.e.* 1886, Colonel (now Sir W.) Lockhart, Colonel Woodthorpe, Captain Barrow, and Dr. Giles, who had occupied the year 1885 in their interesting mission to the court of Aman-ul-Mulk, Mehtar of Chitral, and had explored the southern slopes and valleys of the Hindu Kush, returned to the same destination by a circuitous march from Gilgit (for the most part over the track which I followed and have described) *viâ* Hunza-Nagar, the Kilik, the Wakh-jir Pass, the Oxus valley, Kala Panja, and Wakhan. Theirs was the first scientific report of the main course of that river from its glacier source (which, however, they did not visit, but which was mapped by a native surveyor) to the great bend at Ishkashim. It is enshrined in a monumental government publication.

In the spring of 1887, the three French travellers, MM. Bonvalot, Capus, and Pepin, already well known for their travels and writings in other but less remote parts of Central Asia, made the first recorded passage of the Pamirs from north to south, *i.e.* from Russian territory in Ferghana, to British-Indian territory in Chitral. Descending into the Alai valley by the Taldik pass, they crossed the Kizil-art on to the Great Kara Kul, whence by the Uzbek Pass they proceeded to Rang Kul, and by the Kara-su and Aksu valleys to Aktash, Lake Chakmak, and the Little Pamir. Continuing to Bozai Gumbaz and Sarhad, after an unsuccessful attempt upon the Irahad pass, they crossed the Baroghil and descended the Yarkhun river to Mastuj, whence they were rescued in an almost destitute condition by the kindly offices of Lord Dufferin, at that time Viceroy of India, and safely escorted to

Simla. Their books, which do not err on the side of generosity, have been already alluded to.

From this time onward, attracted by the increasing notoriety, or impelled by the political fascination, of the region, the stream of English explorers in the Pamirs swell rapidly. In the summer of 1888, St. George Littledale, a subsequent Gold Medallist of this Society, paid his first visit to the Pamirs, in pursuit of *Ovis Poli*, penetrating, under Russian patronage, from the north as far as the Great Kara Kul. In 1889 he undertook, with Mrs. Littledale (the first, and so far the last, English lady who ever saw the Pamirs), a more adventurous journey, crossing the region from north to south, and passing *viâ* Kara Kul, Victoria Lake, Lake Chakmak, Sarhad, the Baroghil and Darkot passes to Kashmir. At Kara Kul, in 1888, he encountered Messrs. O'Connor, H. Ridgway (Americans), and H. Dauvergne (a French merchant, long resident in Kashmir), who, entering from the same quarter, were making a tour of the Central Pamirs. In 1889, in the same neighbourhood he met Major Cumberland, who had separated from Captain Bower and H. Dauvergne on the Taghdumbash Pamir, at the same time that Dauvergne had started on his return to Gilgit by the Wakhjir Pass, the sources of the Oxus, the Baroghil, the sources of the Yakhun and Karumba rivers, and the Ishkumman gorge. In the same year, *i.e.* 1889, two other Frenchmen, Visconte de Breteuil and L. Richard, were engaged on a sporting expedition with H. Ridgway on the southern Pamirs.

It was at about the same time that Captain F. E. Younghusband, like Bower, a Gold Medallist of the Society, commenced those explorations of a semi-political, semi-geographical character in the Pamir region which extended over three years, and were diversified by the opposite features at one time of the peaceful reading of a paper before the Royal Geographical Society, at another of his own forcible arrest and expulsion from Bozai Gumbaz by Colonel Yonoff and his predatory band. This was on August 17, 1891, Lieut. Davison (since dead) being simultaneously arrested and deported from the Alichur Pamir, whither he had been despatched on a reconnoitring mission by Younghusband. In 1890 the latter had traversed the central Pamirs with Mr. H. Macartney, the British representative at Kashgar; in 1889 he had broken ground on the Taghdumbash.

I now pass to more recent visitors, the majority of whom have been attracted to the Pamirs by the love of sport, or, in other words, the pursuit of *Ovis Poli*, though to these preoccupations some of their number have added the quest of geographical or scientific knowledge. In 1891 H. Lennard and R. Beech, and separately from them Lieut. J. M. Stewart, were on the southern Pamirs. In 1892 Lord Dunmore and Major Roche, as described in the former's book, crossed the Pamirs from south-east to north-east, entering from Yarkand and emerging at Kashgar. In 1893 a Frenchman, Baron de Ponçins, marched from north

to south, and came down into India. In 1894, which was the year of the journey undertaken by Lennard and myself, which I have here described, Comte de Bylandt, a Dutchman, also crossed from north to south. In 1894-5 Dr. Sven Hedin, the well-known Swedish traveller and scientist, from the base of Pamirski Poste, or the Russian fort at Murghabi, conducted these explorations of Mustagh Ata to which reference has before been made. Other sportsmen, coming from Yarkand and Tashkurghan, have shot *Ovis Poli* on the Taghdumbash Pamir, but, having penetrated no further into the true Pamir country, cannot be counted here. Finally, in the summer and early autumn of 1895, Major-General Gerard, Colonel Holdich, and Captain McSwiney, representing Great Britain on the Pamir Boundary Commission, which was appointed to demarcate the frontier between Lake Victoria and the Chinese border above the Taghdumbash, completed our scientific knowledge, and rectified the cartography of the southern Pamirs, in conjunction with Major-General P. Shveikovski, the chief Russian representative, and M. Benderski, of earlier topographical fame. These are, so far as I know, the only English and European (other than Russian) travellers who have been either tempted by pleasure or impelled by duty to a peregrination of the inhospitable "Roof of the World."

III. Finally, I turn to the Russian explorers, who, though appearing on the field much later than their British or Anglo-Indian rivals, have yet during the last twenty years, owing to the superior proximity of their base, and to the consistent patronage of the Imperial Government, made a more thorough and detailed survey of the northern and central Pamirs, with occasional rushes and excursions to the southern or more British zone, than British officers have ever been able to do of the regions lying beyond the recognized frontier of Hindostan. In the majority of places the Russians have not been the first in point of time to arrive; but, having arrived, they have commonly effected more.

It was as the sequel to her rapid and all but unresisted conquest of the Central Asian Khanates in the decade following 1860, that the pioneers of Russia, pushing their way eastwards through the province of Ferghana, first struck the Pamir region from the north. Fedchenko, in 1871, made his way to the Alai valley, but did not cross the Trans-Alai mountains, though he named their highest peak, in honour of the Russian Commander-in-chief, Mount Kaufmann. He did not, however, touch the Pamirs proper, which were reserved for his successors.

In 1876 the famous Skobelev was placed by Kaufmann in command of the Alai expeditionary force, with instructions to explore and plant the Russian flag in these little-known outskirts of the new Russian dominion. The party consisted of Captain Kostenko as geographer and statistician, A. Bonsdorf as geodesist, W. Oshanin for natural history, Colonel Lebedeff of the Corps of Topographers, and others. Starting from Gulcha, the then Russian outpost, in August, 1876, the main body

of the force, under Skobeleff, did not proceed beyond the Alai valley, but from their camp there Prince Witgenstein, having been sent on with a flying column across the Trans-Alai, was the first European in modern times to see the Great Kara Kul, which he reached on August 12. Thither he was speedily followed by Kostenko, who then started for Rang Kul, but, owing to lack of provisions, did not get beyond the Uzbek Pass, from the summit of which he saw the great peak of Mustagh Ata on August 19. Meanwhile Witgenstein, marching due south from Kara Kul, had proceeded as far as the Tuyuk or Ak Baital Pass. This was the limit of Russian exploration in that year.

In the following year the first really qualified scientific expedition was despatched by General Kaufmann, its operations extending into two years. The control of the party was given to N. Severtsoff, with particular charge of physical geography and zoology; Schwarz undertook the astronomical and magnetic observations; Skassy was topographer; Colonel Kushakevich was botanist and entomologist; and Captain Skorniakoff was in command of the escort. Leaving Tashkend in September, and Osh in October, 1877, they crossed the Alai by the Shart-dawan, and the Trans-Alai by the Kizil-art, and explored the region between the mountains and Kara Kul. In 1878 they reassembled near that lake, being joined there by Rudonef, and then marched south by the Tuyuk pass to Rang Kul, whence they descried the two great mountain masses towering up to the east beyond Little Kara Kul, the northernmost of which had been roughly fixed by Hayward on his road from Yangi Hissar to Kashgar in 1868, and by Trotter from the same neighbourhood in 1874; while the southerly peak had been seen by Kostenko from the Uzbek in 1876, and by Trotter and Gordon from Tashkurghan in 1874. The second of these, as has before been pointed out, is the true Mustagh Ata. From Rang Kul the party turned south-westwards, and explored the Sarez and Alichur Pamira, visited Yeshil Kul, discovered the small cluster of lakes at its eastern extremity, and for the first time connected the Russian with the British surveys, four years earlier, of Trotter. Scarcity of provisions again compelled an early return, and in September the expedition was back at Gulcha. Severtsoff gave it as his opinion that in the inner Pamirs the elevation, which he computed to have risen 600 feet in the last 12000 years, is still going on.*

Meanwhile, in 1878 two other Russian expeditions had, from different quarters, assailed the same objective. Crossing the Trans-Alai range by the Ters-agar pass, to the west of Mount Kaufmann, J. Mushketoff descended upon the valley of the Muk-su, or southern confluent of the Kizil-su, but was prevented from penetrating further southward by

* Vide *Izvestia Imp. Russ. Geogr. Obsh.* (St. Petersburg), 1879; *Zapiski* of Ditto, vol. xiii., 1886, and vol. xv., 1887; and Severtsoff's posthumous work, in Russian, entitled 'Orographical Sketch of the Pamir Mountain System.'

the rebellion that had broken out in Shighnan and Darwaz after the death of the Atalik Ghazi, Yakub Beg. Turning eastwards, he visited Kara Kul, and returned from thence to the Alai. His geological observations showed the northern part of the Pamir region to consist of granite, metamorphic clay, and mica slate, overlaid with strata of the trias formations, the direction of the granite upheavals being north-east.

In the same summer another party, consisting of Oshanin, Nevelski (botanist), and Rodionoff (surveyor), projected a crossing of the entire Pamirs from north-west to south *viâ* Poliz and the Sel-sai; but were stopped by difficulties and accidents, and compelled to return in September to Altyn Mazar, having only surveyed what may be called the northern boundary of the region.

When, in 1878, General Abramoff was placed in command of the military expedition which was despatched by Kaufmann in that year, simultaneously with the Kabul mission, to execute an anti-English diversion in the Pamirs, Matvaieff, the military topographer attached to the party, is said to have surveyed the western confines of the Pamirs, and to have crossed the Oxus into Badakshan. Whether he penetrated the Pamirs strictly so called, I have been unable to ascertain. The names of Dr. Regel, botanist, and Kossiakoff, military topographer, who in 1881 entered Darwaz from Karategin, and in 1882 wintered in Shighnan, should not be altogether omitted in this context, although their labours were directed rather to the Pamir borderlands than to the Pamir itself.

We next come to the second great official Russian expedition, which was commissioned in 1883 to complete the labours of Severtsoff and his earlier band of pioneers. Its members were Captain Putiata of the general staff, Ivanoff as geologist, and Benderski as topographer. Leaving Tashkend in May, and Osh in June, 1883, they marched to Kara Kul, whence Putiata and Benderski proceeded *viâ* Bulun Kul, Little Kara Kul, and the Tagharma valley to Tashkurghan, and from there by the Neza-tash pass down the Aksu to Ak-baital; while Ivanoff's route lay *viâ* Rang Kul, Little Kara Kul (whence he examined Mustagh Ata), and the Aksu to the same destination. Again separating, Putiata went *viâ* Buz-tere to the Alichur, and Yeshil Kul, and then made a circuit by the Koh-i-tezek pass and the Togaz-bulak confluent of the Ghund. Ivanoff and Benderski ascended the Kara-su, crossed the second Neza-tash, ascended the Chish-tiube confluent of the Istik, and came down upon Lake Chakmak and the Little Pamir, whence they mounted the Ab-i-Wakhan for a short distance, returning *viâ* the Urta Bel to Lake Victoria, and by the Bash-gumbaz to Alichur. Here the parties reunited, and returned by the Khargosh Pass to the Great Pamir, and down the Pamir river to Yol-mazar. From this point Putiata and Benderski retraced their footsteps and discovered the Andemin or Benderski Pass between the Great and Little Pamirs. Ivanoff ascended

the Mas river, re-examined the Yeshil Kul basin, and marched down the Ghund river as far as Sardim, the highest inhabited village of Shighnan. Having completed their surveys of the central and southern Pamirs, the expedition contemplated a southerly excursion to the Baroghil and Chitral; but finding this impossible owing to the forward movement of the Afghan forces into Shighnan, they ascended the Kudara river, examined the great Fedchenko glacier, and returned to Russian territory in December of the same year, having contributed to Pamir cartography more accurate and detailed information than any preceding or subsequent expedition.*

In 1887, the brothers Grum-Grjimailo, naturalists, traversed the northern Pamir from west to east, visiting the Kudara river and Rang Kul, whence they crossed to Tashkurghan, and explored the upper waters of the Yarkand Daria.

Five years later Captain Grombochevski, a Polish officer in the Imperial Guards, who had been adjutant to Skobeleff in 1876, and later had officiated as assistant-governor at Marghilan, and frontier commissioner in Ferghana, commenced the series of Pamir and trans-Pamir explorations which for a time rendered his name so familiar to the British public. In 1888 he crossed the Hindu Kush, as previously mentioned, by the Kilik Pass, and penetrated to Hunza, where he endeavoured to win over Safdar Ali Khan, then Raja, to the Russian alliance. In 1889 he entered by Karategin and Darwaz as far as the frontiers of Shighnan, where the Afghan incursion put a stop to his plans of further advance. Proceeding eastwards by the Alichur, Great, and Little Pamirs, he crossed the Bayik Pass on to the Taghdumbash, and while on the Raskam Daria encountered Younghusband, on his march from the Shimshal Pass to the Taghdumbash. When he reached Shahidulla, Grombochevski, finding the winter coming on, demanded permission for himself and his armed escort to descend into Kashmir, and was very much offended when this permission was refused by the British Resident. In 1890 Grombochevski and Younghusband again met in Yarkand. In 1892 he was appointed Governor of Osh, and has probably spent more years in and about the Pamirs than any living man.

In 1889 Prince Galitzin passed as a private traveller across the Pamirs on his way to British India. In 1891 Colonel Yonoff commenced the series of military parades in the Pamir region which were intended to impress the few inhabitants and the surrounding peoples with the might of Russian arms, and which resulted in the permanent occupation by the Russians of the Murghabi fort, or Pamerski Poste, so frequently already mentioned. Finally, in 1895 the Boundary Commission, under General Shveikovski, already cited, completed the arrangements under which, by agreement between Great Britain and Russia, the bulk of the Pamirs have passed into the final possession of

* *Invest. Imp. Russ. Geog. Obsh.*, 1884.

the latter power, the Little Pamir remaining as a sort of unpeopled buffer-state between. The era of exploration and discovery in this celebrated region may therefore now be said to have come to an end. The boundaries having been determined, there survives no legitimate cause of political quarrel; and the mystery and romance of the fabled Roof of the World having been extinguished by the theodolite and the compass, and superseded by the accurate delineation of scientific maps, few persons will probably in future aspire to visit a region where fresh laurels are scarcely to be won, and where the necessities of even a traveller's existence are so scant. On the threshold of this new epoch, I hope that some advantage may be served by the attempt which I have made in these pages to resume, expound, and collate the references of the past by the light of modern knowledge, and to show what the Pamirs really are, as viewed from the double standpoint of historical mention and personal experience. I shall never again visit that distant country myself, but I shall be grateful if the studies of ten years have assisted to simplify any of its features or its problems to the understanding of others. The map which accompanied the first part of this paper (in the July number) marks, I would fain believe, a great advance on any previously accessible publication, either in Russia or England, containing, as it does, a mass of information only to be found in Government bureaux, and never previously made public.

Before the reading of the paper, the PRESIDENT said: We are assembled here this evening to hear Mr. Curzon's account of an interesting journey, from which he has lately arrived in this country. Mr. Curzon is not the first Vice-President of this Society who during the term of his office has started upon a distant geographical enterprise, but he is the first Vice-President of the Society who, during the term of his office, has started on such an enterprise and has returned safely to give an account of his wanderings. I am sure that all his associates will welcome him back most warmly, especially as he is about to give us an account of a region which has great interest for geographers, not only of this Society, but for the geographers of all ages. I will not detain you longer, but will now request Mr. Curzon to address the meeting.

After the reading of the paper, the following discussion took place:—

Field-Marshal Lord ROBERTS: I am sure you will all agree with me that we are all indebted to Mr. Curzon for his interesting lecture. To me it is peculiarly interesting, for although that portion of his travels with which I am most familiar has only been slightly alluded to, some of the country which he has so graphically described is well known to me. It has been said that those people who can only pay a hurried visit to India are likely to take a superficial view of the country, and form erroneous opinions regarding it. This may be the case with the ordinary, unintelligent, self-sufficient traveller, for to these people we know that a little learning is a dangerous thing; but it is quite a different matter when a man of quick intelligence visits India—a man with an earnest desire to make himself thoroughly acquainted with the meaning of everything he sees, with the object of benefiting India and enlightening his own countrymen. I am always thankful when such men are sufficiently interested in India to be induced to go and judge for themselves, and bring back correct impressions of our position there, enabling them to speak authoritatively

on the many important questions which must unavoidably arise from time to time with regard to India. I congratulate Mr. Curzon most heartily on the success which has attended his enterprising journey. I read his several letters in the *Times* with the greatest interest, and I can endorse every word he says when he tells us of the supreme importance to us of being prepared for every contingency that could possibly arise on the north-west frontier of India. Valuable as I feel sure the results of Mr. Curzon's march to the Hunza Nagar, Pamirs, and Chitral will prove, I should look upon his visit to the Amir of Afghanistan as infinitely more valuable. The reception accorded to him by Abdul Rahman Khan shows how much His Highness appreciated an English gentleman taking the trouble to come all the way from London to Kabul for the purpose of making his acquaintance. And it is a great satisfaction to me that Mr. Curzon, by his personal observation and inquiry in that country, can now support the view I have persistently urged whenever the question of the defence of the north-west frontier has been discussed, namely, that whatever policy may be adopted, whether offensive or defensive, it is the good-will of the border tribes, and the hearty co-operation of the Afghans and the Amir of Afghanistan, that are essential to that policy being carried to a successful issue.

THE PRESIDENT: I regret very much the reason which prevents Lord Dunmore from being present this evening and defending his Murghabi source of the Oxus. The secretary has just received a letter to say that he is suffering from bronchitis, and is not able to leave his bed; nothing else would have prevented him being present. As I believe we have in the room nearly all the surviving explorers who have visited the Pamirs since the time of Sir Douglas Forsyth in 1874, we hope that one or more of them will express his opinion on the question raised by Mr. Curzon, respecting the true source of the Oxus.

General Sir THOMAS GORDON: As I am one of the old explorers, I am far behind the times, because it was twenty years ago since I was there; but I would like to add my tribute of praise to the splendidly successful journey which Mr. Curzon has made, and the excellent manner in which he has given an account of it. I will speak but little, and in reference to only one or two points, one regarding the source of the Oxus. When we crossed it we were quite early explorers; there had been before us at long distant dates Marco Polo and Benedict Goetz and Wood. Wood in 1838 went there, and evidently believed, as we did, the popular opinion in regard to the source of the Oxus, and this would account for the idea that has come into political discussions, that the source of the Oxus was the great lake that Wood called the Pamir Great Lake, and so it has remained ever since. We travelled across the river when the whole place was frozen over, in March and April. My scientific companion, who is here to-night—Colonel Trotter, who could talk with much more accuracy than I can—discovered, we thought, that the source of the Oxus was the Murghabi. When we crossed the Aksu valley the whole place was under snow, but on our way back we found a great stream. We came down to the Little Pamir lake, and passed an exit to the east. We then came down to Kala Panja; thence we went up to the Great Lake, and, returning down to the Oxus, found it a running stream unfrozen in the centre.

Colonel Trotter's native surveyor, Abdul Rahman, whose name is now well known, passed afterwards down to Kala Wamar, at the junction of the Murghabi with the Oxus, and gave out that the Murghabi had the greater volume of water; but he was there in the month of June, when there would be more than when it was measured by Mr. Ney Elias. With regard to Pamir, we were much troubled about this, but came to the conclusion it was like a Scotch moor, a flat associated with mountains, lying between ranges of mountains. I have nothing more to say beyond this: I am gratified to find that the geographical work done by my scientific

colleague Colonel Trotter, under circumstances of great severity equal to what you have had so lately brought home to you—I have seen him working with the temperature 26° below zero—all his work done, including his astronomical investigations, has turned out to be perfectly correct, and has been incorporated in the Russian maps, which are very correct, since the Russians have had greater opportunities of pursuing their geographical work than we.

Colonel TROTTER: It was only yesterday that I heard of the lecture that was to be delivered this evening, and I have not been able, as I could have wished, to look up my notes and refresh my memory as to facts connected with our travels in the Pamirs twenty years ago.

With regard to the great question, Which is the principal source of the Oxus? There are red-letter days in everybody's life, and one I always considered a red-letter day in mine was when I thought I had discovered the principal source of the Oxus as being the Aksu-Murghabi river, flowing eastward from the Little Pamir or Chakmak Lake. It was a long and hard day's work, which I recollect describing seventeen years ago in this room. The country had been visited some years before in mid-winter, by an explorer of the Great Trigonometrical Survey, who had erroneously thought that the river issuing from the lake flowed eastward to Tash-kurghan. Our discovery was that this observation was incorrect, and that the water from the lake flowed into the Aksu, called later on in its course the Murghabi river, which joins the Panja branch of the Oxus at Kala Wamar. This Aksu branch I have always considered, and still consider, as the principal head of the Oxus. When we were at Kala Panja, we were not so welcome as Mr. Curzon appears to have been. We had instructions to go on to Cabul if we received a cordial invitation from the Amir, and for this we had to wait. We sent on a native officer ahead, and, after waiting for a fortnight, got a message that the country was so very disturbed that the Amir could not guarantee our personal safety, and as Sir Thomas Gordon was unable to construe that as a cordial invitation, we did not go on. When we returned from Kala Panja, we had with us an employé of the Trigonometrical Survey, who is now in the service of the Amir of Afghanistan. He went down the river from Kala Panja as far as Kala Wamar, and although Mr. Curzon maintains the contrary, he gave us to understand that the Murghabi was far the larger stream of the two. I do not know how long Mr. Ney Elias was at Kala Wamar, and how long his observations extended, but there is no doubt that what at one time is merely a stream that may be walked over is later on a torrent in which nothing can live. I think the opinion of the native surveyor, a careful, painstaking man, ought to be weighed even against that of Mr. Ney Elias. I see that Mr. Curzon has voluminous documents in support of his case, and he will, I hope, later on give me the opportunity of studying them.

Captain YOUNGHUSBAND: I do not wish to enter into a discussion as to the true source of the Oxus, but as I have visited the vicinity of the source which Mr. Curzon claims, it may interest you to hear what I saw upon that occasion. Mr. Curzon crossed from the Taghdumbash Pamir to the Wakhan Pamir. One of the branches of the Oxus flows along the Wakhan pass; I had to avoid that pass for a certain reason, and to find a pass a little bit further south, and on crossing the water-parting I found a small lake with three glaciers flowing into it. Out of this lake there flowed a small stream, which must have joined into that large glacier, the end of which Mr. Curzon discovered. That glacier, I found, took its rise in what I have always considered to be the heart of Asia, because it is at the dividing-line between the three rivers of Asia. On the south of this all the rivers flow down into the Indus and India; then there are the sources of the Oxus flowing down to

Turkistan, Badakshan, and Russian Turkistan; on the east the waters run down into the Yarkand river and Lake Lob Nor. Thus this has some claim to be called the heart of Asia, and I think it would be very satisfactory if in this heart of Asia it may be found that the true source of the Oxus lies.

Mr. Curzon : I foresaw when I had to condense my paper, in a manner that was obligatory in consequence of its extreme length, that I might run the risk of doing inadequate justice to some much greater and more authoritative explorers who have preceded me, and I feel that unwittingly I have experienced that fate. For instance, Colonel Trotter, with whose labours no man is more familiar than myself, and by whose industry no one has profited more than I did, seemed to imagine in his speech, that when I talked about the imperfect information of geographers and travellers, I must have included the party of which he was one of the most distinguished members. I need hardly say that no one who travels in the Pamirs now ever forgets his debt of gratitude to Sir Thomas Gordon, Colonel Trotter, Colonel Biddulph, and the members of that particular party. Not one of us would know what to do, what to inquire, or what to settle, if we had not got the scientific reports and the more popular descriptions of those writers, and no one can be more disposed than myself to render absolute and ungrudging and loyal homage to the pioneers who have done so much more than I can ever hope to do. Nothing would hurt me more than to go away with the impression that anything I had said had in the slightest degree detracted from the value of the work they succeeded in accomplishing, and for which all Englishmen should be grateful. As regards the native surveyor who was sent up to Kala Wamar to inspect the Oxus, I will not argue the question to-night, but will merely ask you to be good enough to read my statement, which has been compiled with the assistance of Mr. Ney Elias. Sir Thomas Gordon has appreciated the fact that, so far from disparaging the testimony of his surveyor, I quoted it on my side.

As regards Captain Younghusband's observations, I am sorry that condensation obliged me to leave out the reference to that part of the journey he has described, when he went over the southern Wakhjir and came down on the glaciers of the upper Oxus to the small lake of which he told us, with the glaciers around it and a little stream trickling out. He saw one of the original tributaries at the source of the great glacier I depicted, but he, as well as anybody who has been in those regions, knows that when you track a great river up to the glacier from which it springs, you must be content to regard that as its source, and not ferret out the little streams that feed the glacier. He has supplied confirmatory testimony to the theory I have explained to-night, and for the proper explanation of that theory I would refer you to the more sustained discussion which I hope to print in the journal later on. Before sitting down I should like to convey my respectful tribute to Lord Roberts for the graceful and complimentary words he has spoken. When a traveller on the Indian frontier meets, as I did, with the encouragement of Lord Roberts before he starts, and the approbation of Lord Roberts when he returns, his reward is such that he wants no better. I did not speak of Afghanistan to-night, partly for the reason I named, that it was not a journey of geographical discovery, and still more because in the pure atmosphere of this room we are safe from the contagion of that Chamber to which I am shortly about to adjourn. It is almost impossible, in talking of Afghanistan, to avoid politics, unless one has the ability and great command of tactics displayed by Lord Roberts. Not having that ability, I thought I had better avoid the matter altogether.

The PRESIDENT : It now only remains for us to return a very cordial vote of thanks to Mr. Curzon for his paper, of the great importance of which I need say very little. For the question of the source of the Oxus has engaged the attention

of geographers from the earliest ages, and before the days of Goetz and Marco Polo. We have had an excellent monograph on the subject from Sir Henry Rawlinson, whose decease we have had on more than one occasion to deplore. Two years afterwards, we had another exhaustive report from Sir Henry Yule, and I cannot but take the opportunity of mentioning that Sir Henry Yule had the same appreciation of Lieut. Macartney as Mr. Curzon. He mentioned that Macartney, with regard to certain points, was still far ahead of all modern writers. The attention devoted to the subject by these great geographers proves the importance of Mr. Curzon's paper. We must also appreciate the difficulties he overcame from cold and want of supplies, and the obstacles in the way of obtaining information, and I am sure I can appeal, with certainty of an appreciative answer, to those assembled here for a hearty vote of thanks to Mr. Curzon, for the charming way in which he delivered his address.

A JOURNEY THROUGH THE TAKLA-MAKAN DESERT, CHINESE TURKISTAN.*

By Dr. SVEN HEDIN.

THE centre of the western part of the Gobi desert, which occupies nearly the whole of the Tarim valley, with the exception of a narrow strip of cultivated land along the base of the mountains, as well as the banks of the adjoining rivers, was never visited by any European traveller; and as we had no information as to the real character of those regions, I made up my mind to make an investigation. My plan was to cross the Takla-Makan desert from the Yarkand Daria to the Khotan Daria, being of opinion that such a journey would not meet with unsurmountable obstacles, as I intended to travel along the south-westerly line of the Masar Tagh, where the sand-mounds were low, and where we might find water and grass. At the base of this mountain range, which, according to Prjevalsky, should go straight through the desert, I even hoped to find remains of an ancient culture which might throw light upon the older history of Central Asia. I intended to cross the desert and continue to Keria, and during the summer investigate the plateau of Northern Tibet. Great care was therefore taken in the outfit of the expedition as far as instruments, clothing, and provisions were concerned.

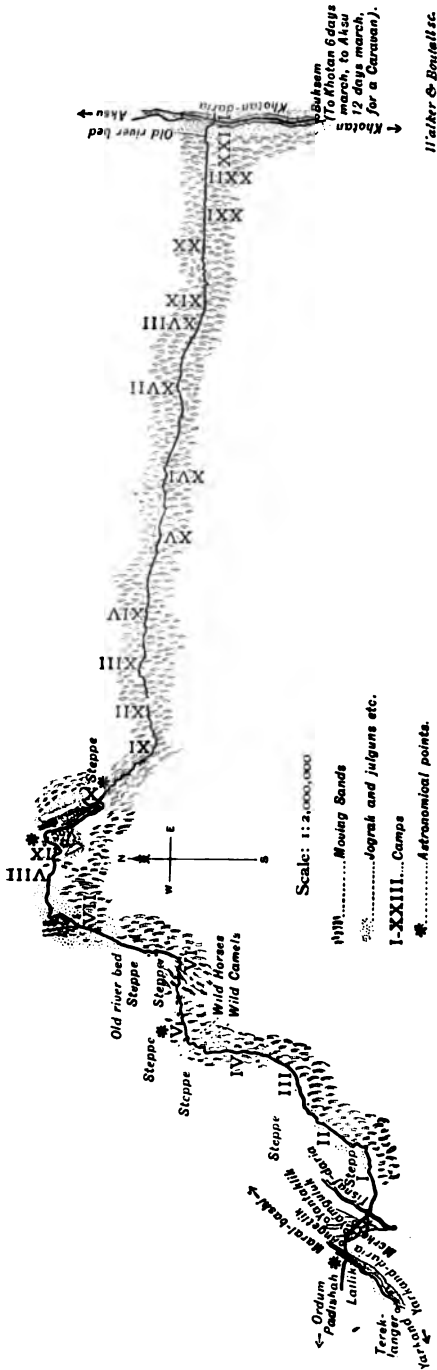
With four servants I left Kashgar, February 17, 1895, and arrived at Maralbashi February 23. After having made a short trip to that part of the Masar Tagh which lies between the Yarkand Daria and the Kashgar Daria, we proceeded on March 2, *viâ* Shamal, Aksak-maral, Alagir, and Meinet (Menut), to Lailik. From the latter point I rode to the holy grave of Ordan Padishah, which was faithfully described by Bellew when he visited this place twenty-one years ago. On returning to Lailik we proceeded on March 19 to Merket, on the right bank of

* Dated "Kashgar, October, 1895."

the Yarkand Daria, where I stayed for twenty days on account of the difficulty in getting camels, which, however, my servants at last succeeded in getting in Karghalik. According to the latest maps, the distance between Merket and the woodlands of Buksem by the Khotan Daria is 180 to 200 miles, and we ought, therefore, to be able to finish this trip in twenty days, even if the road should be somewhat difficult. As we should probably be unable to find any water, we had to prepare for this emergency, and brought with us a supply for twenty-five days. The water was kept in four *tyellek* (iron tanks), containing in all about eleven gallons, and six *tullums* (goatskin bags), containing in all about three and a half gallons. For the camels we brought with us oil and *kindserek* (an oily substance which is left after pressing the oil out of the Kundshut fruit), which not only gave the most nourishment in the most concentrated form, but also took up the least space. For ourselves we brought along a supply of rice, four hundred loaves of bread, *talkhan* (scorched flour), *goman* (macaroni), honey, butter, and potatoes, all bought in Yarkand. Besides this, I had a good supply of preserved food; and lastly we bought three fat sheep (which faithfully followed the caravan till they in turn were killed); eleven fowls, including a cock, which always used to wake us in the morning. Three of the servants that I brought from Kashgar left me here in fear of the desert; only Islam-Baj, of Osh, who had already served me faithfully for two years, was as usual not afraid, and followed me gladly.

At Merket I employed (1) Muhamed-Ikhah, sixty-five years old, of Yarkand, who thoroughly understood how to handle camels; (2) Kasini-Akhun, sixty years, of Yangi-hissar, who for six years had made trips on foot into the desert, in search of gold, always starting from Merket, where he was well known as a daring desert man; and (3) the forty-years-old Kasim-Akhun, of Yarkand. Altogether I had now four men. The caravan consisted of eight big camels—all males, and strongly built—of the kind which are used only on the level, and never in the mountains. The youngest was one and a half year, three were two years, one four, one eight, and one fifteen years old. The last mentioned died first; the eight-years-old one, a pretty white camel, and one of the two-years-old were the only ones that came through; the other six died of thirst, and all the other animals—dogs, sheep, and fowls—as well.

Early in the morning of April 10 the caravan was ready for the start. Water-tanks, boxes, provisions, tents, and all other requisites were placed on the camels, and I mounted one of the largest ones, called Boghra. Over all these various boxes containing instruments, etc., blankets, fur coats, and cushions were spread, covering the camel's humps, thus forming a complete bed, on which we felt very comfortable as soon as we got used to the camel's waddling walk. Even for transporting chronometers the camel is the best carrier I ever tried, and their



*kanrish** and scattered bushes. On this steppe we found the first indication of sand-mounds. These mounds are quite rudimentary, but show distinctly their northerly and southerly direction. It ought, however, to be mentioned that at Merket there stands an isolated mound of considerable dimensions—12 to 18 feet high—from which a splendid view of the town may be had. After marching over 10 miles in an east-south-easterly direction, we camped on the edge of a shallow ravine, 15 to 20 feet broad and 5 feet deep, covered with *kamish* and bushes. My men dug a well in the bottom, and found brackish water at a depth of 3½ feet, where the temperature was 50° Fahr., the air at the same time being 76·5°.

Kasini-Akhun from Yangi-hissar told me that seven to eight days in a north-easterly direction there was a mountain called Chakmak-tagh, which extended in the direction of east by south-east; the eastern part of the mountain was called Akchok. Ten days further east a big lake was said to exist, into which a river formerly had run. Along the shores of this lake pastures and "tograk" (poplar) were found, as well as an old ruin called "Eski-Shahr" (the old city). From this point there was said to be only one day's march to Masar-tagh, and then only a short trip to Khotan Daria. To the north of the Chakmak mountain there was supposed to be a path which, passing a mile-post or *yagach-mishan*, led to an old ruin by the name of Kish-Kishlak (the winter town). This place was, of course, not inhabited, as, indeed, it was not inhabitable. In the southern part of the Takla-Makan there was supposed to exist many ruins of ancient towns. The desert man's story was not confirmed by facts during my journey through the desert. He seemed, however, so positive on this occasion, that I really believe he told the truth. It is not impossible that we may have passed an isolated mountain range without noticing it when the air was filled with sand and dust.

On April 11 we woke up during a heavy storm from the north-east, which filled the atmosphere with dust. We started, however, and proceeded as much as possible in an easterly direction. Our compass was the whole time our most important instrument. Just after leaving the camp the sand became very heavy, and the mounds, being from 16 to 20 feet high, were all lying north by south. At the same time we found here and there *tograks* † and *juglun*, ‡ with branches hard as glass, that broke with a sharp sound as the camels passed. Further on, the mounds became irregular and more like waves. The same physical law which makes the waves grow considerably higher in meeting others coming from a different point, seems also to apply to the sand. For instance, if two currents of sand produced by opposing contrary winds should cross

* *Kanrish* = *Lasiagrotis splendens*.

† *Populus diversifolia* and *Populus balsamifera*.

‡ *Juglun-tamarisk* = *Tamarix laxa* and *Tamarix elongata*.

each other north by south, or east by west, the mounds grow to a considerable height, and, at the intersection, often take a conical shape.

The sand was now getting very hard—my men called it *kattick-kum*—leaving no traces of the footsteps of the camels, but greatly facilitating their march. After a while the sand became so heavy that we were obliged to take a turn to the north, but afterwards we again found a clear road. If we had continued in an easterly direction we should, within a day (according to Kasini-Akhun from Yangi-hissar, after this called "the desert man"), have reached a part of the desert in which the sand was so deep that we should have been forced to turn back. The ground was level for only a short distance. Very soon we met small mounds 6 to 10 feet high, and they were sometimes covered with a very loose and finely distributed sort of dust, into which the camels stepped as if in water. Very often we had to take several turns to avoid these mounds (*beles* in the native language).

The north-easterly wind continued until six o'clock, and the atmosphere was all day so filled with dust that the sun was invisible. During the following days I noticed that the north-east and east wind carried along the dust even when not blowing very hard, while the atmosphere under north-westerly and westerly winds always remained clear. After a strong easterly storm this dust remains in the air for a couple of days, but as soon as a westerly wind comes the dust vanishes. Towards the end of our day's march we passed *tograk* growing sparsely here and there, and immediately on our right hand we had heavy sand. In camp 2 we found water at a depth of less than 2 feet, the temperature of which was 50°. We had travelled 13½ miles in an easterly direction.

On April 12 the mist continued, although there was no wind. We started, as usual, at an early hour, the packing of the camels generally taking an hour and a half. We tried in vain to work towards the east. The mounds to the right, however, forced us in a north-easterly direction. We found a *tograk* here and there. These trees always grow on the top of a conical mound, and the roots help to hold the loose and dry sand together. These cones are 6 to 10 feet high, and are very much like those we saw on the way from Kashgar to Maralbashi. Their existence may be due to the opposing contrary winds, although I should think that the dust which constantly falls would at last hide them. In some places the ground was slightly damp, and covered with a dry, salt crust, which crashed beneath the camel's hoofs. These damp spots made an impression in the ground, and water could no doubt be found at a depth of 5 feet.

We passed another stretch of *tograk* before reaching the next steppe, which was scantily covered with *kamish* and bushes. This steppe we had on our left-hand side, while on our right we had still heavy sand. The mounds pointed straight northwards, but were only a few feet high, and had a very broad base. We met to-day again the same kind

of soft sand into which the camels sank knee-deep, and only proceeded with difficulty. There we also found signs of animal life. We saw a rabbit, which instantly disappeared, and further on we found a path towards the south-east made by deer (Marals). The "desert man" thought that this path probably led to a lake or an oasis (Yeilan). At camp 3 we found brackish water at a depth of $5\frac{1}{2}$ feet (50° Fahr.). The animals drank this water with delight. Distance covered, 15 miles north-east. To the south of our camp there was said to be a lake called Yeshil-Kul (the green lake). None of my men had ever seen the lake, and I did not believe in its existence.

On April 13 we passed several small stretches of *tograk* and sand-mounds, from 65 to 160 feet wide and 6 feet high, all pointing northwards. The steep sides of these mounds face westwards. Very often the mounds were convex towards the east. To-day we met for the first time green *tograks*, with light green leaves; these were eagerly consumed by the camels. The last part of the day's march brought us into heavy sand formed into irregular mounds, sometimes crescent-shaped and sometimes circular, with the steep side towards the south-west. At camp 4 we found water at a depth of $3\frac{1}{2}$ feet (temp. 50°). Distance covered, 13 miles; north $21^{\circ}8'$ east. Lizards, spiders, and moths were the only living creatures to be found. The fact that we always found water at a small depth, and the direction we followed, led me to believe that we could not be very far from the Yarkand Daria. The "desert man" tried to make me believe that we had gone so far from the river that it would take four to five days to reach it. I had found out, however, that all his reports up to this time had been unreliable, so that this one was probably of the same kind.

On April 14 the desert had the same character as before, with *tyong-lu* (high sand) to the right; here and there we passed *tograks* between the mounds. During the two following days I noticed that as soon as we came out of the sand and on even ground the *tograks* disappeared. From this I was, however, not able to draw any definite conclusions; I merely record the fact. The formation of the mounds near the stem of the *tograk* is very changeable. Sometimes the mound seems to leave the *tograk* alone and to go round it, and sometimes the tree is wholly embedded in sand, only the branches being visible. I suppose that this is due to the fact that the *tograk*, being entirely dependent on the water in the ground, grows in small hollows invisible to the eye where the water is nearest. Maybe these elevations of the ground to some extent owe their existence to the phenomena of capillarity. Shortly afterwards the character of the desert completely changed. The brown ground was as level as a floor, and so hard that the camels' hoofs only made an impression of one-fifth of an inch. There we saw a few scattered sand-mounds very sharply distinguished, 3 to 6 feet high, and standing on a broad yellow-coloured base. They resembled small wooden blocks placed on

a smooth mahogany table. We tried as much as possible to avoid the mounds and ride on the hard ground, thereby being forced more northwards. In the open spaces we found many small pieces of a very hard shell-shaped flint, round pieces of porphyry, and the same minerals I had found in Ashur-tag and Turnshuk-tag (on the road to Aksu), in the mountain range at Masar-Alldi; these small minerals we afterwards found in Masar-tag. All these small isolated mountains, the outermost standing on the left-hand bank of Khotan Daria (six days' march to the north of Khotan), are ruins of an ancient mountain chain which stretched through the present Takla-Makan, and seems to have been parallel with the eastern part of the Pamirs. Later on I shall find an opportunity of speaking of the great importance that attaches to these hollow-ground pieces of stone, which have clearly obtained their shape in running water. I may here mention that such a piece of land as this, level hard ground covered with stones, is called in the native (Turkistan) language Sai; the same name is also used in indicating the dry, stony bed of a river.

After a couple of hours' ride the loose sand was decreasing, and to the left we again saw the steppe covered with bushes. Here we made an unexpected discovery—we found the first sign of the wild camel (*yavatuysi*). The footprints which we observed went in the direction north-north-west and south-south-east, and seemed to indicate that the animals came out on the steppe to find food, afterwards returning to the desert. Possibly this might tend to prove that a lake (Yeshit-Kul?) surrounded by pastures really existed in the south. Shortly afterwards we found marks of the wild horse (*khulan*). I was very much surprised by making these discoveries, for, as far as I remember, I have never, in any description of Eastern Turkistan, seen these animals mentioned. The "desert man," however, said that their appearance was general, and that he had often seen them himself; not seldom they would come down in herds to the banks of the Yarkand Daria in search of water and food. I heard afterwards that they even come down to the Khotan Daria, and that they sometimes come from the east of the desert, and, passing the river, proceed to Takla-Makan. At Aksu I was told that in the town of Shak-yar, by Tarim, there was a number of daring and clever men who made a living by hunting the wild camel and the tiger; the skins they sold to the merchants and tanners in Aksu.

On reaching the steppe, my men discovered a herd grazing, but before I got my field-glass adjusted, and before we were able to decide whether the animals were camels, wild horses, or deer (*marals*), they disappeared northwards in a cloud of dust. Our dogs, that always kept in the shadow of the camels, disappeared here suddenly, and when they returned in about an hour, to our surprise we discovered that they had bathed. We continued, however, in the same direction, and by a mere chance we came to a lake containing clear fresh water. This lake was

about 250 feet long and 12 feet wide. The water was about 3 inches deep, and at the bottom, which was muddy, there grew some water-plants. Water-spiders and beetles were numerous, and were eagerly devoured by the fowls. In this connection, I may mention that all my collections of insects—principally beetles—and plants made during the first thirteen days were lost through the disaster that afterwards befell the expedition. By a mere chance, however, my collection of minerals and sand samples were saved. The little lake seemed to me so delightful, that I resolved to camp here. One could plainly see the water coming up from small holes in the bottom, as from a spring. The temperature of the water was 70°, and of the air 78°, at 5 p.m. By 9 p.m. the temperature had gone down to 59° in the water, and 60° in the air. On April 16, at 7 a.m., the temperature of the water was 49°, and in the air 55°. Distance covered, 11½ miles; direction, north 14.4° east. Still the air was so full of dust that the sun could not be distinguished 20 degrees above the horizon. All the time we had tried hard to get towards the east, but, on account of the high sand, we had been forced in a north-easterly direction. We had very little knowledge of the character of the desert we were coming through and of the chances of finding water, so we decided to camp here.

April 15.—The camels and the other animals now had a chance to get all the water and grass they wanted. Our water-tanks were also refilled. It was a curious incident that the fowls on this day of rest laid four eggs; hitherto I had only got one a day. To-day we killed a sheep. During the night our dogs barked continually towards the road on which we had seen the footsteps of the camels; undoubtedly the herds seek the water after sundown. At 1 p.m. the temperature in the sun was 165° (82.8° in the shade); one hour later the temperature of the sand was 112°.

Leaving the lake on April 16, we again met mounds 10 to 13 feet high, north by south. The sand was soft and most difficult to get through; we had to ride zigzag up and down the sand-hills. After a while we came to an open space, where we again found *tograks*, *julgun*, and *kamish*. Here we passed another lake, and soon afterwards a third one. My men thought that this was Kuldenezagi, or the end of the big lake; but, as all these lakes went in an east-north-east direction, and lay in the same line, I concluded that they had formerly formed parts of an old river-bed. Round the last lake we found numerous marks of wild camels and horses. Mounds now appeared again, sometimes as high as 16 feet, and for a short stretch they lay east by west; however, they soon again took their usual course, north by south. Open spaces became now more frequent; *julgun* and *kamish* appeared. To-day we covered 15 miles; direction, north 87° east.

April 17.—At 4 a.m. the sky was perfectly clear, and the stars shone brightly. At 7 a.m. the sun was hot, although a westerly wind was

blowing. The wind had cleared the air, and, thanks to this, we discovered in the distance a large mountain range, with smaller extensions both right and left. The "desert man" believed it was Masar-tag, and I resolved to investigate it. After having passed a stretch of sand 12 feet high, we came out on a plain that seemed to lead right to the foot of the mountain. Here and there we passed scattered mounds, and both *julgun* and *kamish*. Further on we again found mounds of considerable height, sometimes up to 20 feet. The ground now became more uneven, and we passed a small salt-water pond, and afterwards one containing fresh water. I became more and more convinced that these ponds were the remains of an inundation from Yarkand Daria in the spring of last year. I discovered to-day that the water not only creates these small lakes near the rivers, but even, through natural canals, finds its way into the deserts. We passed a 125-foot wide and 6-foot deep river-bed which went from west to east, and where still a little water was left. The bottom was sandy, and *kamish* grew on the banks. Over half a mile further north we could see a river-bed similar to the first one, and clearly distinguishable. In the spring, when the Yarkand Daria carries enormous quantities of water, the overflow is bound to find an outlet, and undoubtedly it flows eastwards into the desert through selfmade channels in the lower ground.

Any one who has seen the Yarkand Daria will know that this river carries along a good deal of *débris*, sand, etc., which remains in the river-bed as soon as the swiftness of the current abates. In this way the river-bed constantly grows higher, and the water has to seek new outlets. As a matter of fact, this moving of the river-bed goes in an easterly direction, and I have particularly noticed this on the western side of Yarkand Daria, between the river and the holy grave of Orden Padishak, where two old river-beds, running parallel with the present river, can be distinctly seen. The two dried-up river-beds recently mentioned also show that there is a tendency towards the east.

The air was clear all day. During our march we had noticed in the far distance a dark cloud, which we now found was due to the vapour coming from the river-beds. Similar vapour-columns, but much larger ones, we also saw the following days, towering high above the Yarkand Daria banks, the dry atmosphere rapidly absorbing the vapour. We proceeded over an uneven ground with scattered mounds, where a few *yantaks** were growing, and again met *tograks*, which were so plentiful that it looked like a regular forest, or *yangal*. Here we rode between high mounds for one hour, direction north-north-east; sometimes the mounds were as high as 30 feet, and their west sides were very steep. We crossed a few mounds before we camped between a couple of old *tograk* trees. Distance covered, 17½ miles; direction, north 18° east.

* *Yantaks* = *Althagi camelorum*.

April 18.—To-day we had strong gales from the north-east, and the air was as usual filled with dust. The heat during the day was less oppressive on account of the dust, but the temperature higher than usual at night. The mountain to the north could not be seen through the mist and the forest. The trees had still that same yellow-greyish colour, and only in a few places we saw some green *tograks*. Here and there between the trees mounds were seen, but the land had altogether lost the character of a desert. The mountainous desert had been succeeded by a marsh covered with trees and *kamish*. We had often to take a roundabout way on account of the marsh, which gradually took the form of a long lake, that became wider northward and had many creeks, and even contained small islands covered with bushes and *kamish*; on the shores were plenty of ducks and geese. We followed the eastern shore northwards through *tograks* and mounds, and reached another lake just like and parallel to the first one. Both lakes, which probably form parts of a big lake in the north, run out southwards between the sand-hills and follow their outlines. Alongside the last-mentioned lake we rode on a sand-hill of considerable dimensions between the trees. At the foot of this sand-hill there ran a dark stripe of faded leaves and branches of trees, showing that the surface of the lake at high water was 20 inches higher than now. The small islands covered with *kamish* showed that the water could not be very deep. To see the clear, deep-blue water through the fresh green leaves was a sight late to be forgotten. The water in the lake is fresh and clear. In my mind, there is no doubt that these lakes have been created by the yearly inundations from the Yarkand Daria. When the overflow ceases towards the summer, some of the water evaporates; when the winter comes, the remainder freezes, melts again in spring, and gradually gets less; in May or June the new supply comes, and the lake reaches again its maximum.

Leaving the lakes on our left, we now took an easterly course, and came through such thick *kamish* that only those who rode could have a full view in front. Later we came out on a long plain, where the finest grass was growing; here and there were scattered groups of trees. But the forest grew thicker, and at last got so thick that we had to use axes to cut our way through. At last we were out of this forest near the Yarkand Daria, and reached the open steppe, where in east-south-east we discovered another mountain. In the dusk we camped on an isolated mound, where we found a great many scorpions. Distance covered, 16 miles in constant turns; direction, north 50° east.

April 19.—The mountain first seen could now be faintly discovered to the north. This is the mountain that stands on the right bank of the Yarkand Daria, and is a continuation of the Masar-aldis mountain, which I early in the spring had visited. We decided to steer our course towards the small mountain in east-south-east, which could be easily

seen through the mist, and consequently could not be far away. We had to pass some very uneven ground, often interrupted by damp ravines, which we had to go round. To the right there is a stretch of marsh land, and to the left grows a number of *tograks*—young, green, and fresh looking, where many crows had gathered. A small range of mountains, completely separated from the main mountain chain, was now our destination; but, coming nearer the base, we found that a lake lay between us and the mountain. This lake went in a northerly direction, where it had an outlet. We therefore turned towards south and east, between the lake and the big mountain. At the base of this were many mounds, which went right up in the clefts of the mountain. We found now that the lake was divided into two parts by a narrow swampy isthmus; *tograks* and *kamish* grew on the banks, and there were also indications of the water having been higher. The water was clear and fresh, and geese and ducks were numerous as usual. The eastern half of the lake disappears in a swamp, and a number of ponds stretch far northward. Between these and a mountain range pointing northward we continued our march, and finally stopped by a small lake, along the shores of which were plenty of *tograks* and *kamish*. I decided to stay in this delightful oasis the whole day of April 20. Besides, I wanted to take some astronomical observations and make a geological excursion. As to the result of the latter, I will refrain from saying anything before the specimens I brought back have been analyzed; suffice it is to say, that the minerals were of the same finely grained and hard kind that I found in the small mountains near the Kashgar Daria conjunction, and that in several places I found veins of porphyry. From the top of the mountain lying to the south of our camp I had a splendid view of the neighbourhood. To the south-west I could see the two small lakes with their clear water, in which could be seen the surrounding mountains as if in a mirror. Straight westward I could see the little isolated mountain with high mounds at the north-eastern foot, which had dammed up the marshland. To the west 320° north, I found the large mountain we first of all discovered, and which cannot be any other than that near Masur-aldi. Of my investigations round this last-named mountain I do not find time to speak now. Between our camp and this mountain, as far as north 30° east, there is an even plain covered by marshes and ponds and fertile vegetation. This swamp and all these ponds, no doubt, form one great lake at the time of the inundation. It is, however, a curious fact that the deepest parts of these depressions are found round the foot of the mountains, where the largest quantities of water remain, although the *débris* from these fast-crumbling mountains ought to add to the height of the ground. I may also note that all these small ponds lie in a westerly direction from the mountains and their extensions, which is clearly shown in Fig. 2. In the first instance, we may conclude that the sand and the atmospheric dust leaves only a very small quantity

(or next to nothing) at the mountain's south-western base; that is to say, to the leeward of the prevailing north-easterly and easterly winds, and that the ground here consequently would become proportionately lower. When we the following day went round the whole complex of mountains, I received full confirmation of the conclusion above arrived at. Towards north-east and east all the extensions were covered with mounds, but as a rule parallel with the length of the mountains, and all very irregular in shape; on the western and south-western extensions not a trace of sand could be found, the ground being either hard or

Swamps extending to Yarkand Daria

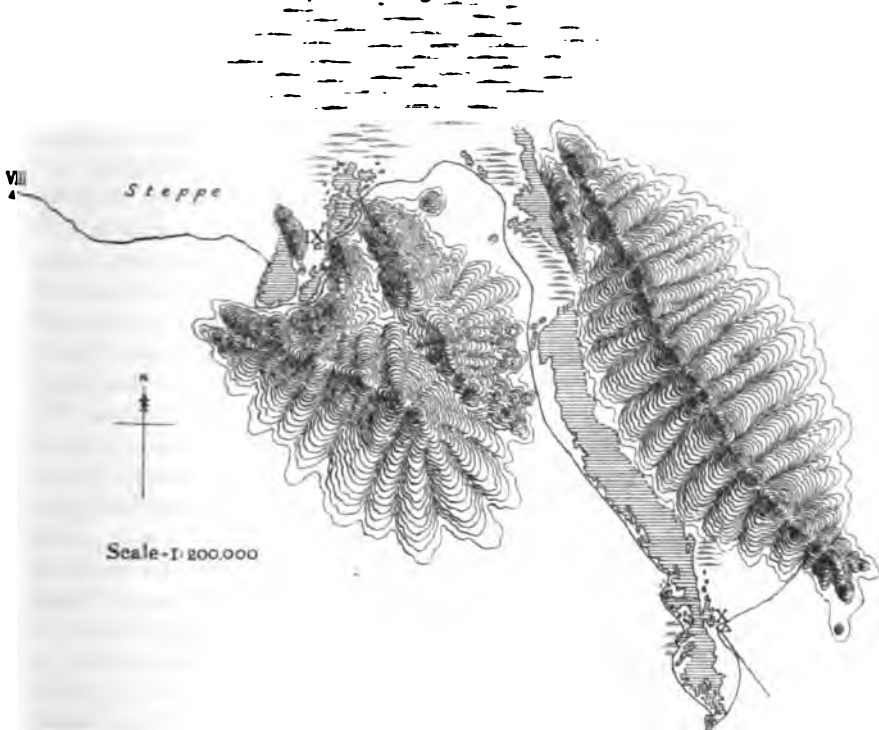


FIG. 2.

covered with gravel and *kamish*. It is, however, quite natural that the sand, carried along by north-easterly and easterly winds, must find a barrier in these mountains. In their formation the mounds have been disturbed at the base of the mountain, and get thinner the higher they get up; they do not, however, reach the top.

To the east of the mountain extension where I had my look-out, is another one running parallel with the first one, and between these two there is a gently sloping valley covered with grass and *débris*, and with a network of dry canals, which are only filled with water after rain and when the snow melts, for of permanent ponds there are none. Generally,

these mountains are fast crumbling, which is a natural consequence of the enormous changes in the temperatures of winter and summer, and even between night and day. I calculate the height of this range at from 800 to 1000 feet.

On April 21, when we passed these two mountain extensions, we again encountered high mounds which blocked the north-eastern slope. To the left we had marshland with *tograks* and *kamish*, and in front of us we saw another mountain, higher than the one we had left. Here and there the *tograks* take the form of a thin forest, and here we also found a path, which the "desert man" explained was an old short cut to Khotan Daria.

We now took a more southerly course between the two mountain chains laying north-west to south-east. The *tograks* gradually disappear, and we are again on the steppe covered with *kamish*. To the left there is a very long lake, only in one place broken by marshland. As far as the eye can reach the lake goes in a north-easterly direction, and probably alongside the south-western base of the eastern mountain. To the right the mounds tower up on the north-eastern slopes of the western mountains, whose cliffs only here and there can be seen peeping out of the sand. The ground gradually gets hard, now and then covered with a little *débris*. At the northern end of the largest lake, where there stands a big isolated rock, we met to our surprise a man, who had come there from Maralbashi to get rock salt. The salt was found high up on the mountain, was perfectly clean, and looked very nice. This man, who had a couple of cart-horses with him, sells the salt to the bazaars in Maralbashi. He had no information of importance to give, but only confirmed what I had already noticed. To Maralbashi there was not quite a two days' march in direction west 330° north; to the south and east there was a sandy desert, but the man had no knowledge of this fact. To the left the long lake continues; there are no islands in it, but plenty of grass. Here and there the lake is surrounded by a swamp; otherwise the ground is very hard, does not even leave any trace of the camels' footsteps, and is absolutely void of vegetation. Even in this lake there were signs of the water having been higher; and the fine sand on the shore was just like finely-chiselled waves. The southern slopes of the western mountain chain sink gradually more and more, and at last are completely covered with sand; they continue towards the south in a long sand-comb. After having left the last mountain slopes, we had the boundless desert on the right hand.

It was my desire now to come nearer to the eastern mountain chain, but we were constantly obstructed by the lake, which, however, became more narrow towards the south. We were therefore bound to turn southwards, where the lake sends out long and narrow arms, just like fingers pointing southward. The ground here gradually rises, putting a stop to the further advance of the water. When we at last had come round

the southern point, we turned towards north and north-east, and arrived at the eastern shore, where we found grass for the camels, but no trees.

On April 22 we were in camp 10. The camels here had another chance of getting all they wanted to eat and drink. I made a trip to the south-eastern point of the mountain, which has the form of a cape, with a little rocky island in front. From this point I had a splendid view of the long lake, and I had a chance to verify my map sketches. To the north-east, east, and south-west is nothing but desert as smooth as the sea. Far away I could discern the first mounds. The day was exceptionally clear; highest temperature (black bulb) at 1 p.m., 180°, 92° in the shade (?). I had brought with me my strongest field-glass, and carefully examined the horizon, but not a mountain to be seen, only desert and mounds. When Prjevalsky in 1885 returned from his last journey, he followed the Khotan Daria northward, and discovered, about six days' march from Khotan, on the left bank of the river, a little mountain which extended northward towards the desert. The natives called it Masar Tagh. Now, Prjevalsky knew that there was one Masar Tagh by Maralbashi, and as the natives assured him that the one by Khotan Daria extended just in the same direction, as far as could be seen, he concluded that they belonged to the same mountain chain, and he marked them down on his map as lying straight across the desert of Takla-Makan. Mr. Carey, who together with the unfortunate Mr. Dalgleish, in the year 1885-86, also travelled alongside Khotan Daria, saw the same mountain, but laid it down on his map as an isolated mountain, which showed more caution, and no doubt also is correct. However, all the Russian maps of East Turkistan and the splendid map of "Tibet and the Surrounding Regions," published by the Royal Geographical Society, as well as several others, have a whole mountain chain across the desert. In Map 60 in "Stieler's Hand Atlas," there is, however, as a sort of precaution, only printed the name without further comment. It is evident that if a continuous mountain chain really existed, we ought to have discovered it just at the point where we now were, but neither here nor further on were we able to discover even a sign of a mountain. It is even less probable that Masar Tagh by Khotan should have the slightest connection with the first-mentioned apocryphal existence of Chak-mak Tagh and Ak-chok, because in such a case we would have passed them. I feel fully convinced that the one Masar Tagh near which we camped on April 22 is totally isolated, and that this is also the case with the mountain seen by Prjevalsky and Mr. Carey. The latter mountain I have not yet visited, but at Buksem (Khotan Daria) the hunters told me that it might be rounded in five or six days. At the top there is a holy grave (masar); hence the name.

When we started on April 23 and left the newly discovered mountains and lakes, I was still of the opinion that if we continued south-eastward we would again come to a mountainous region with lakes and

ponds. Not finding, however, any signs at all of mountains, we steered our course eastward (with a slight deviation towards east-south-east), in order to reach Khotan Daria by the shortest possible route. While resting ourselves, I and my men had a consultation. The "desert man" up to this time had been a very good guide, and his advice had been of considerable value in discovering the new mountain and the lakes, consequently we placed a good deal of confidence in him when he assured us that we had only a four or five days' march to the Khotan Daria. I may here add that on all the maps I had in my possession the distance between the point where we were and the Khotan Daria was given as between 70 and 75 miles. I gave strict instructions to fill the water-tanks for a ten days' march; further on, when it was too late, I found out that my men had only taken a four days' supply. The result of this negligence was the death of two men, six camels, and all the other animals.

As already stated, we left the camp on April 23. During the following two weeks we always sent our thoughts back to this little paradise on earth that we left behind. We steered our course south-eastward to look for the mysterious Masar Tagh. The ground was perfectly hard, and partly covered with soft dust, and now and then with bushes and kamish. Then again we passed cones and hills of clay. In this desolate place, however, there was no other sign of life than the footsteps of the antelope and other animals living in the desert. After an hour and a half's ride, we again met mounds 18 to 22 feet high lying north-west by south-east, and with steep inclines towards south and south-west. A single *yulgun* grew here and there; this *yulgun* is a typical desert tree, and does not appear near the lakes. After two hours' ride, the mountain we had left disappeared in the mist, and afterwards we did not see any trace of a mountain. The mounds made it now more and more difficult for us. For a while we followed in the direction of the mounds, but very soon we met another range of mounds crossing these, whereby pyramids of sand were formed often as high as 60 to 65 feet. During the latter half of our day's march, the sand-combs were as high as 80 to 100 feet. My men called this sand *chong-kum* (heavy sand), or *yaman-kum* (bad sand). As much as possible we rode on the top of these sand-hills to save the trouble of going downhill and then up again, but as a consequence we were obliged to take more turns, as we had to make use of the eastern sides of the mounds, which were more rounded. Once in a while we came, however, to the edge of a very steep precipice which we could not pass round, and here the camels went right ahead and slid down through the sand to the base of the mound, never losing their balance. Sometimes we had to use spades to work our way through the sand, where we also found the last bushes of *yulgun*. We tried to find water by digging, but, not finding any at a depth of 2½ feet, we gave it up. A few moths flew around my candle during the night; the next day even these insects had vanished.

(To be continued.)

DR. NANSEN'S RETURN.

THE news telegraphed from Vardö on August 13, that Dr. Nansen had arrived at that port on board the *Windward*, has been received with the most lively satisfaction throughout the civilized world. Although no special cause for disquietude as to the fate of the brave explorer had arisen, the mere fact that fully three years had elapsed since the date of the last communication from him (sent from Khabarova, in Jugor strait, on August 3, 1893) could not but create a certain feeling of anxiety, now replaced by a corresponding sense of relief that all has gone well. Our warmest congratulations are offered to Dr. Nansen on his splendid achievements, hardly to be matched in the whole history of Arctic exploration. The following are the broad outlines of the story of his expedition, taken from the detailed account telegraphed by the explorer himself to the *Daily Chronicle*, which deserves much credit for its enterprise in the matter.

As reported by Captain Wiggins (*Journal*, vol. iii. p. 122), there was much ice on the Siberian coast east of the Yenesei in 1893, but the *Fram* forced a way through, many islands being met with along the coast, in addition to one reported as discovered in the Kara Sea. The mouth of the Olenek was reached on September 15, too late a date to admit of landing to take in the dogs arranged for. On the 18th the New Siberian islands were passed, and on the 22nd the ship was made fast to a floe in 78° 50' north, 133° 37' east, having already apparently drifted some distance towards the north-west.

Regarding the experiences of the next eighteen months, during which the *Fram* remained fast in the ice-pack, Dr. Nansen says, "As anticipated, we were gradually drifted north and north-westward. During the autumn and winter the *Fram* was constantly exposed to violent ice-pressures, but she surpassed our expectations, being superior to any strain. The temperature fell rapidly, and was constantly low, with little variation for the whole winter; the lowest temperature was 62° below zero. Every man on board was in perfect health. The electric light generated by the windmill fulfilled our expectations. . . . The sea was up to 90 fathoms deep south of 79° north, where the depth suddenly increased, and was from 1600 to 1800 fathoms north of that latitude. This will necessarily upset all theories based on a shallow Polar basin. The sea-bottom was remarkably devoid of organic matter. . . . Under the stratum of cold ice-water covering the surface of the Polar basin, I soon discovered the warmer and more saline water due to the Gulf Stream, with temperatures ranging from 31° to 38°. We saw no land and no open water, except narrow cracks, in any direction."

The north-westward drift was most rapid during the winter and spring, being counteracted or even reversed by northerly winds during

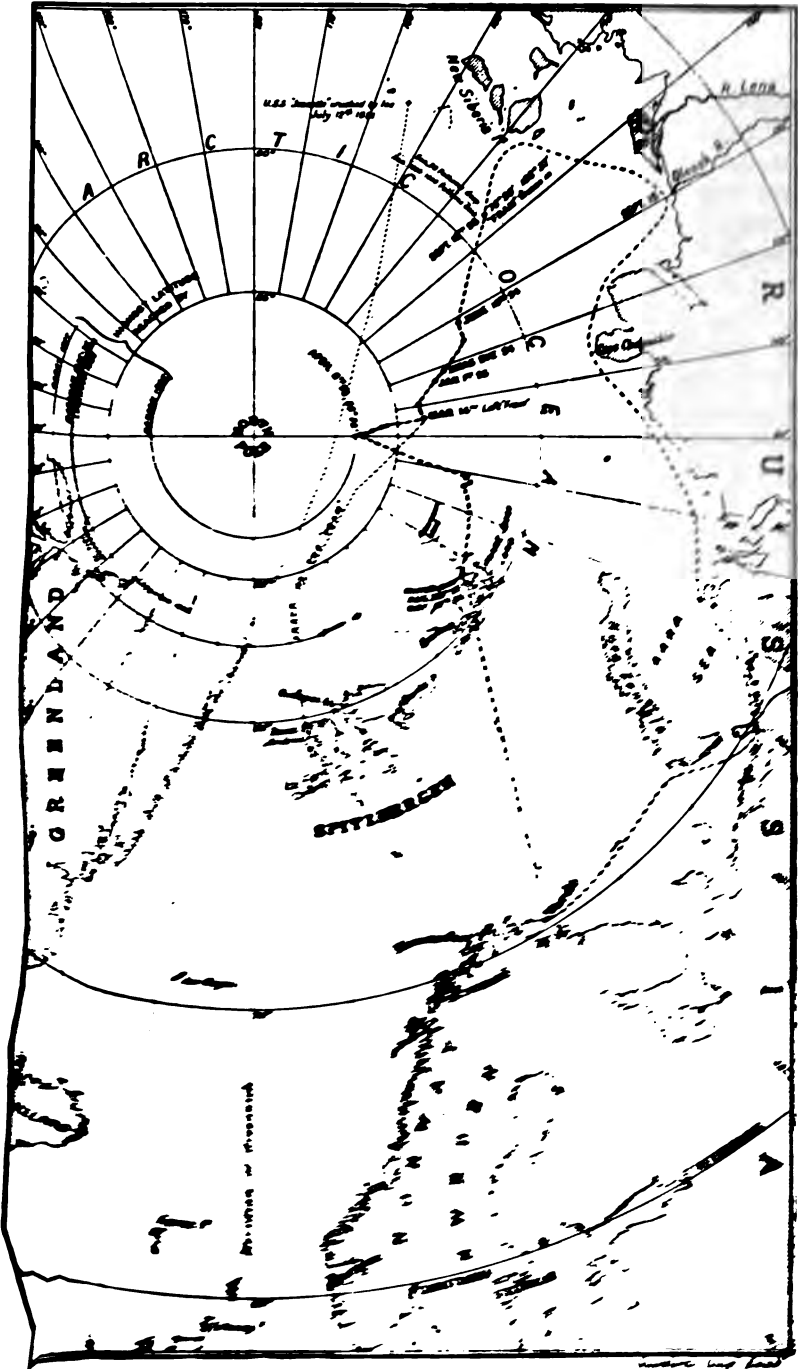
the summer. The highest northern latitude previously reached ($83^{\circ} 24'$) was passed on Christmas Eve, 1894, and on March 3, 1895, $84^{\circ} 4'$ was attained. Very violent ice-pressures were experienced in January, when great ice-masses were pressed against the *Fram*, and threatened to bury, if not to crush her. It will be remembered that, to guard against the risk of crushing, the sides of the *Fram* were built at a very sloping angle, to facilitate the lifting of the ship on to the surface of the ice. In spite of the fears expressed by experts, that this could not take place when the ship was frozen firmly into the ice, the event justified Dr. Nansen's expectations, for the *Fram* was broken loose and slowly lifted out of her bed, showing not the slightest sign of a split in any part of her.

Feeling that the successful crossing of the Polar basin by the *Fram* was assured, and wishing to explore to the north of the probable route, which would, it seemed, lead a little to the north of Franz Josef land, Dr. Nansen left the ship on March 14, 1895, accompanied only by Lieut. Johannsen. The position then reached was $83^{\circ} 59'$ north, and $102^{\circ} 27'$ east of Greenwich. The travellers took three sledges, twenty-eight dogs, and two "kayaks," in case of open water. The northward progress was good for a time, but was soon hindered by rough ice and a contrary drift. The sledge had constantly to be carried across high hummocks of ice, and the advance was slow and fatiguing. The ice becoming still rougher, and an excursion northwards on *ski* revealing nothing but a constant succession of hummocks, the return march towards Franz Josef Land was begun on April 8. The most northern point reached was in $86^{\circ} 14'$. Temperature approaching 40° below zero had been experienced with little intermission for three weeks, causing much suffering to the travellers, who were clad only in woollen clothing, the fur suits having been left behind to save weight. No sign of land had been seen, and from the free movement of the ice (then drifting rapidly northwards), it appeared that there could be none within a long distance.

Progress southward was rendered very difficult by cracks, and the bad condition of the snow. Provisions fell very low, and one after another of the dogs had to be killed to provide food for the rest. During an unusually long day's march the chronometers ran down, and complete uncertainty prevailed as to the longitude. The looked-for land was long in appearing, but a seal and three bears were shot, by which a supply of meat was obtained. At last, on July 24, an unknown land was seen in about 82° north, and proved to consist of ice-capped islands,* which were only reached, however, on August 6, owing to the fact that the ice

* The explorer found it impossible to reconcile Payer's map with the results of his own observations, partly, no doubt, owing to his uncertainty as to his longitude. It seems certain, however, that the land east of Austria Sound is much less extensive than was thought by the Austrian voyager; but it must be remembered that his delineation of it was based upon distant views only.

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ARCTIC SEA MAP OF THE YEAR 1850
 No. 1111 - SEPTEMBER 1850

was broken into small floes, while the crushed ice with which the water was filled prevented the use of the "kayaks." The longitude was supposed to be about 63° east.

It being too late in the season for the voyage to Spitzbergen, a spot was chosen as winter quarters in $81^{\circ} 13'$ north, and about 56° east. A hut was built of stones, earth, and moss, and roofed with walrus-hide, covered with snow. Bear-meat and blubber were the only food of the travellers, the latter supplying also the means of cooking, light, and heat, and bearskins forming their beds and sleeping-bag.

The winter having passed without mishap, a renewed start was made on May 19. Land extending westward was found a little south of 81° , but a broad sound leading southwards was followed. A westward course was taken as soon as the south side of the islands had been reached—open water permitting the use of the "kayaks"—and the meeting with Mr. Jackson took place a little south-east of Cape Flora.

The furthest point reached by Dr. Nansen is nearly three degrees of latitude (about 200 statute miles) in advance of that previously attained, the credit of which rested, as is well known, with Lieut. Lockwood and Serjeant Brainerd, of Greely's expedition, who reached $83^{\circ} 24'$.* So great an advance has not been made by a single expedition since Barents's voyages at the end of the sixteenth century, whilst it is only just equalled by the whole advance effected during the previous 120 years. At the time when Dr. Nansen left the *Fram*, nearly half the distance between the New Siberian islands and the north of Spitzbergen had been covered,† entirely by the help of the currents, on which the explorer had based the whole plan of his expedition. He is confident that, under the capable leadership of Captain Sverdrup, the rest of the passage across the North Polar basin will be safely accomplished, although it is improbable that a much higher latitude will be reached than that already attained before his departure. Although he has not reached the Pole, Dr. Nansen has certainly shown the way in which the crossing of the Polar basin may best be effected, and this, it is to be remembered, was the main object which he proposed to himself at the outset. The results of the voyage include valuable scientific observations relating to meteorology, magnetism, sea-temperature and salinity, etc., taken on board the *Fram*.

The most remarkable feat in the whole journey was undoubtedly that accomplished by the leader and Lieut. Johannsen, after leaving the *Fram*. A journey over the roughest of Polar ice, extending over eight

* Markham's furthest was $83^{\circ} 20' 26''$.

† The drift of the *Jeannette* in the pack-ice east of the New Siberia islands, between September, 1879, and June, 1881, was, roughly speaking, about equal to that of the *Fram* between September, 1893, and March, 1895, but whereas the former was beset in about 71° north, the latter had already reached the high latitude of $78^{\circ} 50'$ before making fast to an ice-floe.

degrees of latitude (as it does if we add together the northward and southward sections of the route), with an insufficient supply of dogs, without fur clothing, or any of the comforts obtainable on board ship or in secure winter quarters, is, it may be said with confidence, unparalleled in the history of Arctic exploration, and shows once more the undaunted spirit and powers of endurance possessed by the explorer.

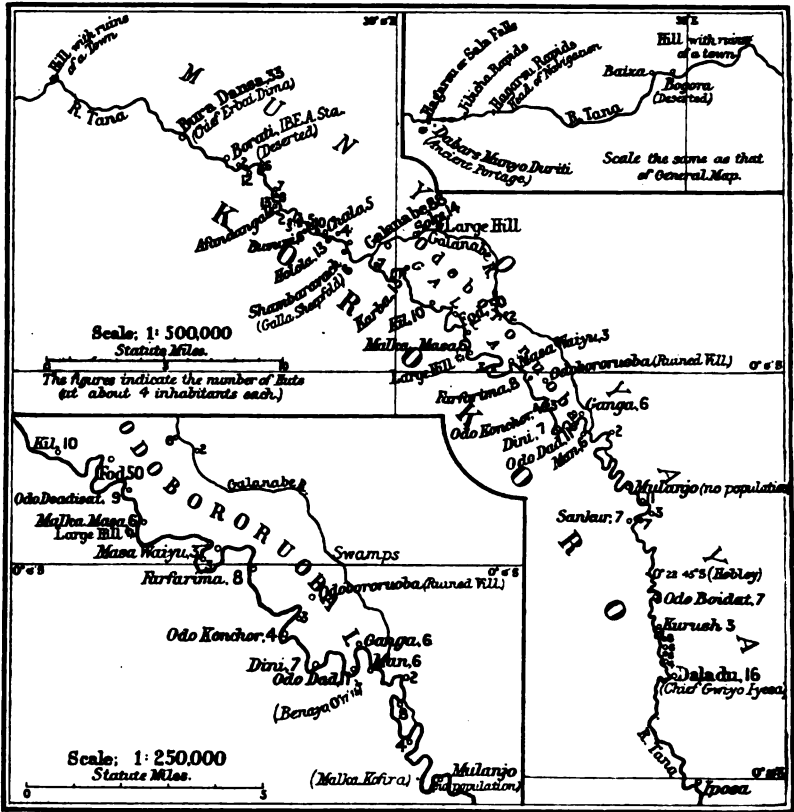
Since the above was written, the general satisfaction at the safety of Dr. Nansen has been enhanced by the additional news of the arrival of the *Fram* on the coast of Norway. Captain Sverdrup telegraphs the following details respecting the voyage. As had been anticipated, the *Fram* drifted north of Franz Josef Land, the highest latitude reached being $85^{\circ} 57'$. After a period of rapid movement, the ship remained stationary (in about $84^{\circ} 9'$ north, 15° east), from the end of February till the middle of July of the present year. From this position the *Fram* steamed through the ice, finally reaching open water north of Spitzbergen on August 12. The lowest temperature during the voyage was -52° C. (-62° Fahr.), and the highest $+3^{\circ}$ C. ($+37\frac{1}{2}^{\circ}$ Fahr.). The sea along the track maintained a depth of from 1800 to 2200 fathoms. No land was seen, and the ice took the form of broken hummocky masses, alternating with large fairly even floes. The result of the voyage thus supplies a striking proof of the correctness of Dr. Nansen's calculations.

THE REV. R. M. ORMEROD'S JOURNEYS ON THE TANA RIVER.

The Tana river was recently traversed from the coast to its highest navigable point, Hagamu Falls, by the Rev. R. M. Ormerod of Liverpool, who was sent by his society, the United Methodist Free Church Mission, to ascertain the character and population of the various tribes on the river. None of the half-breed travellers who had previously reached the falls seems to have taken pains to estimate the population, and no white man speaking the vernacular had reached Hagamu. Mr. Ormerod left the station (which is 20 miles from the mouth of the river) on August 17, 1875. For the first fortnight he had the advantage of travelling in company with two Germans in consequence of Messrs Weber and Ten Engeln of Sigi. In their intercourse with river-borne, the Nopera. But the river was a narrow as a stream and owing to lack of water and the presence of fast rocks, the launch could proceed no higher than Marenvudi the third town of the Strahli district. Thence Messrs Weber and Ten Engeln returned. Betaking himself to various expeditions, which he had undertaken for the purpose, Mr. Ormerod continued the river journey. He had several followers—six Fulani, a Mende, a Galla guide, a Mende boy, and two boys. These men were useful for the whole party and baggage.

Progress was slow, the stream being strong. Masa, the halfway town, was reached at the end of three weeks from the start; and Kidori, the highest town inhabited by the true Pokomo, was passed at the end of the fourth week.

From the river-mouth up to Kidori is locally called Pokomoni, "land of the Pokomos." The Gallas call it Chaffa. It is thickly



SKETCH-MAP OF KOROKORO.
(By the Rev. R. M. Ormerod.)

populated by a typically African race, who claim kinship with the Wanyika of the Mombasa and Melindi district. They are stalwart in physique, with chests well developed by the daily use of the paddle and punting-pole. The men are above the average height, the women often short and stumpy. Their complexions vary through all the shades from chocolate to black, the darker faces being seen the further inland one goes. Flat nosed, wide mouthed, with hair short and tatted, they have little facial resemblance to their Galla neighbours, to whom in most respects they are an inferior race. Their clothing

is scanty, especially with the young women (some of whom have a mere fig-leaf of a rag); but they besmear themselves with red paint and semsem oil—in some up-river places castor-oil. They are of mirthful, happy-go-lucky temperament; of timid disposition, and ignorant of the arts of war. In the Kinakombe district they carry bows and arrows for defensive purposes, but in most other places the spear used for killing hippos and crocodiles is their only weapon. They are much given to fetish-worship, witchcraft, funeral feasting, dancing, and drum-beating; and they drink honey-wine to such an extent as to become helplessly and dangerously intoxicated. Their chief occupation is the cultivation of rice, maize, bananas, peas, sugar-cane, and tobacco; but they plant little more than supplies their personal needs. Fish from the river, water-lily bulbs from the swamps, and white-collared monkeys from the woods are additional food-supplies; and in the higher districts they obtain much meat and occasionally an ivory tusk in game-pits and snares. They divide their land into districts, each stretching a day's journey or more along the river. Each district has its chief town, the centre of administration where lives the chief or "sultan," and thither he calls the elders of the smaller towns whenever "affairs of state" require it. The "sultan" of Subaki refused to supply Mr. Ormerod with canoes or men, assigning as the reason that it was his custom to hinder all Europeans, Arabs, and Swahilis from passing up-river.

The largest town in Pokomoni is Kosi, the capital of the Ndera district. Its population is about 700. Kinakombe, Mikamoni, and Ngao (German mission-station), are other large towns. There are altogether about 15,000 Pokomoni scattered along 250 miles of winding river-course.

Manyole, the land stretching for 60 miles above Kidori, is practically a no-man's land. Mr. Ormerod travelled in it for seven days through almost unbroken forest. Only here and there, at eight different points, a few bushmen were clustered in the forest fringing the river-side.* Their total number he reckoned at 240. They call themselves "Wata;" the Swahilis call them Wamaya, or Waboni. These alternative names, used by the Swahilis, imply a slight distinction, which the Wata themselves do not pay attention to. The Wamaya live mostly on the river, and speak only Kigusa; the Waboni live out in the bush, and have an alternative language, the Kiboni. This Kiboni language they speak of as "the hot Wata tongue." These Wata are all sons of the Galala, and use the Galala language. Their chief, Lubo, lives at a distance of five days' travel Mang'ye. He told Mr.

* These villages of the Wamaya with distances from Kidori in miles were: Manyole 17 miles, Luanda 25 miles, Luanda 35 miles, Mungu 45 miles, Kicia 50 miles, and Tera 55 miles. A further 15 miles, and from 10 to 15 miles and 8 miles below Delimit, the first village of the Waboni.

Ormerod that there is not so much game as formerly, and they have found it necessary to turn their hands to agriculture. They still look to hunting for their staple food-supply, but cultivate maize and a little rice, collect honey, and eke out with water-lily bulbs and wild fruit. Their huts are exceedingly small, merely a few fan-palm fronds stretched over half a dozen bent boughs. Each is barely sufficient to shelter the owner's wife; he and his children sleep outside under the shady trees.

Mr. Ormerod entered Korokoro five weeks from the start, and found himself among a race identical to the Pokomos on the lower river, in every respect except language. They speak only the Galla tongue, and call themselves "Munyo Yaya." Undoubtedly they are Pokomos who, by long separation from their more numerous brethren down-river and long servitude to the Gallas, have been led to abandon their mother-tongue and adopt that of their masters. There are still friendly relations between them and the Pokomos of Masa, Tuni, Bura, and Kidori. Kidori people of marriageable age often go up to Korokoro to seek husbands or wives, and, after staying a few years, return to Pokomoni. The children thus born in Korokoro speak only Kigalla, and have to pick up Kipokomo in later years. There is also some ivory trade between the people of Korokoro and the Pokomos, the Pokomos subsequently selling the tusks to Arabs and Swahilis from the coast.

The total number of the Munyo Yaya is 1500. Their hamlets are dotted along the river-banks for a distance of 100 miles. They have two chiefs: Gwiyo Iyesa and Erbai Dima, both very old and of insignificant appearance. Gwiyo lives at Daladu, the lowest town but one; and Erbai at Bura Dansa, the highest town. A funeral dance was in progress when Mr. Ormerod arrived at Daladu. The old chief and all his people—men, women, and children—were more or less intoxicated. The chief asked Mr. Ormerod to move his tent across river, lest some of the revellers should "run amuck" and molest the stranger. As the night advanced the dance became "fast and furious," and one man had his forehead gashed with a brass amulet, but Mr. Ormerod was not disturbed. Next day (Sunday) Mr. Ormerod tested their knowledge of the supernatural. Their religion seems to be a mixture of fetishism and pantheism. They appear to have no idea of a Personal Creator. On being told of the Divine Being, they exclaimed, "Well, He must be a white man!" Mr. Ormerod described the work and teaching of Jesus Christ, and asked if they had ever heard of such a being. They replied, "Yes; you refer to our chief, Gwiyo Iyesa."

The Galla settlements on the island of Odobororuoba Mr. Ormerod found three days above Daladu. The island is a low strip of land on the left bank of the river, enclosed by a branch stream which forks off at Galanabe and re-enters at Ganga. It is about 15 miles long, and 4 or

5 miles broad. None of it is more than a foot or two above flood-level. The branch stream (called the Galanabe stream), which encloses the island on the north and east, loses itself in swamps, where Mr. Ormerod found mosquitos buzzing about at mid-day. There were thousands of whistling snakes, evidently migrants from the rice districts on the lower Tana. The Gallas live on the island of Odobororuoba because of the protection it offers from the Wakamba and Somalis. They are settled in six towns, all close to the Tana river. The largest, Galanabe, contains about 350 people. All six towns contain perhaps 700 people—not more. Of these many are obliged to remove to the mainland during the flood season. They settle at such times on high land to the north, where they live in constant terror of Masai and Somalis. These 700 Gallas hold the 1500 river-people (Munyo Yaya) in subjection. They have large flocks of sheep, a few cows (taken in raids against Wakamba), and some donkeys (taken from Masai); but they also help themselves to the Indian corn, peas, and honey, and even ivory of the Munyo Yaya. The young Gallas go elephant-hunting at certain seasons, but raiding seems to be an almost equally familiar occupation. They march as far as twenty days away to attack Masai villages, and claim to have gone as far as Kenya in war against Wakamba. The Rhendile and Borana peoples they regard as enemies, although originally of one stock, and they have no intercourse with them.

The Gallas have two chiefs—"landowners," they call them—but they acknowledge Dadi Aba Dada, of Bomapande, on the coast near Malindi, as their king. Of the two "landowners," Mr. Ormerod found Sade Ramatha pleasant and talkative—evidently pleased to converse in his own language with a white man. He spoke respectfully of all the explorers who had visited Odobororuoba except Dr. Peters, whose sudden attack upon their sleeping town he regarded as inexplicable. Nor could he understand why the promises, made by the I.B.E.A. Company on taking over the land, to establish a garrison for its protection had never been fulfilled. Galgalo Dalenoa, the younger chief, lives at Galanabe, the northernmost town on Odobororuoba island.

This point was reached at the end of the sixth week, halts of a day each having been made at several of the Galla towns. At each town—Farfarima, Fod, and Galanabe—the Galla elders solemnly accused the down-river Pokomos of having bewitched Odobororuoba. "Once," they said, "we had no beasts of prey. But two years ago, when Sir Gerald Portal passed this way, seventy Pokomos came up here to paddle him down-stream. One or two were disagreeable. They bewitched our land; and from the very day of their departure we have been constantly troubled with lions, leopards, and hyenas. On returning to the coast, please catch these men—their names are so-and-so—and make them withdraw their evil spell." They repeatedly threatened to kill the Pokomos who accompanied Mr. Ormerod. The Gallas themselves are

little addicted to witchcraft, but they greatly fear the Pokomo "doctors."

From Galanabe Mr. Ormerod proceeded further up-stream. Nine hours' paddling took him to the I.B.E.A. Company's old station, built by the "Kenya" expedition—called "Balarti" in the map published in the *R.G.S. Journal* of August, 1892, but known to the natives as "Borati." The house was in good order, but the stockade almost entirely broken down. There is no population in the vicinity, both river-people and Gallas being afraid of the Somalis, who come hunting across the high pastoral plains behind. An hour and a half's journey higher the last town on the river was reached, Bura Dansa. It is inhabited by Munyo Yaya, who until recently lived at Baiza or Bogore. Erbai Dima, a short, shrivelled old man, is the chief of this outpost of population in the Tana valley. He presented the party with flesh of a giraffe caught in his game-pits, and mentioned that a young rhinoceros had been found in another pit. Evidently game-snaring and trapping is one of the chief pursuits of the Korokoro people.

Paddling for nine hours above Bura Dansa, the party reached Hagarsu falls—the highest point attainable by canoe-travel—at the end of the seventh week from the start. Mr. Ormerod was disappointed with the falls. A series of three shallow ledges of rock bar the river at intervals of half a mile apart. With the river in flood, these may be crossed by expert canoeists. Above these, at a point called Sala, are the falls. For one half of the river there is a clear drop of about 15 feet; the other (northern) half is a somewhat gently sloping cataract, where monster crocodiles lie, head out of water, basking in the sun. The native name for the falls is Dabars Munyo Duriti, "the place which the ancient river-people used to pass." In olden times, they say, the river-people used to carry their canoes overland past the falls, and thus continue their journeys further up-river. Hence the name. Climbing the hills south of the falls, Mr. Ormerod had a good view of the range of hills which makes a pleasing panorama along the western horizon. Rising in the rear of these, bearing 283° by prismatic compass, was the dome-like head of a mountain, which the natives called Meru. This seems to be a name for the Kenya range; and the Gallas mentioned that, when raiding in Kamba-land, they had sometimes seen snow glistening on this mountain. But to Mr. Ormerod the peak appeared to be dark—even darker than the other heights in the neighbourhood.*

Mr. Ormerod camped in one of the numerous islets in midstream below the falls. There he spent a Sunday. In the afternoon he walked for three hours in the dense scrub which stretched league upon league northwards. Curiously enough, Dr. Donaldson Smith's expedition, marching to the Tana from the Rhendile country, was close at hand,

* The peak seen was certainly the Kenya, but Meru is the name of a district about 30 miles to the north of it.—ED.

but neither party suspected the other's presence in the vicinity. That night the island camp was disturbed by hippos, which were put to flight with a few rifle-cracks.

The homeward journey began on October 7; and at Bura Danse Mr. Ormerod had the pleasant surprise of meeting Dr. Donaldson Smith and Mr. Dodson, just arrived from their gallant march through North-East Africa. He had the privilege of travelling down-stream with them. They paddled rapidly, in order to keep pace with Dr. Smith's camels, which were making quick marches through the bush. Some days they paddled twelve hours at a stretch. At Ndera Dr. Smith's party left the river, marching overland to Lamu. Mr. Ormerod kept to the river, and reached Golbanti on the 25th. His canoes did the whole journey from Hagarsu falls to Kau, on the Ozi river (practically the coast), in twenty-one days.

Mr. Ormerod's journey supplies data for reckoning the rate and value of canoe-travelling and transport—the quickest and cheapest mode on the Tana. From Kau, on the Ozi river (to which diawa runs from Lamu), to the Hagarsu falls entails two hundred and thirteen hours of canoe-travel. This, at five and a half hours a day (Mr. Ormerod's average), takes thirty-nine days. Mr. Ormerod made Sunday halts, and spent odd days in food-collecting. The return journey, including halts, occupied fifteen days. Canoeing against the stream averages 2 miles an hour; with the stream, 4 miles. By the use of rafts of canoes, the up-stream journey could be done in almost half the time. A canoe, manned by two Europeans (wage of a month and ten shillings), is capable of carrying 3 tons of goods.

The total population in the Tana river seems to be 10,000, or 12,000, made up as follows:—

Peoples in Lower Tana	12,000
Galas	2,000
Wandari Muraya	500
Galas Kibira	500
Wandari Tana	1,000
	<hr/> 16,000

The estimate is based upon a careful census of the river in all the lower and is considered accurate. It remains to be seen whether by more penetrating the lower part of the river it will be found to be more correct.

In reaching the lower part of the river the journey was not so rapid as in the upper part of the river. The canoes were loaded with goods, and the current was not so strong. The estimate of the population of the lower part of the river is therefore probably more correct than that of the upper part. The estimate of the population of the lower part of the river is therefore probably more correct than that of the upper part.

are living in Somali or Swahili slavery, or are otherwise dispersed) at 3300. After three years' life among the Gallas, Mr. Ormerod feels certain that this estimate is about right. It is certainly not below the mark. The Gallas are but a shadow of their former selves. They have never recovered from the disasters wrought by the Somali invasion twenty years ago; and, deprived of their cattle by repeated plagues, many have succumbed to hunger and want. They are intensely conservative, and, as a whole, refuse all instruction and advice from the intruding white man. It remains to be seen whether, by a continuance in their foolish exclusiveness, they will die out before the advance of civilization, or, by accepting the teaching and arts of the European, they will resuscitate and regain somewhat of their former greatness.

The MAP illustrating this article is copied from a manuscript received from the Rev. R. M. Ormerod. The point at which Lieut. Höhnel made his observations (lat. $0^{\circ} 7' 20''$ S., long. $39^{\circ} 8' 42''$ E.) is supposed to be identical with Borati, the deserted station of the British East Africa Company; whilst Mr. Hobley (see the map in the *Proceedings*, 1892) seems to have observed higher up on the river, the position determined by him agreeing with the "Hill with ruins of a town" on the map before us. Other latitudes accepted are those for Benayo ($0^{\circ} 17' 15''$ S., Höhnel), and Mr. Hobley's camp of June 23 ($0^{\circ} 22' 45''$ S.).

THE INTERNATIONAL GEOGRAPHICAL CONGRESS OF 1895.

THE publication of the *Report* of the Sixth International Geographical Congress may be looked upon as the conclusion of the matter so far as the visit to London is concerned. But the Congress is no longer in the position of a "new star" appearing in the scientific firmament without reference to the past or the future; it has acquired permanency, and, while coming into periodical prominence in different parts of the Earth, it remains in existence so far as its governing body or Bureau is concerned, and it may thus be looked on in a sense as a new and international geographical society. The rule that after each meeting the Bureau elected at or for that meeting continues to act until its successor is appointed, virtually confers special powers and special responsibilities in turn upon the chief geographical society of the countries offering hospitality to the Congress.

The first care of the present Bureau has been to produce the *Report* as speedily as was practicable, having regard to the trouble necessary to ensure correctness in the printing of the four languages employed; and the second was to present the volume in a form which should render it an acceptable memento of the Congress. The *Report* is a royal octavo volume uniform in style with the *Geographical Journal*, but containing about 1100 pages, and bound in olive-green cloth.

Its contents fall into four divisions—an Introduction of 30 pages,

giving a complete diary of the proceedings of the Congress, both scientific and social; the papers which were read, printed in the language in which they were received, and accompanied by an abstract of the discussion which was specially reported, in all occupying 800 pages; and as appendices the full List of Members with revised addresses (84 pages), and the Catalogue (190 pages) of the geographical exhibition.

According to languages, the papers published number in English 50, in French 27, in German 7, and in Italian 2; but according to the nationality of the authors, the order is, British 26, French 21, German 9, Swiss 7, Italians 5, United States 4, Sweden and Norway 4, Austro-Hungarian 4, Russian 3, Chilian 1, Dutch 1, Portuguese 1:—total 86. Thus it appears that of the papers printed in English only one-half were contributed by British subjects, the remainder being by Americans and by foreigners, who preferred to appeal to the larger part of the audience at the meetings, who understood English only. The Congress was attended altogether by 1552 members, of whom 959 were Fellows of the Royal Geographical Society, and 451 were foreign members, 72 of whom were appointed to represent 30 foreign governments, and 169 were appointed to represent 79 geographical societies and 20 societies of kindred aims in all parts of the world.

Attention may be drawn to some of the more important discussions which are reported in the volume. Of these the first was that on geographical education, introduced by an extensive paper on the whole question as exemplified in France by Professor Letamendi, and followed by papers by Professor Lehmann and Mr. Herberich. Then follow the discussions on polar exploration, introduced for the Antarctic by Professor Neumayer, and for the Arctic regions by Admiral Marignan. Papers on geodesic surveys were introduced by the late General Walker, whose treatise on the Geodesic Survey of India, accompanied by a map, is one of the most valuable contributions to the Report. For interest in a practical sense the discussion on the climate of Africa and the suitability of land conditions for development by Europeans will long retain its value. The importance of having papers by such pioneers in African exploration as our late King, Mr. H. M. Stanley, and General Pitt-Rivers together in one volume is underrated. It is unnecessary to quote the names of the speakers on the occasion of the meeting of the Clements Martineau which are given in his anniversary address to the Society *Geographical Journal* vol. vi. July, 1894, p. 1. But it may be useful to append the following summary of the Resolutions passed by the Congress and referred to the Bureau for consideration and execution as far as it may be found possible:—

2. The Bureau of the Congress.

That the officers of next Congress continue to act until the organization of the following Congress is made—

- (1) To carry out as far as possible the resolutions of the last Congress ;
- (2) To keep up relations with the special committees which may be appointed ;
- (3) To communicate with the Organizing Committee of the following Congress regarding all questions pending ;
- (4) To present to the following Congress a report on the work done in the interval.

2. Periodical Geographical Literature.

That the Congress deems it desirable that greater facilities be provided for the purchase of periodical literature devoted to geography. It is therefore recommended to societies and other publishers of geographical periodicals, that they print in their publications the price of annual subscription, and of single and supplementary numbers, including postage, giving rates both for the country of publication and the countries in the Postal Union.

That the President appoint a Committee of one respectfully to communicate this recommendation to the societies and other publishers of geographical periodicals ; and the Committee be requested to obtain from these societies and publishers, as far as practicable, the desired information, to collate it, and to send, as early as possible, a copy of this price list of periodicals to the various publications, in the hope that it may thus receive wide publicity.

That the Committee be requested thoroughly to revise and promulgate this list annually as far as may be done in the manner above described, until the meeting of the Seventh International Geographical Congress.

3. Antarctic Exploration.

That the Congress record its opinion that the exploration of the Antarctic Regions is the greatest piece of geographical exploration still to be undertaken. That, in view of the additions to knowledge in almost every branch of science which would result from such a scientific exploration, the Congress recommends that the scientific societies throughout the world should urge, in whatever way seems to them most effective, that this work should be undertaken before the close of the century.

4. Geographical Bibliography.

That the Permanent Bureau of the Congress should follow out the study of geographical bibliography ; and that it be authorized to associate with itself competent persons, and to give them the necessary powers for prosecuting the inquiry.

5. International Geodetic Association.

That the Congress expresses the opinion that all civilized countries which have not yet joined the International Geodetic Association should be invited to do so.

7. Topographical Survey of Africa.

That it is desirable to bring to the notice of the Geographical Societies interested in Africa the advantages to be gained—

- (1) By the execution of accurate topographical surveys, based on a sufficient triangulation, of the districts in Africa suitable for colonization by Europeans.
- (2) By encouraging travellers to sketch areas rather than mere routes.
- (3) By the information and publication of a list of all the places in un-surveyed Africa which have been accurately determined by astronomical observations, with explanations of the methods employed.

(4) By the accurate determination of the position of many of the most important places in unsurveyed Africa, for which operation the lines of telegraph already erected, or in course of erection, afford so great facilities.

8. Map of the World; Scale 1: 1,000,000.

That the following resolutions drawn up by the Commission appointed at the Fifth Congress relative to the preparation of a map of the World, on the scale of 1: 1,000,000, be adopted by the Congress:—

(1) The Commission has received the Report of the Berne Committee, and feels grateful for the work done by it.

(2) The Commission declares the production of a map of the world to be exceedingly desirable.

(3) A scale of 1: 1,000,000 is recommended as being more especially suited for that purpose.

(4) The Commission recommends that each sheet of the map be bounded by arcs of parallels and of meridians. A poly-conical projection is the only one which is deserving of consideration. Each sheet of the map should embrace 4° of latitude and 6° of longitude up to 60° north, and 12° of longitude beyond that parallel.

(5) The Commission recommends unanimously that the meridian of Greenwich and the metre be accepted for this map.

(6) The Commission recommends governments, institutions, and societies, who may publish maps, to accept the scale recommended.

(7) The Commission lays down its mandate, and recommends that the Permanent Bureau of the Congress be charged with the duty of carrying on its work, and be authorized to co-opt for this purpose scientific men representing various countries.

9. International Geographic Association.

That the Congress considers that those countries which have not published graphic catalogues of maps should be invited to do so, and that geographical societies be recommended to interest themselves in the matter.

10. Hydrographic Research in the Baltic, North Sea, and North Atlantic.

That the Congress recognizes the scientific and economic importance of the results of recent physical and chemical research in the Baltic, the North Sea, and the North Atlantic, especially with regard to fishing interests, and records its opinion that the survey of these areas should be continued and extended by the co-operation of the different nationalities concerned, on the lines of the scheme presented to the Congress by Prof. Pettersson.

11. Seismic Observations.

That the Congress acknowledges the utility, and, indeed, the scientific necessity, of an international system of stations for the observation of earthquakes.

12. Geographical Education in Great Britain.

That, the attention of this International Congress having been drawn by the British members to the educational efforts being made by the British Geographical Societies, the Congress desires to express its hearty sympathy with such efforts, and to place on record its opinion that in every country provision should be made for higher education in geography, either in the universities or otherwise.

13. Geographical Orthography.

That the various Geographical Societies be requested to study the question of arriving at some agreement as to the writing of foreign names, and to prepare reports for the next Congress.

14. Geographical Bibliography.

That this Congress expresses its approval of the principle of State-printed Registration of Literature as the true foundation of National and International Bibliography, and approves the appointment of an International Committee to further the said object, the constitution of the Committee to rest with the Bureau of the International Geographical Congress.

16. Dating of Maps.

That the Congress put on record its opinion that all geographical maps should bear the date of their completion, in order to obviate the errors which would otherwise be apt to arise.

17. Decimal Division of Angles and Time.

That the Congress request the Geographical Societies represented at it to consider the question of the application of the decimal system to angular and time measurements, and to report on the subject to the next Congress.

18. Duties of the Bureau of the Congress.

That the Committee of each International Geographical Congress be charged—

- (1) To print and circulate to all Geographical Societies a list of the notes and resolutions carried at the preceding Congresses.
- (2) To request each geographical society to send in a short report on the progress made in their country on the subjects referred to.
- (3) To appoint a reporter to the next Congress, who shall submit a general summary of progress made in the subjects considered.

THE MONTHLY RECORD.**EUROPE.**

The Sea Approaches to the Mersey.—Lieut. Mark Sweney, I.N., contributes to the Literary and Philosophical Society of Liverpool an interesting historical sketch, with charts, of the changes which have taken place at the mouth of the Mersey since the date of the first recorded survey; and although the chief importance of the paper is from the point of view of navigation, it nevertheless illustrates in a striking manner the progressive action of a river, and affords an opportunity for detailed study of river work. The first known survey of the Mersey was executed in 1689 by Captain Grenville Collins, R.N., Hydrographer to his Majesty King William III., and the chart, which shows two channels, the Farmley and the Horse channel, was published in 1693. At this period Hoylake was a recognized anchorage, and here William III. embarked for Ireland in 1690, hence the King's Gap road, now leading to the shore at Hoylake. The old Liverpool dock was opened in 1700, and finally closed in 1826, when its site was filled up and the present Custom-house erected thereon. The next survey was made in 1736-7, by Messrs. Fearon and Eyes; and in 1767 an amended edition of their chart was issued, showing four lights on the Cheshire shore, two at Hoylake and two at Leasowe, the first in which the catoptric mirrors invented by William Hutchinson, water-bailiff, were introduced. Another survey, by M. Mackenzie, 1771, shows the

Farmley, Rock, and Horse channels, buoyed after the method recently adopted as a uniform system by all maritime countries. In 1833 Lieut. Denham, R.N., afterwards Sir H. M. Denham, was, at the request of the port authorities, detailed from the survey of the British Channel to survey the channels of Liverpool bay. This resulted in the discovery of a new channel, which was opened for navigation, but in 1837 showed signs of deterioration, and had to be closed in 1838. Captain Denham was retained by the Dock Committee as first marine surveyor to the port, and he inaugurated annual surveys of Liverpool bay, so that from his time onward a constant record exists of every change which has taken place, from natural or artificial causes, over the whole area right up to the upper estuary.

Flatey and the Codex Flateyensis.—Flatey ("flat island") is the name of two small islands off the coast of Iceland, one in the north, and one in the west. The northern one is somewhat the larger, and accordingly is to be found "conscientiously inserted" on most of our maps; but Prof. Rein writes to *Petermanns Mitteilungen* (1896, No. 6) to point out that the other, though only about an English mile in circumference, is by much the more important. It is the historically celebrated Flatey, and yet, he adds, with the exception of the latest edition of Stieler's Handatlas, we as a rule search for it in vain on our maps. Nevertheless, it may be mentioned that Prof. Rein might have found it, not only on the last map of Iceland in the *Geographical Journal* (vol. iii. p. 256), but also on that in the *Proceedings*, 1882, p. 192, and that in the old series of the *Journal*, vol. xlv. p. 1. This Flatey is the Breidifjörður (pronounced *Breidifjördr*, says Prof. Rein), and is a member of an archipelago of small low islands, several of which, besides Flatey, are inhabited. Small as it is, it has a church and several farms, and also "the most beautiful harbour in the world" (Olaf and Tovels, p. 617). It is to this harbour that it owes its celebrity. Thence sailed the expeditions that settled Greenland in 983, and discovered the mainland of North America half a millennium before Columbus. From this island was also obtained the 'Codex Flateyensis,' or 'Flateyjarbók,' containing, among other things, the records of these discoveries. This manuscript was bought in the seventeenth century by Bishop Brynjálfr Sveinsson for King Frederick III. from a peasant of Flatey, which at the present day is a small trading-place with 150 inhabitants.

Levelling and Sea-level Observations on the Swedish Coasts.—Mr. P. G. Rosen gives in *Ymer* (vol. xvi. p. 65) an account of the recent levelling operations and observations on sea-level changes on the Swedish coasts. The levelling operations, which commenced in 1886, have now reached such a stage that the work in Southern and Central Sweden may be considered as nearly finished, only a few control-measurements remaining. In Northern Sweden, also, a considerable part of the work has been done, and it is hoped that by 1898 the entire levelling and necessary calculations will be finished. The entire distance levelled in Southern Sweden is 1726 miles; that in Central and Northern Sweden has not yet been made public. The observations on the change of sea-level commenced as far back as 1759, and were continued, with certain interruptions, down to 1852. From the latter year until 1875 another series of observations was made, the results of which were published by Dr. Forsman in *K. Akad. Handlingar* (vol. xiii. No. 11). In 1887 a new series of observations was commenced at seven stations with self-registering level-gauges, and at four stations with level-gauges to be read by scale. The results obtained from the earlier and more recent observations can be summarized thus: (1) The periodical changes of level in the Baltic and Kattegat, which arise from climatological causes, such as temperature and precipitation, are very constant. The only perceptible variation is in the Gulf of Bothnia, and is caused by the more plentiful and uneven inflow of water which takes place in this part of the sea. (2) The local variations,

caused by currents and winds, are, as in other parts of the Baltic, very considerable. Their amplitude reaches 18 inches, whereas the difference between the highest and lowest sea-level on the German Baltic coast is nearly the same, namely, 18½ inches. (3) Neither the Baltic nor Kattegat, along the Swedish coast, has a constant mean level. The changes are partly secular, partly periodical. (4) The mean level of the Baltic is about 7½ inches higher than that of the Kattegat. In conclusion, the author remarks that a speedy connection with the results obtained in adjoining countries is very desirable. With Denmark, across the narrowest part of the sound, it will take place during the present summer; and with Norway, at Christiania and Trondhjem, in the near future.

ASIA.

Captain Deasy's Expedition in Central Asia.—We have received, through Captain E. J. Swayne, some details respecting the plan of the journey undertaken by Captain H. H. Deasy, 16th Lancers, from Ladak towards the frontier of China. In the hope of establishing the identity of the chief rivers crossed by him *en route*, flowing to the Brahmaputra, Salwin, and Mekong, he intends to throw into them soldered-up tins containing parchment notices numbered consecutively, and marked on the outside with a brass label (size 2 inches by 1½ inch) requesting the finder to open. The parchments are to be forwarded to the Royal Geographical Society. Captain Deasy asks us to express on his behalf the request that the officials in the neighbourhood of the rivers alluded to will arrange that a look-out for these tins may be kept. He was already in Ladak early in June last, and will endeavour to reach Batang in China by the end of December.

French Commercial Mission to China.—We have received the following details respecting the "Mission Lyonnaise d'Exploration Commerciale en Chine," now pursuing its operations in that country: The party consists of Consul Émile Rocher as chief, M. Brenier, secretary, and ten others. Five of these represent the Chambers of Commerce of Lyons, Marseilles, and other towns, and there are also two experts in silk, a mining engineer, a doctor, etc. On reaching Yunnan-fu from Lao-kai, they were to split into two parties, one proceeding north to Cheng-tu, the other north-east to Chung-king, where they were again to unite, and where some of the members will probably remain until the autumn.

Discovery of Lake Poso in Celebes.—It has been stated that the first European to visit this lake, whose exploration by the cousins Sarasin is mentioned on p. 205 of vol. vii. of the *Journal*, was the Rev. A. C. Kruijt, a Dutch missionary, who reached it in 1893; but Dr. Wichmann writes to *Petermanns Mittheilungen* (No. 7, 1896), to state that he has ascertained by correspondence that it was actually first visited by Jonkheer van der Wijck, a Dutch official, in 1864, and again by the present Governor Michielsen in 1869. Dr. Wichmann adds some notes about the lake communicated to him by the Rev. Mr. Kruijt, and some observations on the geology of the neighbourhood.

AFRICA.

The New Road to Uganda.—At the date of his last letters (May 24, 1896), Captain Sclater, R.E., F.R.G.S., who is engaged, under orders from the Foreign Office, in improving the communications between Mombasa and Uganda, was at Kamsikak, halfway between the Eldoma ravine and Mumia's, in the Nandi country, through which he proposed to carry a shorter route than the track usually adopted, which lies far to the right. In Nandi it is intended to establish a new station, of which Mr. Foakes, of the Uganda Administration, will be placed in charge as soon as the new route is open. From Eldoma the new route follows the old one for two days'

journey, and then turns off from it a little south of west, and reaches Kamsikak in three days more. After leaving the old route the new road passes through a hilly district, traversed by many streams and varied by beautiful cedar forests. It is described as a very fine country, lying from 8000 to 10,000 feet above the sea-level but quite uninhabited. The game-animals met with were principally Jackson's hartebeest (*Bubalis Jacksoni*), and one of the reed bucks (probably *Cervicapra bohor*). There was still a great deal of work to be done on this part of the new Uganda road, and local labour was scarce. Captain Sclater did not expect to get through to the lake before September.

The Sand-dunes of the Sahara.—M. Paul Privat-Deschanel contributes a letter to the *Revue Scientifique* on the successful experiments made at Aïn-Sefra during the last few years with the view of fixing the sand-dunes on the borders of the Sahara. It was found that a considerable number of plants could derive sufficient nourishment from the sand to keep them alive, and that the method successfully employed in the Landes was available, provided some means could be discovered of giving the plants time to establish themselves before the sand either overwhelmed them or left their roots altogether bare. M. Golron, chief of the Arab department at Aïn-Sefra, hit upon the plan of covering large areas with litter composed of Alfa grass, and in two years was successful in reclaiming 120 acres. The species of plants which flourish best on the sand thus fixed are the Barbary fig, peach, aspen, etc., which, curiously enough, give much better results than the tamarisk or plane tree or the acacia, suggested by the Forestry Department.

The Origin of Lake Tanganyika.—In two articles contributed to the *Mouvement Géographique*, M. Jules Cornet contests the theory that Lake Tanganyika is an old arm of the sea, a "Relicten-See" according to the German terminology. Although the most obvious explanation of the presence of organisms of apparently marine type in the lake, M. Cornet thinks it not the only or the most probable way of accounting for the facts observed. The present character of the shells is, in his opinion, the result of adaptation to environment, for the vast size of the lake brings about a certain resemblance to the conditions of life in the ocean, notably as regards its liability to storms, by which delicate shells would be shattered. With regard to the Medusa, whose presence seems at first sight more difficult to account for, he points out that they exist in other waters which have no communication with the sea, being found, among other places, at Bamako, on the Niger. On the other hand, if we look at the fish of the lake, we find they are fresh-water forms occurring equally in the Congo, Nile, etc. The absence of deposits with traces of marine organisms over the whole of Central Africa is another strong argument against the idea of the marine origin of the lake, which is much more probably due to the great Earth-movements, which, as Prof. Suess has shown, have had such a potent influence in the region in question.

AMERICA.

Venezuela.*—This account of a second visit to the country forms the twelfth volume of the 'Mittheilungen der Geographischen Gesellschaft in Hamburg.' The Society gave the author, who is Professor of Geography at Giessen, the sum of 10,000 marks in order to enable him to supplement the observations taken by him in 1884-85. The journey occupied about nine months, and the results are published by the Hamburg Society. The most interesting part of the book is an account of the political troubles in this somewhat turbulent republic between 1892 and 1893.

* 'Zweite Reise in Venezuela in den Jahren 1892-93.' By Dr. W. Sievers. Hamburg, 1896.

Though this chapter has been written solely with a view to showing the difficulties experienced by the author, it none the less gives a very clear idea of Venezuelan character and the extremely unstable state of its former government. The remainder of the book contains a short chapter on the commercial prostration which followed the civil war; this is entirely descriptive, and without much practical bearing. Another chapter is devoted to the heavy rains and damage produced by them in the same year, 1892-93, and this is followed by the full account of his observations and travels. The following five provinces were visited, and are described in separate divisions: (1) The peninsula of Paraguana; (2) Coro and Barquisimeto; (3) the Karibi mountains; (4) the Llanos; and (5) Guayana. The information given is extraordinarily copious and detailed. It can be best described as an attempt to write in words a large-scale geographical and physical map. There are scattered botanical notes, and also at the end of each division or subdivision, an estimate of the population of every hamlet and town, which is based upon data of which Dr. Sievers does not give any clue, it is impossible to judge. The geology is of a very detailed character, without any attempt to give a general account (the quotations from Humboldt's travels are far more clear than those due to Dr. Sievers himself); but there is scarcely anything about the precious metals. It is scarcely possible to resist the conclusion that so careful a worker would have had more to say on gold and copper, and, as also in the case of his notes on trade and commerce, we can only suppose that these interesting points have been designedly left out. But the absence of a map and index robs the whole work of interest and importance. These 287 laboured pages might be of use to a trained geologist visiting the country, to the senior staff officer of an invading army, or to a map-maker of more than the average patience and industry. There is no complete bibliography, but the copious references to Codazzi, Karsten, etc., render it difficult to tell how much of the work is original. A discrepancy is pointed out between Codazzi's atlas and the English charts of the Gulf of Coro and island of Chicaqua. There is also a long list of altitudes calculated mainly by aneroid barometer.

River Navigation in Venezuela.—To the July number of *Petermanns Mitteilungen*, 1896, Prof. Sievers contributes a second map of Venezuela (see under new maps). In the accompanying text he furnishes, in addition to notes on the hypsometry of the country, some particulars as to the means of communication, including the river navigation. The only two river systems that are used for navigation are those of the Orinoco and the Catatumbo. Every fortnight a steamer of the Royal Mail Steamship Company runs between Port of Spain, Trinidad, and Ciudad Bolívar, making use of the Macareo arm of the Orinoco delta (an arm flowing northwards to the neighbourhood of the Serpent's Mouth). The voyage takes about thirty hours down, and thirty-six hours up stream. During the rainy season (May to November, rarely as late as December) smaller steamers connect Ciudad Bolívar with the western llanos, ascending to Nutrias on the middle Apure. There is no regular navigation on the upper Orinoco above Caicara (confluence of the Apure), but steamers ascend as occasion requires to various places below the rapids of Atures. River-steamers ascend the Catatumbo-Zulia to Puerto Villamizar, and from the mouth of the Zulia a smaller steamer ascends the Escalante to Santa Bárbara, the starting-point of the railway to La Veja, at the foot of the Cordillera de Mérida.

British Columbia: Proposed New Railway.—The report of the British Columbia Crown Lands Surveys for the year ending December 31, 1895, contains, among other things, an account of a projected railway (partly a revival of an old Canadian Pacific Railway project) between the Rocky Mountains and the coast. The proposed railway would start at Waddington harbour, at the head of Bute

inlet (which opens to the east of the widest part of Vancouver island); would then ascend the Homathco river and its east branch to a little above Tatlayoco lake; then, crossing various other valleys, would proceed on the whole eastwards to the Fraser; then, for the last 117 miles, ascend the Fraser valley southwards to the Yellow Head pass, where it would terminate at the height of 3646 feet, 477½ miles from its starting-point. In the first 50 miles it would rise above 2000 feet, and at several other places its altitude would exceed 3500 feet. The lower Homathco valley already has some sixty settlers, and it is believed that the railway would open up a country well suited in its lower levels (below 2500 feet) for cereals, fruits, and roots, and in its higher levels for cattle and sheep. Many parts of the route are well timbered (with Douglas fir, spruce, balsam, etc.). The report contains a plan showing the route, along with a section. It is proposed, also, to continue this line by another, 51 miles in length, along the north side of Bute inlet to the Frederick Arm, a small inlet to the north; at that point to establish a ferry across a channel of 15 miles to Otter cove, on Vancouver's island; and to make another line thence along the east coast of the island to Comox, 70 miles south, through good agricultural and timber land, covering probably not less than 200,000 acres.

The Red Lake Region, South-Western Keewatin.—The geological surveys of countries like Canada have much topographical work to do, and the cartographers, as well as the geologist and geographer, find much information in their reports. In 1893, the south-western triangle of Keewatin round Red lake was explored by Mr. Dowling, and his report has just been published ("Geological Survey of Canada, Annual Report," vol. vii. Part F.). The land mapped lies between the Keewatin river and Lac Seul, and that drained to the south forms almost an amphitheatre, highest in the east. The land is composed of laurentian gneiss and granite with huronian strata round Red, Shallow, and Woman lakes. Traces of glacialism are met with, especially among the latter rocks, and glacial deposits are found in the form of boulder-clay, or else as a "scratched or reworked deposit in the form of fine clay, silt, and stratified sands." A ridge of moraine deposits, rising 27½ feet above Trout lake, forms its southern boundary, and impresses the surface as an accumulation along the front of an ice-sheet ending in deep water. The economic possibilities of the district are poor, the timber being of small growth. The soil just reaches as far as Red lake, which is its northern limit, and few oceans are found as isolated patches as far as the Height of Land. The Indians grow some potatoes here and there. In the musk-horn gardens near Lac Seul, the secondary vegetation are cultivated.

POLAR REGIONS.

Tourist Trip to Spitzbergen.—Mr. P. L. Sander, writes under the following note: On August 2, having with Mr. Loozger and three other men, and a horse ready for the coming winter, the s.s. *Guronia* started on the voyage northwards for a short time to Spitzbergen. Passing Bear Island early in the fall, we found ourselves about 6 o'clock on the following morning, at anchor in Advent bay. In the fjord on the west coast of Spitzbergen. Here some enterprising Norwegians have lately erected a wooden town with seventy-five houses and have established a weekly steamer from Hammerfest to keep it supplied with supplies during the summer months. Sir Martin Conway and his companions will have each used their winter quarters close by, and left the day before it was the upper part of the ice fjord. On landing and walking a few paces from the gravelly beach we found ourselves treading on a perfect carpet of white flowers arranged in long parallel rows. These composites and various arrangements were the most conspicuous. We found a permanent city of animals, some of them gnawing and scratching plants and trees. Some of the party under the *Musca* and *Uros* of the mountains in the air, while others

went a long but fruitless chase after reindeer up the valley. Next day (August 5), starting at 2 a.m., we steamed back to Bel sound, and turned into Recherche bay, where we anchored about 10 o'clock under Observatory mountain. Recherche bay was accurately surveyed by the Training Squadron last year, and the results have lately been published in one of the Admiralty Charts, so that we had no difficulty about our course. Here we found ourselves surrounded by four splendid glaciers, two of which terminated in high faces breaking off into the sea. Passing Fox point on the right hand as we entered, the first of these was Scot glacier, descending into Calypso bay. In the next valley was seen the enormous Fox glacier, bordered on each side by a moraine 100 feet high, and presenting a perpendicular face to the sea of at least the same height and nearly 2 miles in width. On the opposite side of Observatory mountain lay East glacier, of about similar dimensions, and with a slightly longer perpendicular sea-front. On the left-hand side of Recherche bay as we entered, separated from East glacier by the Martin range and Pincher peak (2100 feet in height), lay the Volage glacier, bordered on its sea-front by a mile of shingle and terminal moraine. These four glaciers and the adjacent snow-topped mountains surrounding this retired arm of the sea, presented a scene of unique aspect to the passengers in the *Garonne*, though it may probably be rivalled in other spots of this wonderful land. Landing near the foot of Fox glacier, a large party of us climbed the moraine and walked several miles on the surface of the ice, which is very level, and nearly free from crevasses or dangers of any description. From Recherche bay we returned direct to Vadsoe.

Sir W. M. Conway's Expedition.—Sir W. M. Conway and the other members of his party have returned from Spitzbergen, having, during the course of their excursions, effected the first crossing of the main island from sea to sea.

Mr. Andrée's Balloon Expedition.—Mr. Andrée has returned from Spitzbergen, having decided to postpone his expedition across the North Polar region in a balloon till next year.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Second Cruise of the "Princess Alice."—The *Comptes Rendus* contains a short note by H.S.H. the Prince of Monaco, on the second expedition of the *Princess Alice* to the region of the Azores, being his fourth and most successful exploration of those waters. The expedition left Monaco on May 23, 1895, and returned to Havre on August 16, about two months having been spent in actual work, which included thirty-five soundings in depths up to 2870 fathoms; twenty observations of bottom temperature; the collection of fourteen samples of bottom water for analysis; fourteen dredgings in depths between 300 and 2450 fathoms; and fourteen tow-nettings, besides other observations. A new instrument, called the Buchet apparatus, for collecting specimens of pelagic animals with the vessel under way, was found to work satisfactorily up to a speed of 7 knots; but there were few opportunities of using it, as almost every night during the voyage the sea was covered with dense layers of Medusæ, which threatened to destroy the apparatus by their weight. The success of the steel wire sounding-rope 2.3 mm. in diameter is worth noting in comparison with the results obtained formerly with the single wire. The zoological results of the expedition, so far as the material has already been examined, are of great interest. A fish of the genus *Chimara*, caught between two of the islands at a depth of about 600 or 700 fathoms, may be mentioned; and some remarkable finds in the stomach of a cachalot harpooned by whalers, and towed by the *Princess Alice* into a creek in the island of Terceira. The Prince of Monaco is now developing a scheme for research by several vessels working in concert.

The Bay of Biscay.—The labours of M. A. HANNON, of Bordeaux, in the oceanographical conditions of the Bay of Biscay, have already been noted in this Journal (see especially vol. III. p. 519, and vol. IV. p. 455), and we have now to call attention to further papers by him published in the numbers of the Bulletin of the Bordeaux Commercial Geographical Society for 1890. They deal with the thermal conditions and the salinity of the water as determined by surface observations carried out 1. from the mouth of the Gironde at Cape Palmarie in the waters of the Messageries machines from 1874 to 1890 and later; 2. westward from the Gironde by steamers bound for New York from 1867 to 1897 inclusive; 3. from the Gironde at Ushant by a local steamer in 1870; and 4. at Cape Breton, Bordeaux, and Brest, from 1870, 1878 and 1890. In 1890 and 1891 a number of such extensive observations at various depths were made off the coast of the Landes. While the irregular masses of the different series of observations make it impossible to attempt the construction of synoptic temperature charts M. Hannon has found it possible to put forward certain general conclusions the evidence for which appears to be practically satisfactory though incomplete. The shallow strata of sea, about 1 mile wide and less than 20 fathoms deep, between the mouth of the Gironde and the Azores, is marked by a line of semi-circles which is broken about the centre by the existence of the tidal basin of Arcachon. M. Hannon shows that the water in this shallow sea is strongly influenced by the wind, responding rapidly to the wind in salinity, and being much warmer in summer and in tending to cool somewhat in a hot upper layer covering the colder lower water of the other part of the bay. The current spreading in the lower strata is in the opposite direction to the wind, the probable explanation of the so-called wind current near and which his experiments will fully demonstrate. The warm surface water of the Bay of Biscay in summer seems to form a homogeneous layer the depth of which increases with the mouth of Arcachon and then rapidly tapers away. The warm water undergoes important and more changes of temperature with the season, while in winter the surface water near shore is greatly cooled by the contact with the land. A number of observations in the basin of Arcachon are also noted. The general character of temperature and salinity there shows the influence of the sea and a still higher degree of change is observed and the seasonal temperature curves show the greatest and least and the other more moderate. It is to be noted that the surface of the bay is covered with a similar layer of sea water. In the *Revue Maritime* of the month of March and vol. III. p. 455, M. Hannon has given an account of the way in which the Bay of Biscay in winter, 1890, in the course of a winter oceanographical and meteorological observations in that water. The water had been cold in winter and continuing and cooling had continued in the winter, being cooled by the surface breeze which drove it east the east. The general character of the water and winds in winter in the Bay of Biscay was the same as in the summer, and a large number of observations were made during the winter months. Professor T. J. I. Hannon and M. A. Hannon, in the *Revue Maritime* of the month of March, 1890, have given an account of the way in which the Bay of Biscay in winter, 1890, in the course of a winter oceanographical and meteorological observations in that water. The water had been cold in winter and continuing and cooling had continued in the winter, being cooled by the surface breeze which drove it east the east. The general character of the water and winds in winter in the Bay of Biscay was the same as in the summer, and a large number of observations were made during the winter months.

The Temperature of the Soil.—Dr. V. B. H. HANNON, in the *Revue Maritime* of the month of March, 1890, has given an account of the way in which the Bay of Biscay in winter, 1890, in the course of a winter oceanographical and meteorological observations in that water. The water had been cold in winter and continuing and cooling had continued in the winter, being cooled by the surface breeze which drove it east the east. The general character of the water and winds in winter in the Bay of Biscay was the same as in the summer, and a large number of observations were made during the winter months.

fairly comparable. Herr Böller gives an excellent graphic representation of the normal changes of temperature between the surface and a depth of 4 feet, and adds an elaborate inquiry into the causes of various disturbances in the ordinary course of events. The most striking result is one which will be of considerable interest to botanists, viz. that most of the temperature variations in the soil are directly dependent on the conditions with regard to moisture. Until the mean amount of cloud at the station, the average humidity of the air and soil, and the level of the ground waters are fully taken into account, any mathematical consideration of the conductivity, etc., of the soil is premature. Herr Böller certainly brings this fact into greater prominence than has been done before.

Seismological Observatories.—In the seventh monthly issue of *Petermanns Mitteilungen*, 1896, a number of seismologists and others interested in the subject make an appeal on behalf of the establishment of an international net of earthquake stations for the systematic observation of the movements propagated from the great earthquake centres over the surface of and through the Earth. It is suggested that about ten stations should be equipped for the purpose, starting from Japan as a centre, and the ten following stations are named as suitable, their approximate spherical distance from Tokyo in degrees and kilometres (converted below into miles) being added :—

	Degrees.	Miles.		Degrees.	Miles.
1. Shanghai	16	1120	6. Tacubaya (Mexico) ...	102	7080
2. Hongkong	26	1800	7. Port Natal	121	8380
3. Calcutta	47	3230	8. Cape Town	136	9380
4. Sydney	69	4800	9. Santiago de Chile ...	154	10700
5. Rome	89	6150	10. Rio de Janeiro ...	167	11600

All these stations have the means of accurately determining the time, which is the first essential, and the chief further requirement is a horizontal pendulum with a registering apparatus. It is desirable that all the stations should have instruments of the same kind and the same degree of sensitiveness. The English men of science who sign the appeal are Dr. R. Copeland, Astronomer-Royal for Scotland; Mr. G. H. Darwin, Plumian Professor of Astronomy, Cambridge; Mr. C. Davison, Secretary British Association Earth-Tremors Committee, King Edward's High School, Birmingham; and Prof. John Milne, Shide Hill House, Newport, I.W.

GENERAL.

Local Geography in Prussia.—The Geographical Society of Greifswald has decided, according to *Aus allen Weltteilen* (May, 1896, p. 321), to form a special department for local geography (Heimatskunde). This department is primarily intended to give an opportunity for members by excursions and walks to obtain a close personal acquaintance with the country surrounding their homes, and also to encourage researches in local geography, which shall be published in the Society's annual report, and to collect books and pamphlets on the locality for the special local department of the Society's library. The following special points are suggested for preliminary consideration: 1. *The local maps.* Notes of errors in the existing maps, correction of wrong forms of names, suggestions for improvement; collection of old local maps. 2. *Land forms and geological structure.* Notes on erratic blocks, and ridges of pebbles, soils; particulars as to borings for wells, etc.; modifications of the coasts and of sand-dunes, etc. 3. *Hydrography.* Notes on changes in the volume of springs, streams, and rivers; cessation or formation of wells; changes of level in lakes and ponds; changes in the courses of streams. Notes on abnormal waves on the sea-coast, and on the colour and organisms of the sea-water.

4. *Climate and Meteorology*. Notes on all exceptional atmospheric phenomena. 5. *Flora and Fauna*. Notes on the extinction or introduction of new species; search for extinct forms in mosses, mud-deposits, and calcareous tufa. 6. *Pre-historic population*. Notes on the discovery of remains of early peoples; prehistoric monuments. 7. *Present population*. Notes on special manners and customs, magic and popular medicine, fairy tales and legends, names and nicknames, style of house-building, costume, dialect, etc. It is interesting to note that this scheme was presented to the Griefswald society almost simultaneously with the formulation of Dr. Mill's scheme for a detailed geographical description of the British Islands at the Royal Geographical Society.

Proposed Great Globe for London.—M. Reclus's scheme for the construction of a gigantic model of the globe has already given rise to a similar scheme in this country, though the proposed scale is smaller (1: 500,000). The projector, Mr. T. Ruddiman Johnston, has forwarded us details of the scheme, with a sketch showing the appearance of the globe and its surroundings if finished according to the plan laid down. The diameter on the scale mentioned, which corresponds to about 8 miles to the inch, would be about 84 feet, or double that of the French globe of 1889, giving four times the surface area, and enabling all the important geographical features, and all towns with a population of 5000 and upwards, to be inserted. London would occupy an area rather larger than a penny. Access would be supplied by a spiral gallery running from base to summit, and the globe itself would revolve on its axis. Six specimen sections have already been prepared.

The Vasco da Gama Celebration in Portugal.—The programme for the celebration in 1897 of the fourth centenary of Vasco da Gama's departure for the discovery of the sea-route to India (*Journal*, vol. vii. p. 103), has already been prepared in its broad outlines. Its items are very varied, and include, among other solemnities, the holding of public exhibitions, naval demonstrations, and international competitions; the meeting of scientific congresses; the award of premiums for memoirs, etc., relating to Portuguese voyages and explorations, arts, industries, etc.; the preparation of a great planisphere, showing Portuguese journeys and discoveries by land and sea; and the preparation of a monumental edition of the 'Lusiads.' The 8th, 9th, and 10th of July are to be set apart as public holidays in every part of the Portuguese dominions, public thanksgiving services will be held in the churches, and naval and military reviews and civic processions will be held. Altogether the celebration promises to be well worthy of the greatness of the occasion.

The Seventh International Geological Congress.—By invitation of the Russian emperor, the next meeting of the International Geological Congress is to be held at St. Petersburg in 1897, under the presidency of M. A. Karpinsky. The following is the general programme of the meeting, which will take place towards the end of August, lasting about eight days. The sittings, which will not, as at Zürich, be held in sections, will be devoted particularly to the discussion of questions of principle most needing solution in the present state of the science. Special meetings will be held to enable the geologists present, Russian or foreign, to make communications respecting new discoveries, new instruments, etc., and facilities will be given for the exhibition of geological maps and other appliances. Among the excursions announced, some will be so arranged as to give an opportunity for visiting localities specially interesting from a geological point of view. These include visits to the Ural, the banks of the Volga, and to the Cambrian, Silurian, and glacial formations of Esthonia. Other more general excursions will be directed to Finland and the southern parts of the Russian empire, including Tiflis, Baku, Batum, etc. This last will probably last about a month.

Anthropological Queries.*—This series of questions has been drawn out by the committee "to whom the initiative in the comparative study of primitive law has been delegated." The questions are grouped under the following heads: I. General considerations. II. Family relations, which are again subdivided into, (a) general, (b) relationships, (c) responsibility of relatives for each other, (d) narrower family relations, (e) marriage relations, (f) relations out of marriage, (g) domestic life. III. Succession. IV. Political organization. V. Judicial system. VI. Revenge, fine, and imprisonment. VIII. Rights in movables. IX. Exchange relations. A number of searching questions are given under all these heads in order to elicit in as definite a manner as possible every important detail connected with the legal system of any African tribe. The detailed and thorough character of the questions is their most marked characteristic. They are given both in English and German. The English is a translation of which the character can be judged by the following examples: "Does the widow go back to her own family, or is she entailed upon the family of her husband? Are senile and sick persons killed? Are they also eaten? What reasons are given? What is the rule regarding suretiship (*sic*)? What power have the priests? Are they chosen from certain classes (hysterics, epileptics)? Do the men subsist chiefly by the chase, the women upon fruits and small beasts?" The questions are apparently intended to be given to missionaries, traders, and residents in Africa, in order that they may be answered on the blank pages which are interleaved. Yet it is obvious that only very few would have sufficiently thorough knowledge of the language of any one tribe to give correct and satisfactory answers. It is doubtful whether an Englishman, not knowing German, would understand what some of the questions mean. Still, any traveller with the aid of a Suahili interpreter would probably fill up all the questions if asked to do so. The committee appear to have foreseen this from an introductory note, which says, "The replies ought to be such as to permit a critical examination, not only of their value and of the extent of their validity, but also of the social bases of the phenomena concerned."

CORRESPONDENCE.

Ixtaccihuatl and Popocatepetl.

Hotel Handegg, Grimselstrasse, August 8, 1896.

At p. 140 of the August *Geographical Journal*, I see it stated that the writer is not aware of an authentic account of an ascent of Ixtaccihuatl. A full account (with illustrations) is, however, to be found in the *Alpine Journal*, vol. xv. (or xvi.), by H. R. Whitehouse. In the same periodical (to which there is an Index for the first fifteen or sixteen vols.) there are also several accounts of Popocatepetl, which are fuller and more precise than Mr. Howarth's.

W. A. B. COOLIDGE.

Lindertis, Kirriemuir, Scotland, August 19, 1896.

If Mr. O. H. Howarth had referred to the *Alpine Journal*, he would have seen, in the number for November, 1890, an authentic account of an ascent of Ixtaccihuatl by Mr. H. Remise Whitehouse on November 9, 1889, who found on the

* Fragebogen der internationalen Vereinigung für vergleichende Rechtswissenschaft u. Volk-urthschaft lehre zu Berlin über des Rechtsgewohnheiten der afrikanischen Naturvölker.

summit undoubted evidence that the mountain had been climbed five days previously by Mr. James de Salis. In the same paper Mr. Whitehouse says that a third ascent was made in April, 1890, by Professor Angelo Helprin and Mr. Mark C. Baker, of the Philadelphia Scientific Commission.

In two points Mr. Whitehouse is at direct variance with Mr. Howarth, for the former says, "The crater, although entirely filled with ice and snow, is clearly distinguishable, forming a cup with gently sloping sides between the three almost equally high summits, from one to the other of which one could drive a four-in-hand," while Mr. Howarth "is of opinion that Ixtaccihuatl has no crater, and does not represent any eruptive vent."

Mr. Howarth also says that "the so-called region of 'eternal snows' on the great summits is somewhat mythical. There is, in fact, no 'snow-line' even on Popocatepetl; . . . there are occasions when even at 17,000 feet most of the snow disappears." Mr. Whitehouse, in his ascent, encountered a "labyrinth of huge crevasses" and "snow-bridges spanning the great schrunds." On the summit "on all sides gigantic ice-cliffs (the largest I ever remember to have seen) hang over the glaciers below." It is needless to point out that such conditions as these could not be formed by one or two or three cold seasons, but are unquestionable evidence of eternal snows.

H. T. MUNRO.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. Rd. = Comptes Rendus.	S. = Society, Société, Selakab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mitteilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. Alpine Notes and the Climbing Foot. By George Wherry. Cambridge: Macmillan & Bowes, 1896. Size 8 × 5½, pp. xvi. and 174. *Illustrations. Price 5s. Presented by Miss Cust.*

A series of newspaper articles, arranged in the inverse order of date, descriptive of Alpine tours; followed by a treatise on the position of the human foot in climbing, and a few remarks on the avoidance of accidents.

Austria—Dachstein. *M.G. Ges. Wien* 39 (1896): 140–156. **Böhm.**
Die Vollendung des Dachsteinwerkes von Friedrich Simony. Von Dr. August von Böhm. *With Plates.*

France. **Lallemand.**
Le Nivellement Général de la France. Par M. Charles Lallemand. Extrait des

- Comptes-rendus du Sixième Congrès Géographique International tenu à Londres en Juillet, 1895. (Congress Report, 299-320.) Size 10 × 6½, pp. 22. *Illustrations.*
- France—Corsica.** *B.S.G. Marseille* 20 (1896): 23-44. **Nœtinger.**
Excursions en Corse. Le Niolo. Par M. F. Nœtinger.
The Niolo is a district in the centre of Corsica, where the inhabitants retain most fully their insular characteristics.
- France—Lot.** *Rev. G.* 38 (1896): 401-418. **Martel.**
Quatrième exploration de la rivière souterraine de Padirac (Lot), 28 mars—1^{er} avril 1896. Par E. A. Martel. *With Map and Section.*
- France—Population.**
Rapport au Ministre du Commerce, de l'Industrie, des Postes et des Télégraphes sur le Mouvement de la Population de la France en 1894. Extrait du *Journal Officiel* du 53 Janvier 1896. Paris. Size 12½ × 9½, pp. 6. *Presented by M. Emile Levasseur.*
- France—Population.** *B.S. normande G.* 17 (1895): 187-164, 201-218. **Turquan.**
La population Française. Par M. Victor Turquan. *With Maps.*
- France—Seine.** **Lemoine and Babinet.**
Ponts et Chaussées. Service Hydrométrique du Bassin de la Seine. Observations sur les Cours d'Eau et la Pluie centralisées pendant l'Année 1894. . . . Par M. G. Lemoine et M. Babinet. Versailles: Aubert. Size 17 × 11. *Diagrams.*
- France—Seine.** **Babinet.**
Ponts et Chaussées. Service Hydrométrique du Bassin de la Seine. Résumé des Observations Centralisées par le Service Hydrométrique du Bassin de la Seine pendant l'Année 1894. Par M. Babinet. Versailles: Aubert, 1895. Size 10½ × 7, pp. 56.
- France—Ushant.**
Autour d'Onessant (à propos du naufrage du *Drummond-Castle*). From *L'Illustration*, 107^e volume, No. 2783. 27 Juin, 1896. Paris. Size 16 × 12, pp. [5]. *Maps and Illustrations.*
- Germany.** *Natur.-W. Wochenschrift* 11 (1896): 197-202. **Graebner.**
Klima und Heide in Norddeutschland. Von Dr. P. Graebner.
- Germany—Kissingen.** **Woerl.**
Woerl's Handbooks for Travellers. Guide to the Baths of Kissingen and the Environs. Publisher, Leo Woerl. Würzburg and Leipzig: Woerl's Reisebücher-Verlag. Size 6½ × 4½, pp. 50. *Plan and Illustrations.* Also a French edition at the same price. *Price 50 Pfennig. Presented by the Publisher.*
- Germany—Oldenburg.** **Sello.**
Deutsche G. Blätter 18 (1895): 350-372; 19 (1896): 41-58.
Die oldenburgische Kartographie bis zum Ende des 18 Jahrhunderts. Von Dr. G. Sello.
- Germany—Saxony.** *Deutsche G. Blätter* 19 (1896): 11-61. **Gebauer.**
Die Waldungen des Königreichs Sachsen. II. Von Heinrich Gebauer.
- Germany—Schleswig.** *Globus* 69 (1896): 290-298. **Hansen.**
Zur Geschichte der Zersplitterung Nordstrands. Von Dr. R. Hansen.
An historical account of the changes in the island of Nordstrand, in the North Frisian group, with references to the literature of the subject.
- Hungary—Tatra.** *Jahrb. Ungarischen Karpathen-Vereines* 23 (1896): 1-46. **Steiner.**
Die Gesteine der Hohen Tatra, mit Rücksicht auf deren industrielle Verwerthung. Von Dr. Anton Steiner.
On the economic uses of the granite, gneiss, mica-schist, and felspar of the High Tatra.
- Hungary—Tatra.** *Jahrb. Ungarischen Karpathen-Vereines* 23 (1896): 47-65. **Dénes.**
Gebirgstouren in den Béler Kalkalpen. Von Franz Dénes.
- Hungary—Tatra.** **Szontágh.**
Jahrb. Ungarischen Karpathen-Vereines 23 (1896): 112-124.
Lebensweise und Verbreitung der Gemse in der Hohen Tatra. Von Dr. N. Szontágh.
A picturesquely written account of the distribution and habits of the chamois in the High Tatra.

- Italy.** *Riv. G. Italiana* 3 (1896): 13-18. **Marinelli.**
Escursione ai laghi Laziali. Nota del prof. Olinto Marinelli.
- Italy—Lake Como.** *Riv. G. Italiana* 3 (1896): 105-111. **Marinelli.**
Sopra alcune ricerche relative alle condizioni di temperatura del lago di Como.
Nota di Olinto Marinelli.
- Italy—Papal States.** **Guiraud.**
Bibliothèque des Ecoles Françaises d'Athènes et de Rome publiée sous les auspices du Ministère de l'Instruction Publique. Fascicule Soixante-Treizième. L'État Pontifical après le Grand Schisme, Étude de Géographie Politique. Par Jean Guiraud. Paris: A. Fontemoing, 1896. Size 9½ × 6½, pp. 252. *Maps.*
A study of historico-political geography.
- Norway.** **Goodman.**
New Ground in Norway, Ringerike—Telemarken—Søstersdalen. By E. J. Goodman. With Fifty-six illustrations, from Original Photographs by Paul Lange. London: G. Newnes, 1896. Size 9 × 6, pp. xvi. and 224. *Map and Illustrations.* Price 10s. 6d. *Presented by the Publisher.*
The "new ground" described here is Southern Norway as seen by Mr. Goodman in a recent tour. As the country is very easily accessible and well supplied with facilities for the ordinary tourist, it should become popular amongst British as it has long been amongst Norwegian holiday-makers. The illustrations are good.
- Norway—Hardanger.** **Mockler-Ferryman.**
In the Northman's Land, Travel, Sport, and Folk-lore in the Hardanger Fjord and Fjeld. By Major A. F. Mockler-Ferryman. With Map, Illustrations, and Appendix. London: Low & Co., 1896. Size 8 × 5½, pp. xvi. and 316. *Price 7s. 6d.* *Presented by the Publishers.*
This excellent book describes the author's excursions in the region of the Hardanger fjord and fjeld, with many interesting digressions on natural history and folk-lore. The map is clear, if not very full, and the illustrations are good and interesting.
- Norway—Norwegian Club.**
The Year-Book of the Norwegian Club, 1896. Edited by Charles Peters. London: Printed by W. Clowes & Sons. Size 8½ × 5½, pp. 70. *Illustrations.* *Price 1s.* *Presented by the Editor.*
The longest article in this "Year-book" is on Mountaineering in Norway, by Wm. Cecil Slingsby.
- Russia—Caucasus.** **Freshfield and Sella.**
The Exploration of the Caucasus. By Douglas W. Freshfield, lately President of the Alpine Club, formerly Honorary Secretary of the Royal Geographical Society. With Illustrations by Vittorio Sella. 2 vols. London and New York: E. Arnold, 1896. Size 11½ × 8, pp. (vol. i.) xxiv. and 278, (vol. ii.) x. and 296. *Map.* *Price 63s.* *Presented by the Authors.*
This splendid work, written by Mr. Freshfield and illustrated by Signor Sella, is the subject of a special notice in the August number.
- Russian—Caucasus—Houses.** *Globus* 69 (1896): 267-270. **Hahn.**
Kaukasische Dorfanlagen und Haustypen. Von C. Hahn. Tifis. *With Illustrations.*
- Russia—Caucasus—Tifis Museum.**
Bericht über das Kaukasische Museum und die öffentliche Bibliothek in Tifis für das Jahr 1894 und 1895. Tifis, 1895. Size 9 × 6, pp. 20 and 26. *Presented by the Caucasian Museum.*
- Russia—Mountains.** *Verh. Ges. Erdk. Berlin* 23 (1896): 229-241. **Futterer.**
Herr Prof. Dr. Karl Futterer: Vergleichende Charakteristik des Ural und des Kaukasus.
- Russia—Viatska.** **Krotow.**
Allgemeine geologische Karte von Europäischen Russland. Blatt 89. Geographischer Theil. Oro-Hydrographische Skizze des westlichen Theiles des Regierungsbezirks Wjatka, im Bereiche von Blatt 89. Von P. Krotow.—Mémoires du Comité Géologique. Vol. xiii., No. 2. St. Pétersbourg: Eggers & Cie., 1894. Size 13½ × 10, pp. iv. and 242. *Map.* [In Russian.]

Scandinavia.**Boutroue.**

En Scandinavie. Notes de Voyage. Le pays, ses monuments et ses habitants. Conférence faite à l'Assemblée Générale de la Société de Géographie de Paris le 19 Avril 1895. Par Alexandre Boutroue. Extrait de la *Revue de Géographie* (Juillet—Août—Septembre 1895). Paris: E. Leroux, 1896. Size 10 × 6½, pp. 36.
Map. Presented by the Author.

Switzerland.**Lubbock.**

The Scenery of Switzerland and the causes to which it is due. By the Right Hon. Sir John Lubbock, Bart., M.P. London: Macmillan & Co., 1896. Size 8 × 5½, pp. xxxvi. and 480. *Map and Illustrations. Price 6s. Presented by the Publishers.*

This summary of the physical features of Switzerland will be found of great interest and value to many tourists who, desirous of knowing something of the nature and origin of the Alps, are yet disinclined or unable to consult the original sources of information. Sir John Lubbock has been at great pains to make the book full and clear; he has introduced a profusion of diagrams rare in such volumes, and appends a useful bibliography.

Turkey—Monastic. *Aus allen Weltteilen* 27 (1896): 259–266, 293–300.**Fitzner.**

Der Golf von Monastir. Von Rudolf Fitzner.

United Kingdom—England.

Report of the Director of the Observatory to the Marine Committee, and Meteorological Results deduced from the Observations taken at the Liverpool Observatory, Bidston, Birkenhead, in the year 1895. The Liverpool Printing and Stationery Co., Limited, 1896. Size 9½ × 6, pp. 48.

United Kingdom—English Lakes. *J. Geological S.* 52 (1896): 12–16.**Marr.**

Additional Notes on the Tarns of Lakeland. By J. E. Marr. *With Illustrations.*

United Kingdom—English Lakes.**Marr.**

The Waterways of English Lakeland. By J. E. Marr. From the *Geographical Journal* for June, 1896. Size 10 × 6½, pp. 24. *Map and Illustrations.*

United Kingdom—Geological Survey.**[Geikie.]**

Appendix to the 43rd Report of the Department of Science and Art. Annual Report of the Geological Survey and Museum of Practical Geology for the year ending December 31, 1895. Size 10 × 6½, pp. 48.

United Kingdom—Ireland. *P.R. Irish A.* (3) 3 (1896): 727–732.**Bigger.**

Prehistoric Settlements at Portnafadog, in the Parish of Moyrus, Connemara. By Francis Joseph Bigger. *With Plates.*

United Kingdom—Scotland. *Blackwood's Mag.* (1896): 16–28.**Maxwell.**

How Summer came to Caithness. By Sir Herbert Maxwell, Bart., M.P.

ASIA.**Afghanistan.** *P.R.I.* 14 (1896): 568–579.**Curzon.**

A Recent Journey in Afghanistan. By the Hon. G. N. Curzon, M.P.

Asia Minor. *Globus* 69 (1896): 350–355.**Goebeler.**

Die Forschungsreise des Abbé Le Camus nach Kleinasien. Von Dr. Erich Goebeler. II. *With Illustrations.*

Asia Minor—Phrygia.**Ouvré.**

Un Mois en Phrygie. Par H. Ouvré. Paris: E. Plon & Cie., 1896. Size 7½ × 5, pp. 272. *Illustrations.*

Description of a journey in the summer of 1893.

Central Asia—Pamirs.**Hedin.**

A travers le Monde (Tour du Monde), n.s. 2 (1896): 177–180.

Quelques esquisses de la Commission anglo-russe de délimitation des Pamirs (Août & Septembre, 1895). Note inédite de M. Sven-Hedin. *With Illustrations.*

Central Asia—Pamirs. *B.S.G. Paris* (7) 16 (1895): 516–560.**Poncins.**

Du Turkestan au Kashmir à travers les Pamirs. Par Edmond de Poncins. *With Map.*

Ceylon.

Ceylon in 1896. [Reprinted from the *Ceylon Observer.*] 1896. Size 5½ × 4½, pp. 30. *Presented by J. Ferguson, Esq.*

United States—Washington. *National G. Map 7 2883 1888-91* Hills.
 The Olympic Country. By the late S. C. Gilman. With Map.

United States—West Virginia. Williamsport and Vicinity.
 Field Columbian Museum. Publication 9. Botanical Series, vol. 1. Flora of West Virginia. By Charles Frederick Millspaugh and Lawrence William Vernal. Chicago, 1890. Size 10 x 14. pp. [29.] Map and Plates. Presented by the Director of the Museum.

CENTRAL AND SOUTH AMERICA.

Argentine Republic—Buenos Ayres. Buenos Ayres.
 Annuaire Statistique de la Ville de Buenos-Ayres. VII^e Année, 1890. Buenos Ayres, 1890. Size 11 x 14. pp. cix. and 570. Plans and Diagrams. Presented by the City of Buenos Ayres.
 This volume contains a plan of Buenos Ayres on the large scale of 1:10,000.

Brazil. Buenos Aires.
 Biblioteka Polskiego Towarzystwa Handlowo-geograficznego. Tom I. (The South Paraná w Brazylji) . . . wydany przez Między Państwami Francuzki, Portugalski, Brazylijski, i Australijski ogólny komitet naukowy. Dł. Józef Szymonowski. Warszawa, 1890. Size 8 x 12. pp. 60. Map.

NEW MAPS.

By J. Colles, Map Curator, R.G.S.

EUROPE.

England and Wales. Ordnance Survey.

Publications issued since July 7, 1890.
 1-inch—General Maps—

ENGLAND AND WALES.—(revision) 74, 75, *2, 201, 204, 207, 225, 224, 227, 228, 241, 242, 250, 252, 254, engraved in outline; 251, 253, 255, engraved in black or brown, la carte.

2½-inch—Parish Maps—

ENGLAND AND WALES.—Berkshire (revision), XLVI. 14, 15, 3a, each. Durham (revision), VI. 12; VII. 9, 13; XII. 12, 14, 15, 16; XIII. 2, 3, 9, 10, 11, 14, 15, XVII. 4, 8; XIX. 2, 3, 4, 3a, each. Essex (revision), XLII. 7; LI. 2, 3, 7, 4, 1, LVIII. 3; LIX. 4, 9, 11, LXVI. 2, 4, 6, 12; LXVII. 10, 14, 15; LXXIV. 4, LXXV. 2, 3a, each. Hampshire (revision), VI. 14, 15; XI. 2, 22; XII. 2, 3, 6, 9, 10, 11, 14, 15; XV. 2, 7, 11, 12; XVIII. 9; XIX. 2, 3, 9, 12, 13, 14; XX. 1; XXXI. 6, 11; XLVII. 1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15; XXXII. 10, 11, 12, 13, 14, 15; XXXIII. 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXXIV. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12; XXXV. 1, 2, 3, 4, 6; XXXVIII. 2, 3, 12; XXXIX. 1, 2, 3, 7, 8, 9, 3a, each. Hertfordshire (revision), XII. 12, 16; XIV. 3, 7, 11, 3a, each. Kent (revision), IV. 3, 7; LXXX. 12, 3a, each. Lancashire (revision), CIV. 7, 4a, containing Manchester Ship Canal. Middlesex (revision), II. 12, 14, 15, 16; VI. 2, 7, 8, 11; X. 3, 7, 3a, each. Northumberland (revision), LXXXIII. 12; XCIII. 2, 9, 10, 12, 14; XCIV. 3, 3a, each. Surrey (revision), IX. 13 and 12; XI. 2; XII. 4, 9; XIII. 12; XXIII. 1, 4, 7, 11; XXIV. 2, 3, 9, 11; XXV. 5, 6, 7, 8, 3a, each. Wiltshire (revision), XLIX. 2, 7, 11; LXVII. 4, 8, 12, 3a, each.

Town Plans—10-foot scale—

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London—Re-survey. The revised portion of London is now complete in 716 sheets, 2a, 3d, each. Inset, 3d.

(R. MacLeod Agent.)

No. III.—SEPTEMBER, 1891.

Sweden.**Sveriges Geologiska Undersökning.**

Sveriges Geologiska Undersökning. Scale 1 : 50,000 or 0·78 stat. miles to an inch. Sheets:—"Vittsjö," "Sandhammaren," "Grisslehamn," "Skanör."

Geologisk Översigtskarta öfver Jemtlands Län på grundvalen af Sveriges Geologiska Undersöknings Arbeten och andra källor upprättad af A. G. Högbom. Scale 1 : 500,000 or 7·8 stat. miles to inch. 1894. Presented by *l'Institut Royal Geologique de Suede.*

AFRICA.**Africa.****Bartholomew.**

Political Map of Africa according to most recent treaties. By J. G. Bartholomew, F.R.G.S. Scale 1 : 12,000,000 or 189·4 stat. miles to an inch. 1896. J. Bartholomew & Co., Edinburgh. Presented by the Publishers. Price 3s., mounted on cloth.

This is a new edition of Bartholomew's political map of Africa, on which all international boundaries have been carefully laid down according to the most recent treaties. Insets on an enlarged scale are given of important places, and it is, for all purposes of reference, a very useful map.

Africa, South-East.**Muller.**

Neue Karte des Landes zwischen Zambesi und Limpopo auf Grund des bekannten Kartenmaterials und nach eigener Kenntniss zusammengestellt von Dr. Hendrik P. N. Muller. Scale 1 : 4,000,000 or 63·1 stat. miles to an inch. Verlag von Emil Roth in Giessen. Presented by Dr. Hendrik P. N. Muller.

AMERICA.**Brazil.****Comissão Geographica e Geologica de Minas Geraes.**

Comissão Geographica e Geologica de Minas Geraes. Scale 1 : 100,000 or 1·6 stat. miles to an inch. *Ftha.* No. 2, S₁O, S. João D'el Rei. *Ftha.* No. 1, S₁E₁, Barbacena. 1895. Presented by the Chief Engineer of the Survey.

These two sheets form part of the survey of the Brazilian province of Minas Geraes, which is now being carried on by the Geographical and Geological Commission. The differences in altitude are shown by 50-metre contour-lines, the roads are marked in red, and the water is coloured blue. A full explanation is given of the symbols employed, and the style in which the map is being produced is a very great improvement on anything that has hitherto been issued in Brazil.

GENERAL.**German Colonies.****Langhans.**

Deutscher Kolonial-Atlas. 30 Karten mit über 300 Neubenkarten entworfen, bearbeitet und herausgegeben von Paul Langhans. Erscheint in 15 Lieferungen (jede mit 2 Karten). Parts IX. and X. 1896. Gotha: Justus Perthes. Price 1 mk. 60 pf. each part.

Part IX. of this atlas contains map No. 11, sheet 1, of the German possessions in the Cameroons and Togoland. No. 18 is sheet 4 of the German possessions in South-West Africa. Part X. contains No. 9, a map showing the distribution of Germans in South America. No. 13 is sheet 3 of the map of the Cameroons and Togoland. On each of the sheets numerous insets are given, the routes of explorers are shown, together with notes and information as to telegraph and ocean steamers.

World, Ancient.**Miller.**

Mappaemundi. Die ältesten Weltkarten. Herausgegeben und erläutert von Dr. Konrad Miller. IV. Heft : Die Herefordkarte. Mit 2 Uebersichtskarten im Text und der Herefordkarte in Farbendruck als Beilage, 1896, Stuttgart. Joa. Roth'sche Verlagshandlung. Price 5 marks.

In the present issue of this series a reduced facsimile of the Hereford map is given. Following a general description of the map, and a comparison of it with the Ebstorf map, are the notes which appear on the map itself, and a list of the names, identifying as far as possible their positions. The letterpress concludes with the author's remarks on the sources from which the original map was compiled. The colouring of the original map has not been strictly adhered to, but in other respects it is a very fair reproduction.

CHARTS.**Admiralty Charts.****Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during May and June, 1896. Presented by the Hydrographic Department, Admiralty.

No.	Inches.		
2939 to 2950		Twelve Monthly Current Charts for the Indian ocean. 6d. each. The same charts bound together in an atlas. 7s.	
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3563 m = 0.6		North America, east coast:—Delaware river, Sheet 1. 2s. 6d.	
2346 m = var.		Plans on the coast of Chile:—Lautaro cove, Tames bay, Cokao cove, Colorado cove, Camarones cove, Caleta Chica, Michilla and Gualaguala cove. 1s. 6d.	
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798 m = 0.25		Malacca strait:—Butang group to Pulo Bertala. 3s. 6d.	
2920 m = 0.5		Australia, east coast:—Cape Direction to Cape Greenville. 2s. 6d.	
2513 m = 9.0		New Zealand, east coast of North Island:—Napier port and harbour. 1s. 6d.	
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198		Pelraströ to Cape Sta. Maria I. Lenca:—New plan, Port Cotroc.	
647		Coronel, Lota, and Colbuca bays:—Plan added, Lota bay.	
2528		Povey bay to Cape Palmer:—Plan added, Long point anchorage.	
1414		Anchorage in the Solomon islands:—Plans added, Simala cove, Uru island anchorage, Mappa harbour, Matumba bay, Mandelana island anchorage, Anchorage on west coast of Savo.	

(J. D. Potter, agent.)

Charts Cancelled.

No.	Cancelled by	3s.
2040 The Solent, Hurst point, to Cowes and Southampton water.	New Chart. The Solent, including the Needles channel	2.40
2260 Plans of Longvaar Ford and Christiansand Ford on this sheet.	New Plan. Christiansand and Longvaar Florida on same sheet	2.25
2328 Plan of approach to Grimstad on this sheet.	New Plan. Approaches to Grimstad and Lillesand on same sheet	2.25
2305 Plan of approaches to Aalesund on this sheet.	New Chart. Nerlandsö to Lepsö, including the approaches to Aalesund	1.25
300 Anchorage on the west coast of Spitzbergen.—Le Recherche bay	New Chart. Anchorage on the west and north coasts of Spitzbergen	2.00
2731 Plan of Magdalena bay on this sheet.		
1546 Strait of Samos to gulf of Mandelana.	New Chart. Strait of Samos to Mandelana gulf	1.50
1546 Gulf of Mandelana.		
2528 Delaware river, outer sheet.	New Chart. Delaware river, inner sheet I	2.25
2346 Plans on the coast of Chile.	New Chart. Plans on the coast of Chile	2.25

1863 Sheet 18, Forcados river to Cape Formoso.	} New Chart.	
798A } Pulo Penang to Parcelar hill.		Sheet 18, River Dodo to Bonny river 1868
793B } hill.	} New Chart.	
2920 Cape Direction to Cape Grenville.		Butang group to Pulo Berhala 793
2513 Ahuriri road and port Napier.	} New Chart.	
		Cape Direction to Cape Grenville 2920
	} Napier port and harbour 2513	

Charts that have received Important Corrections.

No. 2010, England, west coast:—Morecambe bay. 1951, England, west coast:—Liverpool bay. 1170A, England, west coast:—Holyhead to Great Ormes head. 1170B, England, west coast:—Great Ormes head to Liverpool. 758, Madagascar, northern portion:—Cape St. Andrew to Antongil bay. 759A, Madagascar:—Cape St. Andrew to Bevatou island. 2017, Ireland, south coast:—Dungarvan harbour. 2327, Norway:—The Naze to Christiansand. 2305, Norway:—Stav fiord to Romsdals islands. 2241, Entrance to gulf of Finland. 2279, Gulf of Finland:—St. Petersburg bay. 2245, Gulf of Finland:—Hogland to Seskär, south shore. 1126, Ports and anchorages in Corsica. 204, Italy:—Gallipoli harbour. 2207, Black Sea:—Danube river, mouths of the Kilis branch, etc. 2835, Black Sea:—Delta of the Danube river, and entrance to Lake Razem. 2231, Black Sea:—Kaliakra to Odessa. 2232, Black Sea:—Odessa to Sevastopol. 603, Black Sea:—Cape Fontana to Tendra peninsula. 234, Egypt:—Port Said. 867, Bermuda:—From the Narrows to Hamilton. 360, Bermuda islands. 2876, Newfoundland:—Codroy road to Bear head. 2490, North America, east coast:—Pemaquid point to Fletcher's neck. 2890, North America, east coast:—Nantucket shoals to Block island. 612, North America, east coast:—Little Spoon island to Pemaquid point, etc. 98, Cuba:—Approaches to ports Casilda and Masio, with the adjacent anchorages. 2103, Gulf of Mexico:—Laguna de Terminos, western entrance. 2831, Gulf of Mexico:—Galveston bay. 23, South America, west coast:—Channel between Magellan strait and Gulf of Trinidad. 1303, South America, west coast:—Approaches to Lota and Coronel. 561, South America, west coast:—Magellan strait to Gulf of Penas. 2840, Vancouver island:—Haro strait and Middle channel. 1001, Africa, west coast:—St. Louis or Guet-n'dar anchorage and Senegal bar; Goree road and harbour. 2760, Sumatra, west coast:—Acheh head to Tyingkok bay. 855, Anchorages on the west coast of Sumatra. 359, Japan:—Nagasaki to Karatsu, etc. 140, Japan:—Mats'sima to Atsusi-no-O-sima, etc. 836, Japan:—Amakusa islands and Yatushiro sea. 2657, Japan:—Gulf of Tokyo or Yedo. 2875, Japan:—Seto Uchi or Inland sea. 83, Japan:—Channels between Misima Nada and Iyo Nada. 1757, Pacific ocean:—Nukulau island to Namuka island, etc. 766, Pacific ocean:—Ellice islands, south-eastern group. 2867, Islands and anchorages in the North Pacific.

(*J. D. Potter, Agent.*)

Chilian Charts.

Oficina Hidrográfica de Chile.

No. 59, Caleta Lohos i Costas Vecinas, Costa de Chile. No. 60, Puerto de Corral, Costa de Chile. Taller de la Oficina Hidrográfica de Chile, 1896. *Presented by the Oficina Hidrográfica de Chile.*

U.S. Charts.

U.S. Hydrographic Office.

No. 1468, Cleveland Harbor and Approaches. No. 1467, South Chicago. No. 1480, Detroit River, from Detroit River (Bar Point) Lighthouse to Mamajuda Lighthouse. No. 1543, Pelée Passage, Lake Erie. Pilot Chart of the North Atlantic Ocean, July, 1896. U.S. Department of the Navy, Bureau of Navigation, Washington, D.C., 1896. Charles D. Sigbee, Comm. U.S. Hydrographer. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

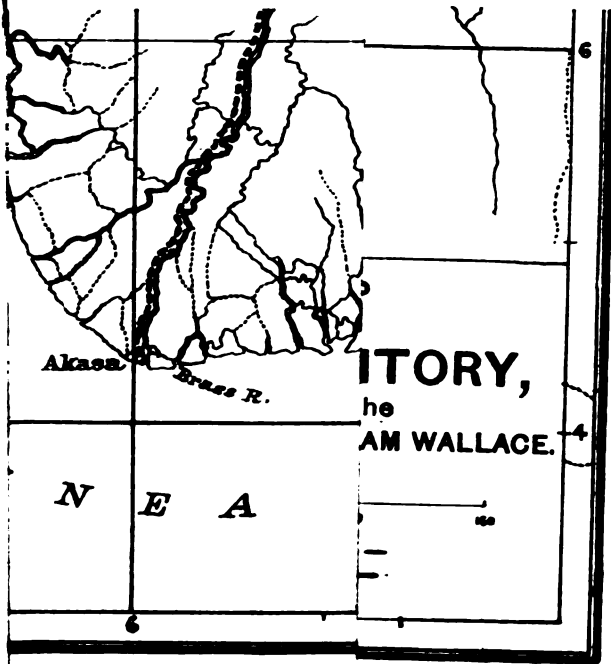
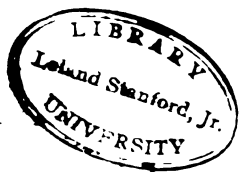
St. Helena.

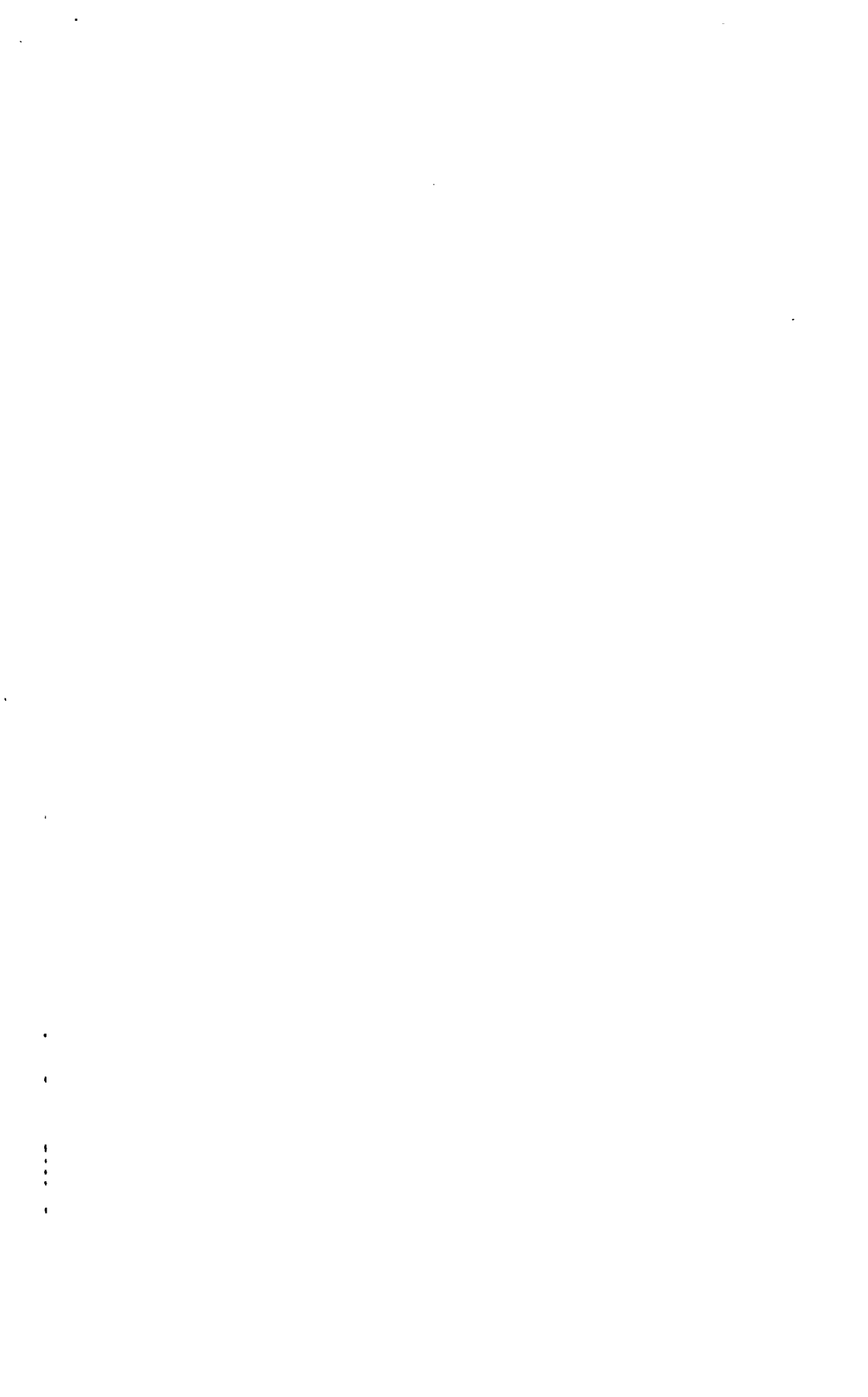
Swinton.

View from the Ridge, St. Helena, 1896. *Presented by Col. A. Swinton.*

This photograph is an addition to the series previously presented by Colonel Swinton, and gives a very good idea of the inland scenery of the island of St. Helena.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





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VOL. VIII.

A JOURNEY IN THE VALLEY OF THE UPPER EUPHRATES.

By VINCENT W. YORKE.*

PART I.—THE JOURNEY.

THE journey, the results of which are described in the following paper, was undertaken in the spring and summer of 1894, and was under the direction of Mr. D. G. Hogarth, Fellow of Magdalen College, Oxford. Besides Mr. Hogarth and myself, there also took part in the journey Viscount Encombe, who made a valuable series of water-colour drawings, which were exhibited to the Royal Geographical Society on May 13, 1895, and Mr. F. W. Green, who executed the map which is appended to this paper. The main object of this expedition was the exploration of the valley of the upper Euphrates from lat. 37° to lat. 40°. This part of the river has been visited by few modern travellers; and the expeditions of the Asia Minor Exploration Fund, the results of which have been described in the papers of this Society by Professor Ramsay † and Messrs. Hogarth and Munro, ‡ have never extended so far east. It was expected that, besides obtaining geographical results of some importance, we might discover traces of the system of defences organized by the Romans in this portion of the eastern frontier of the Roman Empire. Much light had been thrown already on the system of Roman roads leading to the Euphrates by previous expeditions of the Asia Minor Exploration Fund, and there were some grounds for hoping that evidence was still to be found of the continuation of this system in the valley of the river itself.

* Paper read at the Royal Geographical Society, May 13, 1895. Map. p. 428.

† The "Historical Geography of Asia Minor," 'Suppl. Papers of R.G.S.,' vol. iv., 1890.

‡ "Modern and Ancient Roads in Eastern Asia Minor," 'Suppl. Papers of R.G.S.,' vol. iii., 1893.

We landed at Mersina on April 12, and availed ourselves of the short line of railway which has been constructed as far as Adana. From Adana we made our way eastwards to Aintab, whence we proceeded to strike the Euphrates at Khalfat, a point about six hours north of Birejik. From here we followed the course of the Euphrates more or less closely up to the junction of the two branches of the river above Keban-Maden. Along this part of the river the chief places of interest which we visited were Samsat, Kiakhta, and Malatia. From Keban-Maden we followed the western Euphrates, generally called the Kara Su, as far as Erzingan, passing through the towns of Egin, Divrik, and Kemakh. From Erzingan we took the direct route to Trebizond, which joins the *chaussée* from Erzerum near Gyumush-Khané, and on June 18 reached the Black Sea and Trebizond, where our journey came to an end.

The country through which we travelled from Mersina to Samsat is fairly well known, owing to the fact that it was traversed recently by the German expeditions to the Nimrud Dagh.* Hence I have not found it necessary to give any detailed account of this part of our journey, and have confined myself to noticing a few points, mostly of archæological interest. North of Samsat the country along our route is for the most part but little known; some parts of it are described in the writings of Von Moltke † and Ainsworth, ‡ who both travelled here at the time of the Turko-Egyptian war in 1838-9; and some information relating to it is to be found in the reports of Consuls Taylor and Brant.§ But in recent years it has not been visited by many travellers or by any trained observer of antiquities, and I venture to hope that our observations may prove to be of value both to the geographer and to the archæologist. A discussion of the Roman roads and defences on the Euphrates is reserved for the second part of the paper.

On the way from Mersina to Adana we stayed a few days at Tarsus, and visited thence the famous pass of the Cilician Gates. We can claim to have to a great extent elucidated the Roman inscriptions in this pass, which have offered hitherto considerable difficulties to the epigraphist. || At Adana we obtained horses, and the rest of our journey as far as Trebizond was made entirely on horseback. We did not adopt this mode of travelling for choice, as it is, of course, more fatiguing than driving, and leaves much less time for work; but it is not possible to cross the districts through which we travelled, except for very short distances, in any other manner. We came across a few made roads, but

* "Reisen in Klein-Asien." Humann and Puchstein. 1869.

† 'Briefe a. d. Turkei.'

‡ *Journal of R.G.S.*, vol. x., 1840, pp. 275 ff., "Travels in Asia Minor, 1842."

§ Taylor, *Journal of R.G.S.*, vol. xxxviii., 1868, pp. 281 ff.; Brant, *ibid.*, vol. vi., 1836, pp. 187 ff.

|| 'C.I.L.', vol. iii. Nos. 227, 228. These copies, together with those of other inscriptions found on our journey, will shortly be published in a new supplement to vol. iii. of the *Corpus*.

it is a rare exception in this part of Turkey for any road to be practicable for wheels. From Adana we travelled to Missis, the ancient Mopsuestia, where we recopied some of the inscriptions preserved on the ancient site.* From Missis we proceeded eastwards over the Cilician plains to Osmanieh. At Yarsowat, 12 miles from Missis, where we stayed one night, we found three late Greek inscriptions, which may point to the fact of its occupying an ancient site. Osmanieh is a small town situated at the foot of the Amanus range, and the starting-point of three routes across these mountains. One of these goes by Yarpuz to Islahie, the second by Hassan-Beli and Bagche, and the third by which we



KHALFAT (FROM THE RIGHT BANK).

travelled coincides with the second as far as Hassan-Beli, whence it goes direct to Senjerli. A carriage-road has been laid out as far as Hassan-Beli, a small village inhabited mostly by Armenians. Though it has never been used, and is now fast falling into disrepair, it could be made into a serviceable road with little trouble and expense. It owes its existence to Abadin Pasha, a former governor of Adana and the owner of a large property in the plain of Senjerli, with which it was designed to communicate. By this road, which is engineered in easy gradients, we crossed the main ridge of the Amanus range (4200 feet), and descended to the Kurdish village of Senjerli. At this village, which lies close to the foot of the mountains, excavations have been conducted for several years past by Dr. von Luschan, and were in full

* We found one new inscription, a milestone of the three emperors Valentinian, Valens, and Gratian.

progress at the time of our visit, on the site of a "Hittite" and Assyrian palace. The plain of Senjerli is remarkable for containing three large artificial mounds, called Senjerli, Gerchin, and Albistan. Of these, Gerchin, which is situated at the northern end of the plain, would offer very great obstacles to excavation, as it is now only accessible at intervals of a few years, owing to the marshy state of the ground from which it rises; the other, Albistan, situated only about 4 miles east of Senjerli, could very easily be excavated, and would, in Dr. von Luschan's opinion, be likely to afford results equal in interest and importance to those which he has obtained at Senjerli.* The plain has at the present day the reputation of being most unhealthy in summer, when the whole of the inhabitants, for the most part Kurds, remove to higher ground. As it seems to have been a favourite royal summer residence in antiquity, one must suppose that it was not then as wet and malarious as now. There must have been a better outfall at the southern end. From Senjerli we went in two and a half days by Sachtchegozu, near which several Hittite monuments have been found, and Kuradedi to Aintab.

The following table gives the distances along our route from Adana to Aintab:—

Miles.	Miles.
— Adana.	12. Senjerli.
15. Missis.	22. Sachtchegozu.
12. Yarsowat.	20. Kuradedi.
33. Osmanieh.	15. Aintab.
24. Hassan-Beli.	

At Aintab we were delayed for several days awaiting our guns, which had been detained in the custom-house at Mersina, and were being sent after us. We employed the time not unprofitably in collecting small antiquities, which are to be obtained in some quantity in the bazar. They consist mainly of seals, cylinders, and scarabs of the "Hittite" period, and of stone implements, which may possibly belong to the same civilization.† When we finally left Aintab, we travelled in an easterly direction for one and a half days to come down to the Euphrates opposite Khalfat. Between Aintab and the river we passed the village of Arul,‡ where there is a large artificial mound, indicating an ancient site, but no inscriptions, so far as we could learn. It must be identified with Arudis of Ptolemy and Arulis of the Peutinger Table, being placed by the latter on the road between Zeugma (Birejik) and Samosata.

* Monuments have actually been found on each of these mounds.

† Most of the objects were said to have come from Tell-Basher, but some from Jerablus. The latter, which is generally identified with Carchemish, is more likely to be their real *provenance*.

‡ In Humann and Puchstein's work it is called *Arüm*, but the name *Arul* is confirmed by Pococke ('A Description of the East and Some Other Countries,' vol. ii. p. 155). I owe the reference to H. and P., *op. cit.*, p. 172.

The Euphrates, where we first saw it at Khalfat, is certainly not less than a quarter of a mile in breadth, and flows at a speed of nearly 6 miles an hour. The stream is dark yellow in colour, but nevertheless good and wholesome to drink. Just above Khalfat it emerges from a striking gorge formed by sheer cliffs, which rise on the left bank to the height of 900 feet. The castle of Rum Kale is perched high up on the right bank. We crossed the river to Khalfat in one of the rude ferry-boats of the place. Khalfat is a small town of about 2000 inhabitants, and the residence of a Kaimakam. From here we proceeded up the river, at no great distance from the left bank, for a little more



FERRY-BOAT AT SAMSAT.

than two days, to Kantara,* a small village situated on the river about a mile above Samsat, to which we were ferried across. The route which we followed from Aintab to this point is almost identically the same as that taken by Humann, Puchstein, and Von Luschan, in 1883. It is not, of course, the direct road from Aintab to Samsat, but we were advised to take it to avoid being stopped by the Gyuk Su (Singa fl.), a tributary of the right bank of the Euphrates. The country through which we travelled on the left bank is flat, treeless, and most dreary in character; the only inhabitants are Kurds, who live a settled agricultural life, have embraced Islam, and are completely submissive to Turkish rule. The villages, however, are thickly distributed wherever the rocky soil admits of cultivation.

* This name (= bridge in Arabic) preserves the tradition of the important crossing effected here in ancient times by the Indian caravans: *vide* Strabo, p. 664, who seems to mean that an actual bridge, probably of boats, existed (Samocata, ἡ πρὸς τῇ διαβάσει καὶ τῷ ἐν γυματι κείνῳ). The name Kantara occurs similarly on the isthmus of Suez where the caravans set out for Asia.

Samsat, which preserves the name of the ancient Samosata, the capital of the Selucid kingdom of Commagene, the birthplace of Lucian, and station of one of the legions on the Euphrates, is now a wretched Kurdish village of about one hundred houses, three of which are Armenian. Its antiquities have been well described in Humann and Puchstein's work, and the only addition which we can make to the results which they obtained on the site, is that of four inscriptions. Two of these give the name of the Legion XVI. F(lavia), F(irma), which is known from another source* to have been posted here, and a third, found in the castle wall, gives part of the name of one of the Roman governors of Commagene.

From Samsat we began the exploration of the valley of the Euphrates, in search of Roman roads. We first divided into two parties, one of which, under Mr. Hogarth, followed the left bank of the river as far as the mouth of the Kiakhta Chai; the other, consisting of Mr. Green and myself, took the road to Adiaman. Adiaman (Hisn Mansur of the early Moslem chronicles), about 24 miles north of Samsat, is a town of about 10,000 inhabitants, Turks and Armenians, situated at the foot of a lofty range of hills which runs south from the main ridges of the Taurus. It represents in importance the ancient Perre, the site of which has been identified with Perrin, a village about 3 miles north-east of the modern town, where there are considerable remains of antiquity.† The country between Samsat and Adiaman is pleasant and tolerably fertile, and slopes gradually up to the hills. A Roman road led from Samosata to Perre, but we found no trace of it on our path. At Perrin, to which we paid a hurried visit, we copied two or three late Byzantine inscriptions in the rock-cut tombs which abound near the site. From Perrin we went to Kiakhta, following a track which skirts the base of the hills and traverses numerous lateral *derés*, formed by small streams flowing to the Euphrates. Along this path, though in all probability the Roman road from Perre to Melitene once took the same course, we saw no signs of antiquity except some more rock-cut tombs to the left of our road, which have been noticed by previous travellers.‡ At a distance of 28 miles from Perrin, and 4 miles before reaching Kiakhta, we came to the great Roman bridge over the Bolam Su. This bridge, which is one of the most splendid monuments of the Roman period in existence, is mentioned first in the writings of Von Moltke. It was rediscovered by Sester in 1881, and has subsequently been fully published, with the help of photographs and plans, by Humann and Puchstein. One point, however, has been omitted in their description of the bridge. There are undoubted traces of an erased inscription on the single column which stands on the left bank of the stream. The

* 'C.I.L.' vol. vi. p. 1404; Mommsen, 'Provincæ,' vol. ii. p. 119.

† The site is described in Humann and Puchstein, *op. cit.*, p. 401.

‡ H. and P., *op. cit.*, p. 125.

existence of this erasure confirms the fact implied by the words of the other inscriptions on the parapet, that the first construction of the bridge was due to an emperor earlier than Septimius Severus. At Kiakhta we rejoined Mr. Hogarth's party, which had followed the Euphrates as far as the mouth of the Kiakhta Chai, near which point it succeeded, though not without difficulty, in fording the latter stream. The ford, however, is reported shallow enough later in the summer. It had then followed the Kiakhta Chai as far as the Roman bridge and Kiakhta, but observed no antiquities on the route from Samsat to this point, with the exception of the remains of a fine aqueduct, which once brought water to Samosata from the Kiakhta Chai. The remains of this begin to be visible about 6



ROMAN BRIDGE NEAR KIAKHTA.

miles north of Samosata. The water was carried mainly through tunnels and rock-cut conduits, but by bridges across the mouths of the tributary valleys. Near Alakeupri (four hours from Samosata) these bridges assume very large proportions. Originally their arches were wide, and built of squared stones of considerable size—work of the third century A.D.—but later, in order to strengthen the waterway, the arches were almost wholly closed in with coarse masonry of small stones. The region on the left bank of the Kiakhta Chai is one of swelling hills, rising gradually towards the Nimrud Dagh and cut up by the deep gorges of tributary streams. Villages of Kurds, who speak Kurdish only, are very frequent; these Kurds are well-settled agriculturalists of peaceful repate, but one and all very poor. Kiakhta, which lies in a narrow valley beneath the Nimrud Dagh, one of the outlying peaks

of the main Taurus range, now famous for the strange monument erected on its summit by Antiochus I. of Commagene in the first century B.C., is remarkable for a fine castle built on a precipitous rock. There is no evidence to show that this castle is older than Mohammedan times.* In Von Moltke's time Kiakhta was a Kurdish stronghold; it is now the residence of a Kaimakam, and furnished with a strong post of *zaptiehs*, who control the Kurds inhabiting the mountains between it and Malatia and the district of Gerger. At the present day it has about 750 inhabitants, with the exception of the officials and a few Armenians, all Kurds; the houses are built close together, clinging to a steep hillside. The bazar, for the size of the place, is a large one.

The Roman bridge of Kiakhta lies directly between Samosata (Samsat) and Melitene, which may on good grounds be identified with the modern Malatia, and gives certain indication of the spot at which the Roman road entered the high Taurus, which divides the plain of Samsat from that of Malatia. In the hope of being able to find the pass which was selected for the Roman road through these mountains, we gave up the original project of following the course of the Euphrates through the Taurus, and made inquiries as to the easiest and most direct road from Kiakhta to Malatia.

The route which we were induced to take on the assurances of the natives as being a direct and easy path to Malatia, has not hitherto been travelled by any European, and may briefly be described as follows.

The path which leaves Kiakhta in a northerly direction does not ascend much at first, but winds over easy slopes up to the shoulder of a spur about one hour from Kiakhta. We then descended to a small stream, a tributary of the Kiakhta Chai, a short distance above a Kurdish hamlet. From this point we gradually ascended along the side of earthy hills, where there is little vegetation except a few burnt oaks, and after crossing another tributary of the Kiakhta Chai reached a rocky crest. We then sank down to the bed of a stream flowing to the left about half a mile below the village of Karachu. Soon after this we passed a mill and began to mount again along a steep and narrow path, where, owing to the crumbling soil and projecting rocks, disaster among our pack-horses was frequent. After a short descent to the bed of a stream, where there is a Kurdish *yaila*, we ascended by a dangerous and difficult path, which in half an hour brought us to the top of the first summit. This we reached rather more than four hours after leaving Kiakhta. Our path then descended for quite 1000 feet to the bed of another stream. From this point an hour's climbing along a steep but fairly easy path brought us to a small plateau where there are stunted oaks and an abundance of grass. Here we camped

* Abul Fida (263) speaks of Kiakhta as one of the fortresses of Islam, and describes the castle as high-built and impregnable (l'Estrange, 'Palestine under the Moslems,' p. 475).

for the night. The next morning we reached in half an hour the second summit, 6823 feet high and little lower than most of the peaks in this part of the Taurus. At this point we found a large quantity of snow still (May 15) unmelted, which added considerably to the difficulty and danger of the path. From this summit the track turns towards the Bekiakr Dagh, and traverses rolling uplands which slope towards that mountain. At seven hours from the summit the Tekke Deresi Su is reached and followed for half an hour, when a steep descent to the valley of the Euphrates and the plain of Malatia begins. From the bottom of this descent, where we stayed the night near the village of Mamuraka, Malatia is reached in three hours, the last two of which are along the *chaussée* which leads from Sivas *viâ* Malatia to Kharput. The whole distance from Kiakhta to Malatia we traversed in eighteen hours twenty minutes; but the distance by this route cannot be estimated at more than 50 miles, as the difficulty of the path caused us to travel very slowly. Along this route we saw no signs of any old road, which must have taken some easier course from the bridge. The path by which we travelled can only be used in summer, and was not fairly practicable for beasts at the date (May 14-15) when we crossed the mountains. We passed through no villages on our way from Kiakhta, but met with Kurds in considerable numbers. These Kurds differed considerably in bearing from those whom we had seen in the plains south of Taurus. They seem to have preserved some of the independent spirit for which they were famous at the time when Von Moltke travelled in this part of the Taurus, and one and all are armed to the teeth. Though we heard of no disorder among them, and, indeed, on one occasion had to interfere to prevent a single Kurd being ill-treated by a *Yaptieh*, their general demeanour towards the Turks is very different to that of their brethren of the plains. They have one curious custom which is perhaps worth recording. They wear turbans composed of small cloths, to which they add one for each year of their life. In consequence of this, a Kurd of this district who reaches any considerable age has to support, besides the burden of his years, that of a very considerable head-dress.*

The following table gives the distances and some of the heights on our route from Samsat to Malatia :—

Miles.		Fet.	Miles.		Fet.
—	Samsat	1504	9½	First summit	5512
24	Adiaman	—	6	Second summit	6823
35	Roman bridge	—	23½	Mamuraka	3978
3½	Kiakhta	2508	10½	Malatia	3458

The plain of Malatia, which is watered by a large tributary of the

* Some doubt was thrown on the genuineness of this custom by Professor Vambéry when Hogarth read a paper on this journey before the British Association in 1894, but it was vouched for by one of our servants, himself a Kurd from the plain of Senjerli.

Euphrates, the Tokhma Su, with its own considerable affluent, the Sultan Su, is a very fertile district, and famous on this account in modern as in ancient times. The old Malatia, which stands probably on the ancient site of Melitene, was deserted by the inhabitants at the time of its occupation by Turkish troops in 1839. They migrated to the *yaila* of Asbusu 5 miles distant, and here founded the new Malatia, which has inherited the name and importance of the old town. It contains at the present day 5000 Turkish and 1200 Armenian families. The town is very loosely built, and every house has a large garden attached to it in which all kinds of fruit-trees flourish.

The importance of Malatia at the present day, as that of Melitene in ancient times, lies in the fact that it is situated on a great trade-route to the East, and near to an easy crossing-place of the Euphrates at Isoli.* The old Melitene was the *caput viæ* of the great military road constructed by the Romans from Cæsarea-Mazaca to the Euphrates, and the head-quarters of the Twelfth or "Thundering" Legion, most probably stationed here to guard the passage over the river. In 1873 it was visited by a severe earthquake which destroyed many of the poorer houses. The sultan is said to have given £T8000 towards the rebuilding of the houses and mosque, but this may only mean that the local taxation for the following year was increased by that amount. There is a fine new *khan* in the town, a good bazar where a large trade is done in fruit, and some new barracks where a detachment of soldiers is permanently stationed. Trade at the time of our visit was stagnant, owing to quarantine in the vilayet of Sivas which had cut off the carriage-traffic on the great road from the west.

At Malatia, where we stayed two days, we were shown a new "Hittite" monument which had recently been brought into the town and placed for security in the courtyard of the *serai*. It was discovered in a ploughed field at Arslan Tepé, a large mound a little to the right of the road from Malatia to Eski-Shehr, and not more than 3 miles from Malatia. The monument represents a lion-hunt, portrayed in such a manner as to resemble very closely many scenes of Assyrian art. The field above the figures is almost completely filled up with "Hittite" characters in relief.† We afterwards visited Arslan Tepé, and found it to be an extensive mound, probably to a large extent artificial, and rising to a height of 60 or 70 feet from the plain. The name (Lion Hill) would indicate that other similar monuments have been found on the spot, and it is in all probability the site of a "Hittite" palace. The discovery of this site is important as adding one more to the number of "Hittite" settlements known to have existed in this part of Asia

* We were told on the highest authority that the Turkish Government intend very shortly to throw a military bridge over the river at this point.

† This has been published by Hogarth in Maspero's 'Recueil de travaux relatifs à la Philologie,' etc., vol. xvi.

Minor. The triangle formed by the Bimboa Dagh, the Taurus, and the Tokhma Su has already yielded several monuments of this class to the explorer,* and the discovery of another in the plain of Malatia may serve as an additional link by which the "Hittite" civilization of Cappadocia may be connected with that of North Syria by way of a road descending the valley of the Tokhma Su. It also gives some reality to the legend handed down by Pliny,† that Melita or Melitene was founded by Semiramis, which, as in the case of a similar legend preserved by Strabo ‡ with regard to Tyana, seems merely to indicate that it was a seat of prehistoric civilization.

From Malatia we moved to the old town, now called Eski Shehr—the Malatia of Von Moltke's time, and built on the site of the ancient



HITTITE MONUMENT AT MALATIA.

Melitene. It is situated about 5 miles due north of the new town, and is about 3 miles distant from the Euphrates. There are considerable remains of old walls round the town, which is now almost completely deserted. These walls may in some parts be as early as Byzantine times, and the work of Anastasius or Justinian, who, according to Procopius,§ both fortified the town. There are numerous columns and mouldings of Byzantine date built into the mosques and houses within the walls, but we were most unsuccessful in our search for inscriptions. We only found two fragments, both unfortunately quite valueless; and the result, if the fact be considered that Melitene was for so long the station of a Roman legion, is most disappointing. There is a certain amount of Seljuk work in the numerous ruined mosques of the old town, and we found two Persian lions carved in stone, with the sun

* Near Gyurun, at Kuchuk Yapalak, at Palanga Chiflik, and at Izgin (*vide* Hogarth, 'Suppl. Papers of R.G.S.,' vol. iii. p. 35).

† 'Hist. Nat.,' vol. vi. p. 3.

‡ 537.

§ 'De Æd.,' vol. iii. p. 5.

represented behind them,' which may be relics of that period. The enormous graveyards (probably the result of the great mortality at the time when the Turkish army was stationed here) yielded no inscription.

From Eski Shehr, after an unsuccessful attempt had been made by the authorities to detain us in quarantine, we set out to follow the right bank of the Euphrates northwards. By so doing we expected to find some traces of the Roman road which once led from Melitene to Satala, another legionary camp, in Armenia Minor, and which is said in the Antonine Itinerary to have kept to the bank of the river. At a distance of two miles from Eski Shehr we found an inscribed milestone by the side of the modern road, which has already been published from the very imperfect copy of a German engineer.* But this stone stood perhaps on the road Melitene—Sebastea, not Melitene—Satala. We were able to decipher on it the names of the Emperors Constans and Constantius, but little more.

From this milestone to the bridge called Kirkgeuz-Keupri, over the Tokhma Su, the distance is another two miles. This bridge, which bears some signs of antiquity, is in good condition, and spans the river in twenty-three arches at a point about a mile distant from its junction with the Euphrates.† Immediately after the bridge the *chaussée* to Sivas *viâ* Hekim-Khan goes off to the left. The track which we followed goes over a low earthy and well-cultivated plateau, in a direction parallel to the course of the Euphrates, and at one hour thirty-five minutes from the bridge crosses by a ford the Kuru Chai, another considerable affluent of the right bank of the river. From this point to Chermuk, a village about seven hours distant from Eski Shehr, our path lay close to the right bank of the river. The country on this bank is for the most part level, and has a fair sprinkling of Turkish villages.‡ It presents a great contrast to the country on the left bank, which is bold and mountainous. The Euphrates (here called Frat according to the people of Chermuk) we found to be much broader than at any point where we had seen it below the Taurus; in places it is certainly not less than a mile in breadth, and is dotted with numerous islands. Above Chermuk the country on the right bank becomes broken and mountainous, and one hour after leaving that village we left the river, which here flows through a deep and narrow gorge. We then forded a tributary of the right bank, the Soyut Chai, a broad, muddy, but shallow stream. One mile after leaving the ford the horse-track from Malatia to Arabkir goes

* 'C.I.L.' vol. iii. suppl. 6893.

† It is in all probability the same as the bridge over the Kubakib (Tokhma Su), mentioned by the Arab geographers, where a garrison was stationed (*vide* l'Estrange, *Jour. Roy. Asiat. Soc.*, 1895, pp. 46 ff.).

‡ It is hard to tell whether the inhabitants are really Turks; in type they cannot be distinguished from Armenians, and though they have outwardly embraced Islam the women in many of the villages do not veil.

off to the left, and the path which we followed led us over bare and undulating country, to join, after four hours' travelling, the new araba-road from Arabkir by the ferry of Keban-Maden to Kharput, at a point about two miles to the east of Seraijik. We then followed this road, which descends from a great height, to the ferry of Keban-Maden. This road, which has been well engineered, is fast falling into bad repair, and is now hardly safe for arabas, which, indeed, as we were told, have never used it. At the ferry, which is only served by one boat of the usual primitive description, the river is about 200 yards broad, and the stream very swift; but the passage is much facilitated by a strong backwater under the further bank. High rocky cliffs rise on each side



VIEW OF THE KIRKEGÜZ KEUPRI BRIDGE.

of the river, and just below the ferry it enters a narrow and imposing gorge.

On our route from Malatia to this point we came across no certain sign of antiquity, with the exception of the milestone near the bridge over the Tokhma Su. At Chermuk we observed a piece of a stone conduit which may possibly be of Roman date, and be all that is left of Ciaca; and three hours beyond Chermuk we followed for an hour the remains of a made road running by the side of our path. These consist of stone foundations about 16 feet in width, with a well-marked seam or ridge running down the middle. We found no milestones or other evidence to prove the road to be Roman, and its breadth seems to be too great to admit of its being of Roman date.

Above Keban-Maden the country on the right bank of the Euphrates is still mountainous, and we took a path which, though it keeps some

little distance away from the river, preserves a direction more or less parallel to its course. Following this track, we ascended to a considerable height, and then rode over some high ground which slopes gradually down to the valley of the Angu Chai. We here found the black-bellied sand-grouse, which we had previously seen at Chermuk, in considerable quantities, and these, which are easily shot, formed a welcome addition to our larder. Besides these birds we met with little or no game through the whole of our journey, with the exception of here and there a quail and the red-legged partridge. The latter is fairly abundant in all the districts through which we passed, more so, however, on high than on low ground. Immediately after crossing the crest of the hills we came on the foundations of an old road, which are very similar in character to those which we had seen near Chermuk. We lost all trace of this road shortly before reaching Korpanik, a Turkish village of about forty houses, which is three and a half hours distant from the ferry of Keban-Maden. It is situated in a treeless pastoral district near a large natural mound on the right bank of Angu Chai, a considerable tributary of the western Euphrates, which flows into the river a short distance above its junction with the eastern branch. Over this stream in the immediate neighbourhood of Korpanik there are remains of two bridges, one of which, situated about two miles east of the village, is certainly Roman, and most probably gives a fixed point on the Roman road along the Euphrates. The remains of this bridge, which was constructed in one bold arch * with span of about 100 feet, consist of two abutments, of which that on the left bank is preserved to a height of thirteen courses from the ground. The other abutment is only preserved in entirety at the base, where it measures 16 feet 5 inches in breadth. Both abutments are constructed of concrete, which is faced with well-squared stones. There are no traces preserved of any road leading to the bridge on either bank of the stream. One mile lower down the Angu Chai there are ruins of another bridge, which would seem to belong to Turkish times. On the left bank the rubble core of a pointed pier is preserved, but only to the height of 2 or 3 feet from the ground. There are also remains of a road, banked up against the hill on the right bank, leading down to the bridge. This road is engineered down the hill in steps, and in this respect resembles many of the old Turkish roads which were made to serve for riding rather than for driving. It is most probably the same as the old road which we observed on the way from Keban-Maden to Korpanik, and which, when we last saw it, was pointing in the direction of the ruined bridge. It is quite possible that the remains in both places may be those of the road

* In this respect it resembles the great bridge at Kiakhta. Another point of resemblance is afforded by the manner in which the holes destined to receive the scaffolding during the construction have been left unfilled.

constructed from Samarra to Kharyut by Beshir Pasha, portions of which were noticed by Consul Brant.* A third bridge over this tributary of the Euphrates is described in the report of Consul Taylor, who passed through this district in 1868.† He speaks of it as being only one hour distant from Agirra, so that it must be quite close to Korparik. It is according to his description, constructed in the form of a high pointed arch, with an inscription written all along one side of it. The evidence of the inscription, of which he gives a copy, points to the bridge being of Byzantine date.‡ We were told of another bridge thirty minutes higher up the Anga Chai from the Roman bridge, which is probably the one mentioned by Taylor. Our guide assured us that it was new, and we



THE CASTLE OF KAKERZA.

did not visit it; perhaps he may only have meant that it was still in use.

We were unable to find any definite evidence of the existence of Roman remains in the vicinity of Korparik besides the first of the two bridges described above. The mound near the village is a very strong natural position, being about 200 feet high and steep on every side, and it is tempting to conjecture that one of the Roman stations of the *Tabula* and the *Notitia* was situated at this point, especially as a Roman road, for which the bridge was built, must have passed quite near to it. But there are no remains on the top of the mound except those of a mediæval castle. On the other hand, several Roman coins, said to have been found on the spot, were brought to us at Korparik.

* Kinnear, vol. x. p. 500.

† Taylor, *Jour. of R.G.S.*, vol. xxxviii pp. 313 ff.

‡ A copy is also given in Waddington and Leves, No. 1614c.

From Korpanik we proceeded across the Angu Chai to Aghin, about 5 miles distant. It is a large village of about a hundred and fifty Turkish and twenty Protestant Armenian families, and has a small bazar. From this point we divided for one day into two parties, and followed two different routes to Ashuk, which lies on the Arabkir and Egin road. The shortest of these routes keeps at some distance from the banks of the western Euphrates; the other follows the course of the river for some time, until the mountains begin to close in on the right bank, and then joins the direct path about three hours before Ashuk is reached. By the direct route Ashuk is six and a half hours distant from Aghin. The country through which we passed is fertile and well populated, and the villages are chiefly Turkish. The Euphrates, to which the inhabitants give the name of Murad,* here flows in a serpentine course. The stream is swift and deep red in colour, and is generally about 200 yards broad. We had fine views all day of the Dersim mountains, which descend abruptly to the left bank. At a point three hours distant from Ashuk we came on, and followed for half an hour, more remains of a paved road laid over some marshy ground. These remains consist of large stones regularly laid, with gutters cut across them at intervals of about 20 yards. The road is about 8 feet wide, and seems only to have been laid over this piece of bad ground, as we lost all trace of it soon after getting on to a higher level. As far as can be judged from the character of the remains, the road would appear to be not older than Turkish times. Ashuk is a village almost entirely Turkish, consisting of about ninety families, and is a halfway house on the road between Egin and Arabkir. From Ashuk we followed the new araba-road, constructed along the tremendous gorge, through which the Euphrates flows, to Egin. On leaving the village there is a considerable descent to the level of the river, after which, for the rest of the way to Egin, the road keeps close to the right bank, generally about 25 feet above the stream. The road, which must have been expensive to make, is at present impassable to arabas, having been in many places washed away by the stream, but, at the time when we passed, was in course of being repaired, and might with little trouble be made into a good carriage-road. The river is here considerably narrowed, being generally from 100 to 150 yards broad, and

* It is a fact that at Korpanik, at Aghun, at Egin, at Pingan, at Kemakh, and lastly at Erzingan, we found the name *Murad* in use for the western Euphrates. Hogarth says that, both when directly questioned and when talking among themselves, the natives used no other name for their river in his hearing. The *Kara Su* of the maps and geographers was apparently unknown. At Korpanik, whence a reach of the eastern Euphrates could be seen, Hogarth was told that the latter was called *Palu Su*. Nevertheless the earlier travellers can hardly all have made a mistake, and perhaps the truth is that the name *Murad*, well known as that given to the united stream from Keban Maden to the Persian Gulf, is given also to *both* the arms, there being also local names, such as *Palu Su* for the eastern arm, and *Kara Su* for the western. But on the fact that at any rate *Murad* is used, as well as *Frat*, for the western arm, by dwellers on its banks, we venture to insist, all maps and geographers notwithstanding.

is hemmed in on each bank by precipitous crags. At Egin, where it is spanned by a wooden bridge, it is not more than 40 yards across, and flows with the speed of a torrent.

The following table gives the distances on our route from Malatia to Egin —

Miles.		Feet.	Miles.		Feet.		
—	Malatia	...	3453	11½	Korpanik	...	3021
7	Eski Shehr	...	2971	4	Aghia	...	3291
18	Kilislik	...	2629	18	Ashuk	...	4049
33	Keban-Maden	...	—	15	Egin	...	3342

Egin, a town of about 15,000 inhabitants, Turkish and Armenian in about equal proportions, is situated in a large recess in the valley of the river, and is backed by a great semicircular precipice fully 1500 feet high, from which a torrent, which supplies the town and its gardens with water, flows in a series of magnificent cascades. It is sheltered from every wind, and we found the climate during our stay both relaxing and oppressive. The people, especially the Armenians, have an unhealthy appearance and a number of them suffer from the *goitre*. The houses, which are built for the most part along the hillside, have in many cases large gardens; the streets are very steep and ladder-like in character. There is hardly a decent *khas* in the place, and trade, owing to the absence of wheeled traffic and the insecurity of the roads, is practically non-existent. The Armenians as they grow up generally go to other parts of the Empire to earn a living, coming back to their native town in middle age. The town is not older than the eleventh century, when it was founded by Armenians,* and is singularly barren of antiquities. There are three Armenian churches in the town, all of which have been restored in recent years, and have little archaeological interest. In one of these we were shown a manuscript of the Gospels in Armenian, which bears the date 1169, and is said to have been written by Fadaafgaver, a prince of the district of Sasun,† in memory of his daughter Gamma. The book is plentifully illustrated, and contains portraits of the prince and his wife and daughter. At this point it may be well, in view of recent events, to say a few words about the condition of the Armenians in this part of the Turkish Empire. At Malatia and Egin, and afterwards at Divrik and Kemakh, we came in contact with numbers of Armenians, many of whom poured into our ears complaints of Turkish oppression. It is difficult to judge correctly as to the value to be attached to these statements, and it is not safe for travellers to show Armenians marked attention, still less to conduct any systematic inquiry into the causes of complaint. But we may say that, as appeared to us, the same story of

* St. Martin, 'Mémoires sur l'Arménie,' vol. i. p. 189.

† The only other reference to princes of this district that I have been able to find is given in de Muralt, 'Chronographie Byzantine,' vol. ii. p. 22, ann. 1072.

wrong was made to do duty many times, and that in many cases the Armenians have by their restless intriguing made themselves directly responsible for the ill-treatment they suffer. One grievance, which was perhaps brought before us more frequently than any other, the law forbidding Armenians to leave Turkey on any pretext whatever, is undoubtedly as real as it is deeply felt by those whom it affects. Religious feeling, on the other hand, at the time of our journey, did not run high, and outwardly, at any rate, perfect toleration was exercised by Moslem to Christian and *vice versa*.

After a stay of two days in Egin we set out for Pingan, near which Greek and Latin inscriptions have been found, in the hope of being able to find some fresh evidence with regard to Roman remains in that neighbourhood. Between Pingan and Egin the western Euphrates flows in a deep narrow trough, which the stream has carved in the high rocky mountains. The route which leads to Pingan on the right bank was reported to be very difficult, and we were advised to take a route on the further side of the river, along which a carriage-road has been constructed for a short distance. After leaving Egin we crossed the river by another bridge, which is situated two or three miles above the bridge we had seen on first entering the town. Each of these bridges has two stone piers which are joined by a step-like construction of wood on which the roadway is laid. From this point the carriage-road continues for about two hours in the direction of Pingan. It was intended to continue it to Kemakh, but the design has never been followed out. We followed the road until it ceases, and then took a path which crosses some high shoulders of the Dersim range and mounts to the height of 5913 feet. Subsequently the path gradually descends and inclines towards the river, which we reached after about seven hours' travelling at Pingan. Between Egin and Pingan the country on the left bank is very sparsely inhabited, and during the whole of this day's journey we did not meet with a single human being. The only object of interest on this route is a small Armenian church of simple design and probably of considerable antiquity, which we passed two hours before reaching Pingan.

Pingan is a village of about two hundred families, all of which are Armenian; it is situated on the side of a hill sloping down to the Euphrates, which is here not more than 50 yards broad, and crossed by a wooden bridge. The inhabitants struck us as being more independent both in character and bearing than any Armenians with whom we came in contact on our journey, and seem to enjoy a fair measure of prosperity. They have an excellent school, served by two French-speaking teachers, and a reading-room furnished with journals and reviews in the Armenian language.

Opposite Pingan, after crossing the river to the right bank, we found, among the gardens, and recopied the inscriptions which have already

been published from here.* From these inscriptions it appears certain that there was once an ancient site at this spot, and its identification, which presents considerable difficulties, is discussed below. From this spot we went in two hours along the banks of the Zimarra Su to Zimarra, an Armenian village of two hundred houses, at the foot of lofty hills. On this, and on a subsequent visit, we made every inquiry for antiquities without obtaining any information, and the place, though from its name there is reason to suppose that it occupies an ancient site, preserves no evidence of antiquity whatever. Taylor † reports that he saw a Roman wall behind the village, but he gives no description of its character, and we neither heard nor saw anything of it. From Zimarra we turned west, with the object of visiting Divrik, which is commonly identified with the ancient Tephrike. Two routes are open to the traveller from Zimarra to Divrik. We went by the more direct path, which goes over a high range of mountains, and came back to Zimarra by the longer but easier path which skirts their base. By the direct route Divrik is not more than seven hours distant from Zimarra, and we stayed the night at Kesmé, an Armenian village, with good school, situated in a pleasant grassy valley. From Kesmé the top of the mountain, which overhangs Divrik, is reached in two and a quarter hours by a difficult path. On reaching the summit (7922 feet) we had a splendid view of the Taurus to the south, the Dersim mountains to the east, and of a broad plain watered by a considerable river, perhaps the Halys, to the west. We then had a weary ride of two hours down to the plain of Divrik. The path is in most places bad, and ends in a very sharp descent. We then crossed a considerable stream, the Chalta Irmak, and reached Divrik, which lies on the further bank.

(To be continued.)

A VISIT TO THE NORTHERN SUDAN. †

By J. THEODORE BENT.

WITH a view to examining the east littoral of the Red Sea, we hired a dhow at Suez, and used this as a basis of operation. The party consisted of my wife and I; Mr. Alfred Cholmley, who took most of our photographs; and Lieut. N. M. Smyth, of the Queen's Bays, kindly attached to our expedition by Major Wingate for cartographical purposes. On two occasions only were we able to get well inland between Ras

* 'Arch. Epigr. Oester,' 1884, p. 239; 'C.I.L.,' vol. iii., suppl. 20, 6748; Ramsay, 'Hist. Geogr.,' p. 314. We found one new inscription in Latin, of which nothing more than the name "Ovidia" can be made out with certainty.

† *Loc. cit.*, p. 308.

‡ Paper read at the Royal Geographical Society, June 1, 1896. Map, p. 428.

Bernas and Sawakin, which journeys I propose to describe in this paper.

We left Suez on Christmas Day, 1895, and in a fortnight reached Halaib, where the Mamour Ismael presides over a few Egyptian troops living in brushwood huts round a whitewashed fort, and from here we made two expeditions. The first was to the ruins now known as Sawakin Kadim, on the coast 12 miles north of Halaib. It is like Berenice, nothing but a mass of mounds, and must at some time or another have been a much larger place. We excavated one of these mounds, but found nothing earlier than Kufic remains, unless the graves, which were constructed of four large blocks of madrepore sunk deep into the ground, may be looked upon as a more ancient form of sepulture. We opened several, but unfortunately they contained nothing but bones. Originally this town must have been built on an island, or an artificial moat must have been dug round it to protect it on the mainland side; this is now silted up, but is traceable all along. Three large cisterns for water are still in a fair state of preservation, and I am told that a Kufic inscription was found here some years ago. There seems to me to be no doubt that this town is the one mentioned by the Arab geographers, Aboulfida and Edrisi, by the name of Aydab, which was a place of considerable importance between Ras Bernas and Sawakin. There are no traces elsewhere along this coast of any other town, consequently we can fairly place it here. Aboulfida says, "Aydab is a town in the land of Bedja; it is politically dependent on Egypt, though some say it is in Abyssinia. This is the rendezvous for the merchants of Yemen and the pilgrims, who, leaving Egypt, prefer the sea route, and embark for Yedda. In other respects Aydab has more the aspect of a village than a town, and it is seven days' march north of Sawakin where the chief of the Bedjas lives." Counting a day's march at 25 miles, this would place it near Halaib, which is 170 miles north of Sawakin. Hitherto, on our maps Aydab has been placed near Mohamed Gol, but, as there are no traces of ruins there except the towers to which we shall presently allude, this position for an ancient town is untenable.

Edrisi tells us, "At the extremity of the desert and on the borders of the salt sea is Aydab, from whence one crosses to Yedda in one day and one night. Aydab has two governors, one appointed by the chief of the Bedja, and the other by the princes of Egypt." From the fact that Aydab is mentioned by none of the earlier geographers, it would appear not to have been one of the Ptolemaic settlements, but a town of purely Arab origin. The people of Bedja, so often alluded to by these Arabian geographers, seem to have had considerable power, and to have occupied all the Sudan and as far north as Berenice, being probably the precursors of the Bisharin Amara tribes, which wander now over this desert country. It is a curious fact that in the Aksumite inscriptions we come across an account of wars and victories by the old Ethiopian

monarchs over the people of Kasuh and Beja to the north of Angaria, which people Professor Müller identifies with the people of Kush and the Bedja alluded to by the Arab geographers.

The mountains behind Halaib look very fine and suggest to the coast, and under the protection of the sea of the straits of the Red Sea Arab tribe, Mohamed Ali Tint, called over the Kasena in the Kasena language, we made an expedition to explore them. We pitched our camp just under Sialah which is the most fertile of the plains and when we were there in February last, just after a severe rain, the slopes were beautifully covered with verdure and the vegetation was dense.



VIEW FROM THE CAMP

THE MOUNTAINS OF THE SUDAN ARE VERY BEAUTIFUL AND THE VIEW FROM THE CAMP IS VERY INTERESTING. THE MOUNTAINS ARE VERY HIGH AND THE VIEW FROM THE CAMP IS VERY INTERESTING. THE MOUNTAINS ARE VERY HIGH AND THE VIEW FROM THE CAMP IS VERY INTERESTING.

The highest of the mountains is the Kasena mountain which is very high and the view from the camp is very interesting. The mountains are very high and the view from the camp is very interesting. The mountains are very high and the view from the camp is very interesting.

hanging down the neck, usually white and stiff with mutton fat. They are medium sized, dark skinned, and some of them decidedly handsome. They are girt only with a loin-cloth and sheet, and every shepherd here carries his shield and his sword. Under a good and settled government they would undoubtedly be excellent members of society, but with the Khalifa on one side and the Egyptian government on the other, their position is by no means an enviable one. Their huts are very small and dingy, being constructed with bent sticks on which palm-leaf matting is stretched; inside they are decorated with their paraphernalia for weddings and camel-travelling, all elaborately decorated with cowrie and other shells, the most remarkable of these things being the tall conical hats with long streamers used for dances at weddings, entirely covered with cowrie shells in pretty patterns. Also the things they use for hanging up food are prettily decorated with shells and strips of red and blue cloth. The family occupying a hut sleep on mats in the inner part, with the usual wooden African pillows, and around the outer edge of the hut are collected their wooden bowls for sour milk, their skins for water, their incense-burners, and their limited number of household utensils. Often when he goes off to distant pasturages a Bishari will pack up his tent and household gods and leave them in a tree, where he will find them quite safe on his return. They principally live on milk and the products of their flocks, water being to them a far more precious article than milk. They are very knowledgeable in the mountain shrubs and herbs, and pointed out to us many which they eat for medicinal and other purposes; but the only one of these which we appreciated was a small red gourd climbing amongst the mimosa branches, resembling a tomato, *Cephalandra Indica*. This they call *gouroud*, their usual word for gourd. Also they are, like the ἀκριδόφαγοι whom Agatharcides places on their coast, large consumers of locusts when in season; they catch them only when they have reached the flying stage, and roast them in the ashes. We saw clouds of locusts in this district, devouring all the scanty herbage and literally filling the air.

Wadi Shellal and the adjacent mountains of Shendeh, Shindoeh, and Riadh form a *cul de sac* as far as camels are concerned, and only difficult mountain paths lead over into the Sudan from here, and, owing to rumours of hostile tribes behind these mountains, we were unable to penetrate very far at this point. Halaib in these last weeks has been threatened by Osman Digna, so it is perhaps as well we went in no further here; and indeed, as far as we could see, the country did not look very tempting or promise much compensation for the difficulties of transit. We were taken by the Batran to a few spots where there had been ancient habitations; they probably belonged to the Kufic period, and were doubtless military stations to protect the small hamlets scattered at the foot of these mountains, when Aydad was a place of some importance, from the incursion of hostile tribes from the interior.

Shibah itself reaches an elevation of 4100 feet; Shimoh, 4500; Kadh, 4800 feet; and Asoraha or Saccara to the south seems, though we did not get its elevation, to be the highest of the group.

Our net results from the excursions from Halaib were more or less of a negative character. The mountain scenery was grand, and the climate exquisite, but from our observations, we came to the conclusion that at no time was this country of much use to anybody, and never had been thickly inhabited, the existence of Aydat being probably due to its position as a caravan port opposite Arabia for the inhabitants of the



BISHARIN WAREHOUSES.

Nile valley. Water is, and probably always has been, very scarce here, and except after the rains this country is little better than a desert.

On our return to Halaib we passed a Bisharin encampment, consisting of half a dozen beehive huts made of matting on rounded sticks. The women were weaving rough cloths at the door of one of them, and were dressed in long sheets which once may have been white, but are now the colour of dirt. They had glass beads and cowries tied to their matted locks, and brass and silver rings of considerable size fastened to their noses; the small children ran about naked, with waistbands of leather straps, on which were strung long agate and carnelian beads, with cowrie danglements hanging down in front. They seem very poor, and the old ladies to whom I gave pinches of tobacco were so effusive in their gratitude that for some moments I feared my generosity was to be rewarded by a kiss.

From Halaib we sailed in three days to Mohamed Gol, where, under the auspices of the Mamour Mohamed, the Egyptian governor, we arranged another and more ambitious expedition into the interior. Mohamed Gol is a trifle more important place than Halaib, and boasts of a fair-sized bazaar, where we were actually able to purchase a few commodities, our stock of which was running short.

To secure our safety, the Mamour summoned to Mohamed Gol three powerful sheikhs, into whose hands he entrusted us, and through whose territories he said we might safely travel. Sheikh Ali Debalop, the chief of the Kilab tribe, was to take us to his district, Wadi Hadai and Wadi Gabeit, some way inland at the back of the Erba mountains, which group we insisted on going entirely round. He was a tall, fine specimen of a Bishari sheikh, with his neck terribly scarred by a burn, to heal which he had been treated in hospital at Sawakin. He is, as we learnt later, a man of questionable loyalty to the Egyptian government, and supposed to be more than half a dervish; this may be owing to the exigencies of his position, for more than half his tribe living in the Wadi Hayet are of avowed allegiance to the Kalifa, and Debalop's authority now only extends over the portion near the coast. As far as we could see, his intentions towards us were strictly honourable, and he treated us throughout our expedition in a much more straightforward manner than either of the other two.

Sheikh number two was Mohammed, the son of Ali Hamed, head sheikh of a branch of the great Kourbab tribe. As his father was too old and infirm to accompany us, he took his place. He was an exceedingly wild-looking fellow, with a harsh raucous voice, and his statements were not always reliable. We have reason to believe that his father is much interested in the slave-trade, and therefore not too fond of Europeans; but these sheikhs by the coast are generally obliged to be somewhat double in their dealings, and, when anything can be gained by it, affect sincere friendship for the English.

Sheikh number three bore the name of Hasan, and is wagdab or chief of another branch of the Kurbabs, and his authority extends over the massive group of Mount Erba and Kokout. He is a man who seems to revel in telling lies, and we never could believe a word he said. Besides these headmen we had several minor sheikhs with us, and two soldiers sent by the Mamour from his garrison at Mohamed Gol to see that we were well treated. Hence our caravan was of considerable dimensions when we took our departure from Mohamed Gol on February 6 last.

The Mamour and his *aide-de-camp* accompanied us as far as an ancient tower called Asafra, about 4 miles inland, and in pathetic tones he appealed to the three sheikhs to see that no harm came to us. Soon after leaving the tower we entered the Wadi Hadi, and encamped near a well of filthy water, not unlike port wine in colour, and full of tadpoles and leeches.

The tower of Anafra is about 20 feet high, built in the same manner of Kufic buildings. It is octagonal, with windows on four sides and no doors, and it had originally been covered with a dome. It struck us, from its position at the extremity of the range of hills to the north of Mount Eria, that its original object had been a watch-tower which would be seen from the sea; had it been a tower of windmills, and the windows, and had it been either a watch-tower or a windmill, it would have had a door. We found several other towers of a similar nature on the island.



CLIMBING A ROCK FACE.

of the island and the surrounding sea, and the view from the summit was very fine.

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One especially, just above our camp at Hadai, placed at an angle where the road into the interior turns to the left, was intended for strategical purposes, and as soon as I saw it I saw a close resemblance in it to the circular fort on the Lundi river leading to the ruins at Zimbabwe. Below this, on a little plain, is another tower similarly constructed to the one near the coast, and several curious circular constructions of dry building with odd curves and bulges, which bore an unmistakable kinship to many of the buildings we found scattered over Mashonaland, and this is the first time since our visit to South Africa that I have been able to trace any genuine similarity of structure.

Taking this country generally, I can safely say it is the most uninteresting and arid country we have ever visited. Our way perpetually led through valleys winding between low brown mountains, the dry river-beds of which were studded here and there with acacia trees. Occasionally one got a glimpse at the majestic spurs of Erba, and occasionally a fantastic rock or a hill-slope a trifle greener than the rest would temporarily raise our spirits. I remember feeling it a relief one day, after the monotony of our rides, when we entered a valley with scarcely any vegetation and entirely filled with sand.

As for water, we had the greatest difficulty about it, and our guides always enveloped its existence with a shroud of mystery. Men would be sent off to the hills with a camel, and return to the camp with skins of water from somewhere, probably from gulleys where rain-water still lay; but until we reached Wadi Hadai, after a ride of six days, we never saw water with our own eyes after leaving Hadi, and then it was only the tiniest pond in a corner of the valley beneath a rock. Each day we rode for five or six hours, on our camels, and each camp at night was more dreary than the last. Sheikh Debalop had one of his wives travelling with him, and one or two servants. She would stick up a mat each night to shelter her from the wind, and her lord and master, with his sword with silver-embossed handle, would recline on the bare ground beside her. The sheikhs generally encamped at a little distance from us, and as they were given to nocturnal conversations and monotonous noises which they called singing, we were glad they were not too near.

We gradually ascended as we followed the valleys inland, until on the fourth day we came to a curious narrow pass which just left room between the rocks for our camels to walk in single file. This pass, which is called Todin, landed us on a small plateau about 2000 feet above the sea-level, where we found a large number of the circular remains. Todin is one of the most important approaches into the Sudan on the north side of the Erba group, and is practicable the whole way for camels, from which we never once had occasion to dismount. Two days more brought us to Wadi Hadai, where we were to halt a while to rest the camels. On the hill immediately above us was the circular fort, with its door to the east, to which I have already alluded, and

in the plain below was scattered and smaller than those seen
 young specimens and many stones of the size of the smallest
 specimens to be seen elsewhere. Also here we saw many pieces of the
 "volcanic" basalt—dark rocks of white stones with a thin yellowish
 surface forming a pattern around them, and a reddish brown
 in the middle was a thin black inscription. These things were
 very familiar to the Arabs who in Nubia are very familiar
 with a kind of basalt.

Among the in this region was very small. We found many
 of them which are in the same of the same kind as the



INScribed-STONES WADI GABRIEL.

only large animal which can live in this and country, and several of
 these fell to the gun of Mr. Smyth and formed a valuable addition to
 our herds. Partridges, pigeons, and sand grouse came in quantities as
 high as thirty to the small pond, but otherwise this country is
 exceedingly sparsely supplied with both animal and vegetable life.

The following day Dehaly took me an expedition to see some
 remains in Wadi Gabriel and I was so interested with what I saw, that
 after our rest we determined to have our camp there, so as more
 thoroughly to investigate the spot. After three nights spent at Hadai
 we started, and a ride of three hours brought us to the valley in
 question. Wadi Gabriel was just a trifle better than those we had
 passed through, having finer trees in the valley beds, and here we saw
 the first colony of natives since leaving Mohamed G. consisting only

of three huts of pastoral Kilabs, which will give an idea of how sparsely this country is inhabited. Debalop's huts were certainly somewhere in the vicinity of Hadai, not more than an hour away, but for some reason known only to himself he would not take us there, though he went there himself every night, and when he joined us on our way to Wadi Gabeit he brought with him another wife, having evidently had enough of the other's company on his journey from Mohamed Gol.

A few miles before reaching the ruins in Wadi Gabeit we were stopped by a few men, who wished to impede our progress and prevent our going there. I never could really ascertain why they did this; some said it was for fear our large party should drink up all their water. At any rate, there was much screaming and brandishing of shields and spears; but we insisted on going on, offering to pay something for water if that was really the difficulty. On our arrival at the spot, and when we had pitched our tents by the side of a tiny pool, almost a pitched battle ensued between our men and the enemy; unearthly yells and clashing of arms made matters look rather serious for a few minutes, and we were advised to have our guns ready in case of emergency. Then affairs became more tranquil, numerous palavers took place, and before the afternoon was out our enemies came round our tents on friendly visits and to ask for medicine. The real truth was that we were now very near, if not quite in, the territory of that branch of the Kilab tribe which owns allegiance to the dervishes, for when Mr. Smyth rode ahead next day to take observations from a hill called Darouba, Mohamed Ali Hamed, who accompanied him, made him dress up in a sheet and pretend to be an Arab woman when they came in sight of some people, whom he declared to be dervishes.

The ruins in Wadi Gabeit turned out to be of a very interesting character. For two miles up the river-bed of the main valley, and up all the smaller collateral valleys, are to be seen the foundations of miners, huts, dry built and small, but representing what must once have been a very large population. The traces of at least seven or eight hundred of these huts can still be seen. Scattered all about near the huts and by the sides of the river-bed were hundreds of crushing-stones, made of rough blocks of a hard igneous rock with a hole in the middle, into which the upper grindstone had been fitted, and a handle for turning had been fixed into the upper stone. These, as will be seen from the photograph, formed very evenly made basins, far neater in character than any crushing-stones I have seen elsewhere.

Traces of slag and burnt quartz, and fragments of quartz with red veins in it, lay about amongst the huts; and the hills on either side, which were formed of igneous rock with deep veins of quartz in it, had been quarried at some time or another to an enormous extent. There was no room for doubt that here we had come across a very extensive ancient gold-mine, and that in ancient times a stream no longer

in which the washing had been performed, ran down this valley, and that all that is now left of it is the small pool near which we had pitched our camp. We were able, in spite of the remonstrances of our sheikhs, to spend two nights in Wadi Gabeit and submit the remains to a



CAMP IN WADI AMBAYA.

close investigation. On a rock which stands out conspicuously in the middle of the valley, and which had been cut away in all directions in following the veins of quartz, I found a rude inscription; all that can be made out of it is the word "rock".

Just above the valley, on a hill about 300 feet above our camp, are the remains of a small dry-built circular fort, which may have served also as a landmark, and closely resembles the one we saw on the hill in Wadi Hadai. This led me to suppose that many of the structures we had seen on our route were landmarks to guide the miners to this spot. We were told of a native who had lately found a gold nugget whilst digging in the sand. The veins of quartz, particularly on the southern side of the valley, are very marked, and the chiselling by which the miners had followed up their veins could easily be seen, and it would appear that the workings here had been of a very extensive character, and the output of gold in some remote period must have been very large.

We were also conducted to a hill about 2 miles from our camp, where there are old cuttings in the quartz, some of them going a considerable depth underground, and blocks of quartz were still standing there ready to be broken up; also we saw several crushing-stones here, but there were no traces of miners' huts, so presumably the quartz was removed to the valley below.

On the rocks near the cuttings we saw also many rude drawings, one of a parrot and several of gazelles, evidently done by the workmen with their chisels.

In referring to the ancient gold-mines of Egypt, we find that a mine existed in the Wadi Alaki, some days south of Kumombo, in the Bishari district. This mine was visited and identified by MM. Linant and Bonomi; there they found an excavation 180 feet deep, handmills similar to ours, and traces of about three hundred miners' huts, also several Kufic inscriptions on a rock. These mines, Edrisi tells us, were twelve days inland from Aidab. So we must look elsewhere for a notice of another mine nearer the Red Sea. Edrisi makes two mentions of these mines of Alaki, in one of which he says they are in a deep valley at the foot of a mountain; in another he alludes to them as on an open plain. On turning to Aboulfida, we find him relating "that Allaki is a town of Bedja; the country of Bedja is in the neighbourhood of the Red Sea. One finds there pearl-fisheries which do not give much profit, but in the mountain of Allaki is a mine of gold, which covers the cost of working. The mountain of Allaki is very celebrated." Hence it would seem that two spots are alluded to both under the name of Allaki, one inland and one near the Red Sea, from which gold was obtained. Professor Gœrje of Leyden, the greatest authority on early Arabian literature, pointed out to me further discrepancies in the distances from Aydab to the gold-mines of Allaki in early Arab geographers, and suggests that the mines found by MM. Bonomi and Linant and ours, though several hundred miles apart, may have belonged to the same reef, and have been known by the same name.

In M. Chabas' *Inscriptions des mines d'or* we have a very interesting dissertation on an ancient Egyptian plan of a gold-mine on a papyrus in

the museum of Turin, of the time of Seti I., which he thus describes :
 " Unfortunately, the name of the locality, which the plan gives us under
 the form *Ti, ou, oi*, the phonetic signs of which form a confused combina-
 tion, does not give us any clue. We must therefore limit ourselves to



PEASANTS, GEBEL KOKUT.

the conclusion that this map, the most ancient that exists in the world, represents to us an auriferous vein in a desert mountain situated to the east of Higher Egypt, and very near the Red Sea. The shells spread on the path leading to it are a proof that the sea is very near ; we can only

think of the Red Sea, the shores of which abound in coral, in sponge, and shells variegated with the most beautiful colours."

There seems every probability that this is the mine illustrated by the most ancient plan in the world, and, curiously enough, the Greek inscription we found seems to give a combination of vowels closely resembling the name given on the plan. On Egyptian inscriptions we constantly read of the gold of Kush, and that the prince of Kush was always interfered with in his work by the want of water, and from the Arab geographers we learn that they were finally abandoned by the caliphs owing to the want of water for washing purposes, and as far back as the reign of Usertesen we get illustrations of their washing process. Diodorus gives us a vivid description of the gangs of captives and convicts employed in these mines, and the miserable cruelty with which they were goaded on to work until they died of fatigue. He also gives some interesting details as to the processes of abstracting gold, which tally well with what we saw on the spot. "They burn the quartz and make it soft," which will account for the quantity of burnt quartz we saw; and again, "they take the quarried stone and pound it in stone mortars with iron pestles." Mr. Rudler examined the specimens of quartz we brought home, and describes it as "vein quartz, more or less ochreous with oxide of iron suggestive of auriferous quartz," and told me that, unless I was going to start a company, there was no necessity to get it assayed; for archæological purposes the presence of gold was sufficiently established.

When at Wadi Gabeit we received a summons from the Mamour of Mohamed Gol to return as quickly as possible, as dervish raids were feared in this direction, and apparently the authorities of Sawakin were somewhat anxious about our safety; but our three sheikhs did not appear to anticipate any alarm, so, not knowing how imminent war was in this part of the world, we determined to adhere to our plan of returning by the west side of Mount Erba to Sellala. It was a distinct disappointment to us only to see the mountains of, and not to be able to penetrate into, the Wadi Hayet, owing to its occupation by dervish tribes. On excellent authority we heard that there were numerous ruined cities there, especially at a spot called Oso; that it was more fertile than the parts through which we had passed; that the Mogarra mountains were higher than Erba; and that it is well watered. Apparently, this important Sudanese valley takes its rise in Bawati, to the south of Erba, and, after making first a bold sweep right through the heart of the Sudan, it reaches the sea to the north of Mount Elba, some 20 miles north of Halaib. This Wadi will form an interesting point for exploration when the Sudan is once more settled, and if these statements are correct it will be of considerable importance in the future development of the country. As for the valleys near the coast, unless they prove rich in minerals they can never be of much value to any one. In Wadi Gabeit,

the only industry now carried on by the very few inhabitants, except the rearing of flocks, is the drying of senna, which grows wild here in considerable quantities. They cut the branches and lay them out to dry on levelled circles; these they take down to the coast and export to Suez.

Our first day's march after leaving Wadi Gabeit was dreary in the extreme, over country covered with dark shale just like a colliery district without the smoke, and with the faintest possible trace of vegetation here and there. Then the next day we wandered through desert valleys, in which everything was dried up, with clumps of grass in it as black as if they had been burnt, and as if they had not seen rain for years.



GEBEL SHELLAL.

All the valleys to the west of Mount Erba seem to be arid except Gumateo or Gumatiwa, a big valley which must have water near the surface, which runs all along at the back of the range, with arid hills from 500 to 1000 feet on either side of it. Vegetation here is more abundant, and masses of arack trees (*salvadora*), supposed to be the mustard tree of the Bible, grow here, the wood of which is much esteemed for cleaning the teeth; and Wadi Gumateo seems to be a favourite nursery for camels. On our way we passed many camel mothers with their infants, feeding on the arack and other shrubs. At the upper end of this valley, where we encamped for a night, Mount Erba, with its highest peak, Mount Nabidua, stands out in bold and fantastic outline. It is a remarkable range as seen from this spot, shutting off like a great wall the Sudan from the Red Sea littoral.

Next day we gradually descended by a narrow valley or khor to the south of the Erba; it is called Wadi Khur. There is an exceedingly fine gorge, with stupendous rocky scenery, and from above some ill-conditioned individuals rolled down large stones at us, and our sheikhs on this account forbade us to encamp underneath the rocks, where we hoped for shade, but made us pitch our tents in the more open parts of the valley. There is much more vegetation here, many tamarisks and other shrubs giving delightful shade. Wadi Khur is the nursery for young donkeys, many of which, we were told, from time to time escape to the higher mountain, and have established the race of wild asses to be found here. The valley, too, has a good many pastoral inhabitants, and in the side gorges are deep pools of lovely water in natural reservoirs, in which we revelled after our somewhat limited supply further inland. Up these gorges we found bulbs, rushes, and water-plants. At our camp here our men busied themselves in decorating their locks prior to reaching Sellala. Mutton fat is beaten in the hands till it becomes like lard, and this material the hairdresser dabs at the curly wigs of his patient; those whose curls become the whitest and stiffest deem themselves the finest.

On February 28 we left Mount Erba behind, and marched for several hours through a sandy desert, where the hills were comparatively low until we reached Sellala. This spot we had been led to believe by Sheikh Ali Hamedi's son to be a perfect paradise; instead we found a wretched arid spot, with one deep and well-constructed well, probably of considerable antiquity, around which were collected a large number of camels. All our promised verdure resolved itself into a few mimosa trees and desert plants, and we encamped in great discomfort in a raging sandstorm, quite out of patience with our guide for his deceit. About 200 yards from the well was Ali Hamed's village, a collection of some six or eight huts, in one of which dwells old Ali Hamed himself, the aged sheikh of this powerful branch of the Kurbab tribe, and the only evidence that we had of greater prosperity was that the women here wear gold nose-rings, and have long gold earrings and more elaborate ornaments hanging from their plaited hair.

Ali Hamed looked very old and decrepit. He has a long hooked nose and exceedingly unpleasant face, and when we saw him we quite believed him to be, as they say, a hardened old slave-dealer. Perhaps the most remarkable fact about him is that he has a mother living, a wizened old crone who inhabits a tiny hut at Mohamed Gol, reputed to be 135 years old by her friends, though I question if she is much over 90. Old age is rare amongst these nomads, and hence they make the most of any specimen they can produce.

We sat in the village for some time, and purchased various camel ornaments—tassels which they hang from their necks, and curious adornments decorated with cowries, which they place before the covered

awning beneath which great ladies conceal themselves when on a journey.

Ali Hamed's son took us the next day on fast-trotting camels to visit some graffiti on basaltic rocks about 8 miles distant. Here we found representations of animals chiselled on the hard rocks, similar to those we saw in Wadi Gabait; we could recognize gazelles, camels, and elephants, and we thought the artist also had intended to depict giraffes, mongooses, and other strange beasts. Scattered amongst these animals are several Sabæan letters, the two ♀ (*ya*) and ♂ (*wa*) being very conspicuous. These scribblings were evidently done by the miners, who



GEBEL ERBA.

were on their way from the coast to Wadi Gabait, having landed at a convenient little harbour close by called Salaka. There is also one of the ruined towers not far from this spot, and the letters point to the fact that some of the miners here engaged must have been of Sabæan or southern Arabian origin.

On the 22nd we left Sellala without regret, to go to Mount Erba and explore its fastnesses before returning to Mohamed Gol, though we felt that our exploration here was by no means original, as the slopes of Erba had been previously visited by Wylde and Schweinfurth, whereas the western side of the range had been hitherto unexplored.

On the way we passed three more of the tall towers similar to those we had previously seen, and felt still more convinced that they were connected with the gold industry in the inland valley, and had been built to mark the roads conducting in that direction.

Wadi Ambaya is the chief valley of Mount Erba, and it runs right into the heart of the mountain. Up this we were conducted by Sheikh Hasan, in whose territory we now found ourselves. This valley is fairly well inhabited by pastoral people; they live in huts dotted about here and there, which are difficult to recognize from the rocks surrounding them, which they would almost seem to have been made to mimic. The slopes of Erba provide pasturage for a large number of flocks at all seasons of the year. Nabidua, the highest peak of the range, reaches an elevation of 7800 feet; Sherbuk and Emere are not much lower, and the outline of the rugged peaks is exceedingly fine. Up in the higher parts of this range there are a great number of ibex, several of which fell to Mr. Smyth's rifle, but we did not care much for the flesh. The natives hunt them with dogs of a breed said to be peculiar to these parts. They are very fond of the ibex horn for making camel-sticks and long pins for the hair; these latter they adorn with bands of silver, and stick through their shaggy locks to use for scratching purposes when they itch. The ibex horns are first covered with grease, then softened in hot water or the fire, and flattened down, making supple and very strong sticks.

Our camp in Wadi Ambaya was a delicious spot, amid fantastic boulders and rich vegetation. On climbing up the gorge behind us we came across a stream with running water, and forming deep green pools among the rocks, and to us, after the arid deserts we had passed through, this spot was perfectly ideal, and the people, too, who dwell up in the higher ground, look infinitely healthier—lithe, active men, who leap like goats from rock to rock, each with a sword and shield. There are several valleys in Erba penetrating into the heart of the mountains, but Ambaya is the principal one.

We were next taken to visit Kokut, a mountain really separate from Erba, but looking like a spur of it, the highest peak of which is only 4000 feet above the sea. Here again one penetrates into the mountain by a curious gorge, with deep pools of water, the rocks about which are, if possible, more fantastic than those of Erba. One comes to chasms, over which the water flows, which look like the end of all things, but by climbing up the side of these one finds the gorge continuing until the very heart of the mountain is reached, where is a little open ground well stocked with water and green. High up here we spent a few hours at a pastoral village, where we found the women busily engaged in making butter in skins tied to a tree; these they shake until butter is produced. They store it in jars, and take it to Mohamed Gol to exchange for grain, but they eat very little except the products of their flocks, and, like the Abyssinians, they do not mind eating meat raw.

We saw some interesting domestic features in this mountain village. The children are given toy shields and spears, with which to practise in early life; and we found here several long flutes with four notes each, the

music of which is weird and not unlike that of the bagpipes, and well suited to the wild surroundings.

Here, too, they play the ubiquitous African game. Two rows of six holes are dug in the ground, and in these they play with counters of camel-dung a mysterious game which I never can learn. Here they call it mangola, and it is played all down the East Coast, from Mashonaland to Egypt, and also, I hear, on the West Coast, and it seems a general form of recreation throughout the Dark Continent.

On leaving Kokut, Sheikh Hasan took us to his well at Tokwai, another deep and presumably ancient well, near which he has his huts; and from there to a spot called Akelabelleh, about four miles from Tokwai, and not far from our original starting-point of Hadi. Here we found slight traces of gold-working. About half a dozen crushing-stones lay around, and a good deal of quartz fragments. Probably this was a small offshoot of the more extensive mines in the interior which had not repaid extensive working.

A rapid ride of three hours from Akelabelleh brought us back again to Mohamed Gol and the close of our expedition, for already the first murmurs of disturbances with the dervishes were in the air, and the Mamour of Mohamed Gol and the officers at Sawakin affected to have been very anxious for our safety. We, however, being on the spot, had been in blissful ignorance of any danger, and further considered that the country we had traversed was not the least likely to be raided by any sensible people, desert and waterless as it was for the most part, and would offer no attractions in the shape of booty, except in the fastnesses of Mount Erba itself. Not one inch of the ground was under cultivation, and the few inhabitants were the poorest of the poor, and I think this is the only expedition we have ever made in which we never once saw such a thing as a hen or an egg.

At Sawakin we visited the young sheikh of the Morghani fraternity, the youthful religious head of all the Sudanese tribes which do not own actual allegiance to the Khalifa. At the instigation of the Government, he had kindly written to the sheikhs of the Kurbab and Kilab tribes to treat us well. So, probably owing to his intervention, we were kept out of trouble.

Before the reading of the paper, the CHAIRMAN (Sir G. TAUBMAN GOLDIE) said: I think I may assume that Mr. Theodore Bent is too well known to the audience in this hall to need the usual introductory remarks from the chair. I will call upon Mr. Bent to read his address.

After the reading of the paper, the CHAIRMAN said: It is now my duty to invite discussion on Mr. Bent's paper. I shall not venture to make many remarks upon it myself, because, though my earliest journeys in Africa were near the regions he has described, it would be old history of more than a quarter of a century ago. I may say that his remarks show that the conservative tribes of the Ababdeh

and the Besharin have not altered since those days. I would also point out the fact that Mr. Bent could only proceed a little distance with evident danger to himself and his party, and had to be accompanied by soldiers. One cannot but remember that in former days travellers from Kordofan to the Red Sea could proceed without guards or soldiers, and in perfect security; while, now, the whole region is shut off from contact with the civilization of the outer world. I hope it will not be for long. I see Mr. Cholmley, Mr. Bent's companion, is here to-night, and I invite him to make some remarks.

Mr. A. J. CHOLMLEY: I have not much to say in addition to what has been already said. My part was chiefly photographing, bird-skinning, and collecting butterflies. The butterflies will be described in the *Zoological Society's Journal*, and the birds in the *Ibis*. At present I cannot say exactly what we have got, as I have been absent from London, and have not been able to get the names of the birds I have collected.

In answer to a question from Mr. WILFRID BLUNT, Mr. BENT said that almost all the trees met with were acacia and mimosa.

Colonel WATSON: I think it is hardly fair for Sir George Goldie to call on me, because the part of the country with which I am acquainted is considerably to the south of that in which Mr. Bent travelled. The mountains are a continuation of the same chain as those on the road between Suakim and Berber. My connection with Mohamed Ghul is simply that about ten years ago I had the fort built there from which Mr. Bent started, and I had the pleasure then of knowing some of the skeikhs who live in that neighbourhood, and a good set of people they were. Mr. Bent seems to think they treated him with a certain amount of doubt, if I may so call it, but I don't think we can wonder at that. They feel that we, the English nation, have abandoned them to the Dervishes. As one of them said to me, "Your Government is like a shepherd who has abandoned his flock to the hyenas." That was the feeling throughout the country, and therefore I don't think it wonderful that when an Englishman goes there, they are a little doubtful as to how to receive him. Of one thing I feel sure, that if the Bisharin and Ababdeh knew for certain that the English Government would come back and establish a settled government there, they would all rise up to help us. As another of them said to me one day, "We want to have a government;" and I said, "What on earth do you want a government for? Can't you govern yourselves?" He said, "That is all very well. What we want is some one above us, to prevent us from cutting one another's throats." They want to have a higher authority, to see that each tribe remains in its own district, and does not interfere with the others, so that each may pursue their own avocations in peace and quiet. I had opportunities of studying the subject on the spot, and I think that if more travellers like Mr. and Mrs. Bent would be so kind as to go into the country and talk to the people, and let them see that all English people do not take the view that the country should be abandoned, in course of time it will be easy to open it up again; and I believe there are great prospects in the country. Mr. Bent pointed out the gold-mines at Mount Erba. Those who have read Mr. Floyer's interesting book on the country between Berenice and Assuan, will see that the whole of the country in days past had gold-mines; and further south, between Mohamed Ghul and Sawakin, there are reefs of quartz which no doubt are also auriferous. I may mention that in 1885, when the New South Wales contingent combined with the English force at Sawakin, there were men who had been accustomed to gold-mining, who examined that quartz reef not many miles north of Sawakin, and who said that they had never seen a reef better worth working, and this has never been worked at all. Further north, at Erba and at Wadi Allaki, it was worked in old

times. I have no doubt in course of time, if the country is opened up, we shall be able to get a good deal of gold, perhaps not an unmixed benefit; but English people are fond of gold-mines. I would therefore direct their attention to the country between Berenice and Assuan.

With regard to the game of munkalah. It is an excellent game, played throughout the Sudan and throughout Egypt. The other day I was in Jamaica, in the West Indies, and found the negro soldiers playing munkalah. I have two or three boards of my own, and have had the pleasure of teaching some of my friends. There are two games: one is the game of the ignorant, the other is the game of the intelligent. The game of the ignorant is suited for children, but the game of the intelligent is good exercise for the brain. You can play it anywhere by scraping twelve holes in the ground, and taking up seventy-two stones. It is a game that can be played anywhere, for one can easily scrape the holes, and there are plenty of stones; there is never any difficulty about that. In conclusion I would express the hope that Mr. Bent's excellent paper will direct the attention of the Fellows of this Society and others to the advantages of opening up this most interesting country.

Sir WILLIAM FARBER: Will you allow me to ask Mr. Bent if he can tell us anything of the nature of the rocks where these gorges have been cut? Is it a rock of the limestone character of Abyssinia, or is it of the character of the sandstone from Nubia, or is it volcanic? I venture to ask this question, as rocks seem to be a striking feature of the country, and I think it would be interesting to know what its geological character is.

Mr. BENT: I am grieved to say I am not a geologist, but I may, at the same time, state that the opinion of others, who know better than myself, is that the rocks in that direction are igneous.

Mr. LOGAN LOBLEY: The sandstone which this gentleman referred to cannot be igneous. This would be the Nubian sandstone, about the age of which there are differences of opinion. The rocks that prevail in that part of the world are the Nubian sandstone, which are, of course, of sedimentary origin, and not volcanic; but as to the age, it is a matter of very great discussion. As I recently had occasion to know, some assign them to the Palæozoic age, and others to the age of the Secondary rocks of this country. Between these two ages there is a vast difference. I think any one who has a knowledge of geology will very much hesitate to say what their age is.

Mr. BENT: I would like to state that, though I mentioned sand, I never mentioned sandstone, because I never saw it.

The CHAIRMAN: I will now call on Major Cunningham, who, although he has just returned from Uganda, is well acquainted with Sawakin.

Major CUNNINGHAM: I can add very little to what Colonel Watson has said, but can thoroughly endorse his statement as to how willing all these chiefs would be, if the Government went to their country, to place themselves in its hands rather than in the hands of the dervishes. When I was there, the orders were not to push into the country. I think also that the lecturer was a little hard on them as regards the slave-trade. When I was there, I gathered that the dhows for the slave-trade were fitted on the Arabian coast, and run across to some quiet harbours on the uninhabited portion. I don't think the sheikhs on the west coast of the Red Sea are very much engaged in that trade. As regards those towers which Mr. Bent mentioned, I should like to say that four years ago I accompanied Sir Charles Holled-Smith on an expedition to another port 100 miles from Sawakin, and came across some similar towers, with no doors, and several in a row. We could not make out what they were, but the natives agreed that they were tombs. As

regards that game of makalla, it is played on the shores of Lake Victoria, and may be said to be the whist of Africa. As regards the photograph of the hairdressing, it is said that when a young man wishes to marry, and meets a young lady, he says to her, "Do my hair." If she does it, she accepts him; if she does not, she refuses him.

The CHAIRMAN proposed a hearty vote of thanks to Mr. Bent.

A JOURNEY THROUGH THE TAKLA-MAKAN DESERT, CHINESE TURKISTAN.*

By Dr. SVEN HEDIN.

On April 24 I woke up at 3.30 a.m. A storm from the west threatened every moment to blow away my tent. The tent was of an excellent quality, and had the usual Indian shape. Mr. Macartney, of Kashgar, had made me a present of it; formerly it had belonged to Lieut. Davidson, who died very young. The wind came down on the camp from all sides, but the western sky was, as usual, clear. To the north there was a high mound stretching west by east, and sloping towards the south at an angle of 31°. To the south there was another parallel with the first, sloping towards north at an angle of 10°. The fine sand which always covers the surface of the mounds here runs in small curly waves in a longitudinal direction. The "desert man" told me in the morning that he was certain that he would come to a region covered with *kamish* and other plants before nightfall, and that we would also find water beneath the surface; this water, he said, would be connected with the Khotan Daria. The whole day we marched on in the thick sand, and got deeper and deeper into the lifeless, unknown desert. The mounds were only 40 to 50 feet high, but they lay in less advantageous position—north by south, and north-north-west by south-south-east—forming what my men called *davan-kum*, or *beles-kum*, that is, sand with a pass running through it. Sometimes we passed small patches of ground that were brown, hard, and free from sand.

The strong westerly gale continued the whole day, driving in front of it clouds of sand. The sand followed the ground, and flew from one sand-comb to the other. Above us the sky was clear and blue; the horizon disappeared in an orange-coloured cloud. From the top of the mounds the sand flew into the air like a yellow spray; one could clearly see the grains dance in the air before they fell down and took, as if by command, the shape of small waves. This sand is very disagreeable; it gets into the mouth, nose, and ears (to protect our eyes it was absolutely necessary to use dark spectacles covered with a net of straw), and, penetrating our clothes, it went right to the skin. Islam-Bey was our

* Dated "Kashgar, October, 1895." Continued from p. 278.

pilot through the mounds. The caravan followed straight in his path. Quietly and solemnly the camels walked in measured steps, and the bells of the caravan sounded regularly and monotonously. Often our pilot stopped on the top of a mound, took a look round, and walked back, saying, "Hetj joll jock" ("No way at all"), "Her taraf jaman kum" ("Everywhere high sand"), or "Kum tag" ("Mountain of sand"). My men all walked barefooted; they were quiet, tired, disgusted with the heat, and disappointed because the sand was so thick. They often stopped to take a drink of water, the temperature of which is 86°. Although the water was warm, they drank it to increase the perspiration, the breeze giving them temporary relief. The black iron tanks were covered with *kamish* to protect the water from the rays of the sun; but the camels now commenced to feed upon this herbage, thus consuming the last natural food available. We kept a sharp look-out from our higher points, but there was no change; only an indefinite sea of gigantic sand-mountains, seemingly standing still, but in reality moving west by south-west. Now and then we passed small hard patches of ground covered with white salt. Now this disappeared entirely, and again we had only fine yellow sand. Not the slightest sign of vegetation, not even a leaf as big as a finger-nail carried along by the wind disturbed this disconsolate and depressing silence of death. The mounds were longitudinal, with their steep side towards west, and as high as 100 feet. I generally used to calculate the height of the mounds when we came to an open space; I remained at the foot, while the caravan proceeded upwards. When the first camel reached the top I took the height, including the camel, and, knowing the animal's correct size, I afterwards calculated the height of the mound. The camels had hitherto performed their work admirably, although the desert was so difficult to get through, that any horse or mule would have died in a couple of days from exhaustion. At this point, however, the camels commenced to manifest signs of fatigue; they stumbled now and then, and especially when they were climbing up the steep side of the mound and had reached the top. When a camel falls, it is impossible to get him up on his legs again except by rolling him down to the foot of the hill, sometimes a distance of 60 feet. We made our camp 12 in a small open space. Distance covered, 8 miles; north 80° east. The place was just large enough for the caravan, and was surrounded by three mounds of irregular shape. The northern mound lay 26° south, the southern 10·5° north, the eastern 27° west and 16° east. The ground here consisted of clay, which was so soft that it formed into dust at the slightest touch. The ground was level, except at the northern end, where it was terraced. It is a question whether these terraces are remains of an ancient river-bed, or have they been formed in course of time in a Central-Asian sea, the bottom of which is now covered by sand? This question must be left unanswered.

During the night, April 25, the temperature went down as low as 46°.

In the morning the atmosphere was filled with sand, on account of the north-easterly wind. I found that our water-supply would only last for two days more, but I had no fear, as I firmly believed that we, before this time, would get out of the maze of sand and reach the Khotan Daria. In one way these flying particles of sand are of value, because they reduce the heat considerably; but at the same time it takes away our view. The sand-combs seem to rise out of the mist like giants, and, although they are quite near us, they seem to be far away. On account of this, one is easily deceived as regards distances and the size of objects. At this point the mounds lay in irregular squares, but still in a longitudinal direction, while those of a larger size still had their greatest width towards north-west by south-east (see Fig. 2). We now seemed to be right in the heart of the desert, everywhere sand, only sand; in front of us we saw whole mountain ranges and plateaus of sand. The mounds were as high as 160 feet to 200 feet. A big black



FIG. 3.—SAND MOUNDS.

camel—fifteen years old, the oldest of the lot—slackened his speed and dropped behind. I ordered a man to lead him, and tried to strengthen him with a little water and hay. The load he carried was divided between his comrades. Towards evening another camel dropped behind, and we had to stop for the day—camp 13. Distance covered, 9 miles; north $80^{\circ}2'$ east. We gave the camels the rest of the day. A wasp, two mosquitoes, and a raven enlivened us a little. They had probably been carried along by the wind, or had perhaps been following us. During the whole of that day I had walked, and afterwards I always did.

April 26.—To-day the sand was more irregular; the steep side of the mounds lay often towards east. Just after sunrise I started out by myself. I took with me compass and field-glass. I walked 8 miles in an easterly direction. About noon the sun was so hot that I stopped to wait for the others, who wearily dragged themselves along in my

footsteps. Enormous mounds lay here north-east by south-west and east by west, thus covering the others. The height of the mounds were from 130 to 160 feet. Small open spaces appeared again, and for a distance of $1\frac{1}{2}$ mile we walked on soft dust without any obstruction. This strengthened my belief that the sand would get easier towards the east. The steep sides of the mounds were always towards the east and south-east, thereby making our march easier. This shape of the mounds proved that at this time of the year westerly winds generally prevailed. In some places the ground is covered with red-coloured *débris* and pieces of stone; these *débris*-covered patches seem to have the same effect on the sand as oil on a stormy sea—the mounds do not come near them.

Camp 14. Distance covered, 10 miles; east $97\cdot3^\circ$ south.

Here we found many specimens of curious minerals, shell-formed pieces of flint, and a kind of stone just like pieces of thin pipe. We found fragments of a skeleton of the wild horse. From the size of the bones, I could see that they had belonged to a wild horse, because they were too big for an ass and too small for our domestic horse. It was a peculiar discovery right in the centre of the desert. An ordinary horse or donkey would not have been able to get through this sand. We could not find the skull or any other bones; the small pieces we found were so brittle that they fell into ashes as soon as we touched them. How long has this skeleton been here? This is a question not easily answered. It is a fact that organic remains, embedded in sand for a length of time, are wonderfully preserved. The skeleton we found to-day may have been here for a number of years. We made another discovery during the following days. We found small white shells, about one-third of an inch in diameter, and small pieces of oyster-like shells, which clearly proved that this part of the country in former years had been under water.

The two men that I had left behind in charge of the two sick camels arrived at the camp late in the evening and reported that the camels had died. All my men were now put to work to find water. About 6 feet below the surface the clay was moist. We had to insert candles in the recesses, and hoist the sand up in buckets. Three and a half feet below the surface the temperature was 61° (in the air $83\cdot5^\circ$, 6 p.m.); at a depth 5 feet below, 55° ; at 7 feet, 52° . Not finding water at a depth of 10 feet after three hours' hard work, we gave it up in disgust. All the animals had, as if by instinct, gathered round the well, waiting for the result. At night the camels received their last drink of water, a little hay, oil, and bread.

April 27.—In the morning we discovered two geese flying in the direction of south-east, their destination probably being the lakes. Small spots were often surrounded by mounds about 33 feet high. I noticed that the mounds here often had a round shape, which showed that the ground underneath was higher, and that these bare spots lay

on hills, where the sand had less strength than down in the valleys. These sand-hills, which may be likened to an enormous gathering of mounds, lay all in the direction of east by west. Very often the mounds had the shape of a crescent, with the convex sides towards the north and the steep incline towards the south. But although we marched on, keeping a steady look-out, we saw nothing but sand. My men told me that we were under the influence of witchcraft, and that we had to continue walking in a circle until we died.

Camp 15. Distance covered $12\frac{1}{2}$ miles; direction, east 100° south. The western and south-western sky was dark and full of rain, but, as the wind blew in a southerly direction, we did not get one drop of it. In one of the tanks there was still a little water, and this we kept like a treasure. My men discussed our chances in that quiet way which is strictly Oriental and not without a touch of humour. They were positive that we should all die here in the desert, first of all the camels, and we afterwards.

April 28.—When I woke up in the morning, there was a terrible storm blowing from north-north-east. The air was full of dust and particles of sand. The tent had not been used, and as the whole camp was nearly buried in sand we had lost many of our things, which had to be found with the aid of sticks. We could not see anything in front of us, and therefore often marched right into big mounds. Thanks to the mist, the air was cool all day; at 1 p.m. the temperature was only 65° . We could only see two camels; the others disappeared in the mist. The wind howled and whirled the sand high into the air. Very often we had to turn round so as not to get choked. Sometimes it got as dark as night, and a dreadful feeling of the hopelessness of our position took hold of us.

At this point, when marching through a difficult pass in an enormous mound, the third camel dropped down, and although he was freed from his burden, two empty water-tanks, he could not rise, and had to be left behind. After a while I ordered a man to try to bring him back, but the man soon returned and reported that the camel was dying. I did not want to kill these animals which were left behind in this way, as I still had a faint hope that we would reach the woodlands of the Khotan Daria, when we could easily return and save them.

After having marched 13 miles in the direction east 96.3° south, we stopped on reaching a bare spot. A couple of days ago we had left behind two overcoats, my bed, and a couple of boxes. In camp 16 we left a number of articles that we could dispense with, such as a fur coat, two rugs, two provision boxes, a stove, etc. The boxes were covered with rugs, and at the top of the nearest mound we planted a pole with a Swedish newspaper wrapped around it. We could see this pole at a long distance. My men were allowed to eat as much as they wanted of the preserved goods. I picked out those that were the least dry—lobster, sardines, raw mushrooms, English soups, etc. The camels

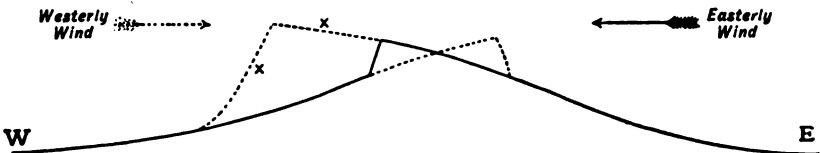
received a supply of hay. In the evening we had two quarts of water left in our iron cans. During the night one was stolen, and half of the other was equally distributed the next morning. The last pint of water, which I wanted to keep for the evening, was stolen during the day.

On April 29 we marched a long distance, but the sand remained the same. The mounds lay north by south as before, and with the steep incline towards west. These sides are generally covered with a steel-grey, bright-coloured dust, which, on inspection, was found to be leaves of shale. These little leaves are very light, and gather in heaps to the leeward. I made an experiment with pieces of paper, and found that these also gathered just in the same places. At this point we were subjected to a very disagreeable optical illusion. Looking east, the eye meets the steep sides of the mounds, which seem to rise above each other like steps; looking west, the eye meets the eastern slopes of the mounds; this leaves the impression that the sand becomes higher and more impenetrable towards east. Although the camels were tired, they kept on all day. They ate very little, and were daily getting thinner. We marched 17 miles; direction, east $93^{\circ}9'$ south. It was mainly due to the north-easterly storm, which filled the air with such quantities of sand, that the temperature the whole day was so low (1 p.m. $58\frac{1}{2}^{\circ}$), and enabled us to cover such a distance. In the evening we fed the camels with all that was left of the potatoes, butter, and onions, as well as with a quantity of hay.

On April 30 we looked in vain for a change in our situation. The sand was just as before; sometimes it formed into squares north by south and east by west. The following sketch will convey my meaning more clearly:—



From the above sketch, it will be seen that the steep incline (a) towards the top of the mound is very short. Both sides of the mound (b and c), however, slope at the same angle, which shows the sharp edge has been formed by the constant easterly and north-easterly winds. This formation of the sand also shows that at other seasons of the year north-westerly and westerly winds prevail. The steep incline (a) is thereby forced eastward, but the time is too short to enable it to reach any height worth mentioning; the height was generally from $1\frac{1}{2}$ to 2 feet. The following sketch shows the alternate state of the mounds:—



If an easterly and north-easterly wind prevailed the whole year round, the mounds would have the shape indicated by the dotted line marked xx, just as in the western part of the Takla-Makan.

My men, as well as the camels, seemed now to be fast losing their strength. Kasim (the "desert man") was so weak that he dragged himself along in the track of the caravan, and only arrived at camp 18 the next morning. The sheep stood the exertion best of all the animals. Our dog Jolldash whined all the time, and scratched the sand with its fore feet. The other dog had already run away on April 23, when we left the lakes. To-day we found a faded leaf "jigge,"* no doubt brought here by the wind—the only sign that we were approaching a forest. The day before we had found the skeletons of a bird and a rat. Both were found on the surface of the sand, showing that the animals had only been recently killed. The rat had probably been dragged to this place by some bird of prey, as it was clearly impossible for it to have come all the way out by itself. Distance covered this day, 12 miles; direction, east 112·6 south. As the camels simply refused to go further, we had to camp on the top of a mound.

May 1.—During the night the temperature went down to the lowest point hitherto experienced, 36°. The day was clear, and in the sun it was very hot. It seemed to me impossible to continue in this way. There is a limit even to great physical strength, and we were fast approaching the limit. In the morning my men drank the last of the rancid oil that belonged to the camels, and as I was suffering myself from thirst, I drank a little of the Chinese brandy which we used for our cooking-stove. The camels were a poor sight; their throats were white and dry, they gnashed their teeth and roared, and their breath filled the air with a terrible stench. We made but little progress; the caravan often stopped, and I dragged myself along far behind. After having marched 3 miles, the camels stopped again, and when I at last reached them I found the old Muhamed Ikhah lying on the ground, crying and praying to Allah to help him. I decided to look for an open space and try to find water by digging, but the camels refused to rise. The sun sent out a terrible heat, and it was impossible for us to move till after sunset. It was 10 a.m. when we pitched our tent for the last time. I lay down in the shade of the camels entirely undressed. Muhamed Ikhah and the "desert man" lay still in the same position where they fell. Towards evening the heat grew less, and with a heavy heart I gave instructions to kill our last sheep. The blood was, however, so thick and had such a bad smell that nobody would touch it. The bladder was emptied; it contained about a glass full of urine. My men mixed it with vinegar and sugar and drank it heartily, especially Islam-Baj, who afterwards vomited violently. The "desert man"

* Jigge = *Eleagnus hortensis*.

chewed a piece of the sheep's lungs, and behaved like a lunatic, always shouting, "Su, su" (water).

Nothing was left for us now but to try and save our lives. Consequently we left nearly all our baggage: our tent with rugs and cushions, my two European saddles, ammunition chest, eight cases containing clothing, books, medicines, two English cameras with more than a thousand plates (of which more than one hundred were developed), and numerous other articles. The following things we took along with us: instruments, diaries, sketch-books, minerals, sand specimens, plant collections, money, a few provisions, overcoat, blanket, tobacco, and, lastly, our guns and revolvers and a few cartridges. These few things were packed in "kurtjiner" (a kind of bag used by the natives), and at 7 p.m. we continued our march. Muhamed Ikhah and "the desert man" lay in the same position where they fell in the morning; I never saw them again. While writing this their families have not yet heard anything about them. The night was dark, and I walked in front with a lantern. By midnight we had marched about 2 miles in five hours. At this point Islam-Baj fell, seized with convulsions. He lay on his back with outstretched arms and legs, and could not speak or move. As we had a hot day before us, I could not afford to lose a single minute of the cool night, and decided to risk everything. I whispered a few encouraging words to Islam, and asked him to follow us as soon as possible (in fact, I did not believe he would live much longer). In company with Kasim, of Yarkand, I hurried along eastward. When we left the dying caravan, the lantern was still burning.

May 2.—We walked without interruption for two hours through deep sand, but by this time we were so sleepy that we had to lie down for a while. The cold night, however, gave us little rest, and we walked on till 9 a.m., when we took an hour's rest. A strong westerly wind made our walk cool and comfortable. At 11.30 a.m. the heat was so intense that I nearly fainted. Here we stopped for the day, and, taking off all our clothes, we buried ourselves in the sand. Our clothes we hung on a spade near our heads to protect us from the sun. The spade Kasim carried in case we should need it for digging; he also carried the hind part of the sheep. I carried two chronometers, a watch, compass, a box of matches, pen, paper, handkerchief, ten cigarettes, a box of lobster, and a box of chocolate. We lay buried alive in the sand till 6 p.m., when we continued our march eastward, very weak and very tired. With many interruptions we walked on till after midnight, when we fell asleep on a mound. We had walked $16\frac{1}{2}$ miles in constant turns, to avoid the most difficult mounds.

May 3.—We started at 5.30 a.m. At daybreak Kasim discovered, in the eastern horizon, a thin streak of green bushes (*julgun*). We immediately laid our course towards this point. We had not been

deceived; it was really the first signs of "land." At 10.30 we met a similar plant. The fresh green leaves showed that the roots reached water. The heat at this point forced us to stop. At 7 a.m. we started again, and at ten o'clock we passed three green tograks, a heavenly sight. The ground was bare, and we started to dig a well, but nearly all of our strength had gone. We used the spade in turns, and even scratched away the earth with our hands. We were, however, obliged to give it up, as the clay did not even get moist. We gathered all the dry branches that lay strewn around and made up a big fire, hoping in this way to attract the attention of Islam, if he was still living, which I very much doubted. We also wanted to attract attention towards the east, in case anybody should happen to be travelling between Khotan and Aksu. We kept up the fire for two hours. We slept soundly near it, not feeling the cool night air.

May 4.—With fast-losing strength we continued at 4 a.m., but reached again a belt of deep sand without tograks, but here and there julgun. At 9 a.m. we were completely fatigued, and rested the whole day in some bushes of julgun. I was not able to move before 7 p.m. I dressed and called Kasim; he angrily hissed out that he was not able to get up. I started out by myself, and walked till 1.30 at night, when I fell down and made up a small fire. A little later Kasim appeared, and we continued till about 3.30 a.m.

Sunday, May 5.—We started at 4.10 a.m. Kasim looked horrible; his cheeks were sunken, his throat was parched, the tongue swollen and white, lips blue, and he vomited constantly. At 4.45 we came to a "dara" (valley), stretching from north to south, where the tograks grew plentifully. We tried once to find water, but without success. Leaving the last belt of sand behind us, we reached at last, at 6.30, a thick forest. Our feelings may be easily imagined. How delightful, after this long march through the desert, again to be surrounded by green trees, to hear the birds sing, and to be able to lay down in the cool shade! At 7.10 we found old footprints of human beings and horses. For nearly two hours we marched southward, when the heat compelled us to stop. In the evening Kasim grew unconscious, and was evidently dying. I had, therefore, to start alone, taking with me the spade. I walked eastward through thick forest. After half an hour's march the forest suddenly came to an end as if cut off by fire, and towards the east the ground was an unbounded stretch of fine, hard sand and clay as even as a floor. Thanks to a few dry stems and branches of tograk which I found, and some winding furrows of sand, I came to the conclusion that this could be nothing else but the bed of the river Khotan Daria. I did not find a drop of water. The sand was just as dry as before. I had arrived during a season when the river-bed is completely dried up, and is awaiting the higher water of the spring.

I had learnt that these rivers had an eastward tendency, and therefore the encroachment on the right-hand river-bank is increasing year by year. In view of these facts I continued my march in the moonshine, and walked $1\frac{1}{2}$ mile in a south-easterly direction, although the last few days we had marched straight eastward. I was sometimes of the opinion that if I followed the opposite bank towards the east, I would reach the river in a shorter time; but by some unknown power—hypnotism, or whatever you may choose to call it—I was constantly driven in a south-easterly direction. At last I saw the first signs of the woodlands along the right river-bank; only a few steps more, and I see a duck fly up in the air with a splash; and the next moment I am standing on the shore of a 120-foot-long lake of clear, cold, delicious water. It is not my intention to trouble the reader with further details of my travels in the desert. It may be sufficient to add that I the same night returned to my servant Kasim, following in my own footsteps. I filled my boots with water and fastened them to the spade-handle, which I carried across my shoulder. After he had drunk a little water and again become conscious, he was still so weak that he could not follow me when I, on May 6, 7, and 8, went southward. I followed the dry river, suffering from hunger, my only means of subsistence being leaves, grass, and frogs. During the march I found several lakes, the distance between each being, however, so large that I had to carry water in my boots, and walk barefooted. Towards evening on May 8, I suddenly came across a shepherd's camp on the right-hand bank (Bukseu), where I was kindly received, and where I enjoyed a good long rest.

That my faithful servant Islam was saved from certain death was the most remarkable thing that had hitherto occurred. After I had left him, he had recovered and continued the march, taking the camels with him, only one of the camels he had left behind dying. He had seen, and had been greatly encouraged by, the fire that we made up on May 3. He had even reached as far as the tograks, had cut a hole in the stem of one of the trees, and refreshed himself by the juice. The camels had eaten to their hearts' desire of the leaves. In the sand-belt to the east he had lost another camel; a third one ran away, taking the course towards the forest; a fourth one was left behind in a dying state near the forest; and with the last, a big white camel, he had ultimately reached the river-bed. His strength was gone, and the river was dry. In despair he lay down, awaiting death, the deliverer from all sufferings. Strange to say, a couple of traders happened to pass, coming from Aksu, and with Khotan as their destination; they found him, restored him to life with water and bread, and on May 10 he arrived with the camel at the camp where I was. Just imagine what this model of a servant had saved from certain ruin. He brought back all my money (Chinese jamber and Kashgarian tenges), all my astronomical and

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meteorological instruments, all my diaries and sketches, and all the minerals from Masar Tagh.

After I had bought horses from a travelling merchant, I sent Islam and Kasim, accompanied by three hunters from Khotan, back to the desert; but they only found the camel that had gone towards the forest. There was no trace to be found of the other camels. I had now to give up every hope of getting back all my valuable instruments. I lost three aneroid barometers and a theodolite, and as I could not travel without this latter instrument, I decided to return to Kashgar *via* Aksu and Ich-Turfan, arriving there June 21.

As it was necessary to telegraph to Europe for all the articles I had lost, I was compelled to wait about three months. During this period I made a trip to the Eastern Pamir, and to the springs of Tagdumbash Daria and Amu Daria. I am greatly obliged to Consul-General Petrovsky and to Mr. Macartney for their kindness in lending me their aneroid barometers and several other necessary articles for the journey. At the same time I may take the opportunity to thank Baron von Richthofen, who had the extreme kindness to furnish me with new and first-class theodolites, which were forwarded to Kashgar.

This trip was a real recreation after the march through the desert. I even had the opportunity of spending a couple of weeks with the members of the boundary commission, who at this time were stationed at the intersection of the Mehman-yolli valley with the Aksu valley. Among these Russians I met several old friends and protectors, from my former visits to Turkistan and the Pamir. I had even the pleasure of forming friendships with some of the Englishmen, that belong to my dearest memories. My conversations with Colonel Holdich were particularly interesting and instructive, as this gentleman had a thorough knowledge of the geography of Central Asia and Tibet, and had rendered invaluable service to the scientific world as far as astronomy and trigonometry were concerned.

RETROSPECT.

During the twenty-three days of our march we had crossed the desert of Takla-makan, and covered a distance of 286 miles, or an average of 12½ miles a day. This course, which takes thousands of turns, and, besides, forms a considerable curve towards north, is much longer than the direct line between the points Yarkand Daria (between Lailik and Merket) and Khotan Daria (by Buksem).^{*} According to Map 60 of 'Stieler's Hand Atlas,' the distance is 175 miles; according to the R.G.S. map of "Tibet and the Surrounding Regions," 188 miles; and according to my own map (see Diagram No. 1), 190 miles.

^{*} On all the maps I have seen published, the name of "Buksem" and nearly all the other names of places near Khotan Daria indicate forests, not towns, as one would imagine from the way the names are printed.

At present I am not in a position to give a detailed description of the geology of the desert and of the movements of the sand-mounds; to be able to do this properly, and to give a satisfactory answer to all the questions arising, it would be necessary to have more material from the southern part of the desert, which I now intend to investigate.

Several archæological discoveries from Lob-nor to Khotan (scientists will probably have heard of Consul-General Petrovsky's remarkable discovery at Borasan, near Khotan, of relics of an ancient Buddhist culture), further historical facts and legends (see Grigorieff's Russian translation of Ritter's book, 'The Eastern or Chinese Turkistan,' the best book written about these districts), and, lastly, the threatened destruction of the southern and western desert towns and plantations, on account of the movements of the sand, all seem to prove that it constantly keeps moving in a south-westerly and westerly direction under the influence of the north-easterly and easterly winds. To this rule there are only a few exceptions, and mostly in the eastern half of the desert, where the mound had the steep side towards east. This would seem to show that the mounds, at least during the last few years, had been under the influence of westerly winds; we found that this latter appearance of the mounds was merely local and temporary.

When we came to the small mountain range laying north-west by south-east, the mounds followed the same direction during our whole day's march towards south-east. Otherwise the mounds lay usually north-south, with a single exception north-west south-east, or north-west south-south-east. At the same time we noticed, in the eastern half of the desert, large series of mounds composed of a number of smaller ones. As aforesaid, I think this is more due to the formation of the ground than to the wind.

From my meteorological observations, it is seen that on our march through the desert we had mostly north-easterly winds; the storms we encountered came also from the same direction. Consequently, the mounds ought to lie north-west by south-east, which, however, is not the case. At the same time, we must not forget that the wind at some other time of the year might be different. The observations also show that we sometimes had north-westerly winds. If this latter wind was just as strong as the north-easterly wind, the direction of the mounds would be exactly longitudinal. We found, however, that they lay mostly north-west by south-east, or north-north-west by south-south-east (see Fig. 3). That the north-easterly wind really is the strongest is clearly shown by the fact that the steep edge of the mounds nearly always lay towards west or south-west, and also thereby that the more or less crescent-shaped mounds usually had the convex side towards east.

During the whole march from the mountain to Khotan Daria (150 miles), we passed mounds sometimes as high as 190 to 200 feet. Every

second or third minute we passed a sand-comb (making a total of 1200 during the whole journey), or four or five mounds on each mile; the distance between the mounds was, therefore, on an average of 600 to 620 feet.

The word "Takla-makan," well known all over Eastern Turkistan, means, in the native language, that part of the desert situated between Yarkand Daria, Khotan Daria, and the road between Yarkand and Khotan. The etymological meaning of the word is still a mystery waiting to be solved. Mr. Petrovsky believes that it is a Chinese translation of "Tukhara," the name of an ancient tribe that lived between Tarim, Khotan Daria, and Lob-nor. (It is a well-known fact that the Chinese people pronounce *r* as *l*; it is impossible for them to pronounce the consonant *r*.) In some places I heard the name "Dekken-dekka" (1001) being used, as it was generally believed that one thousand and one cities were buried beneath the sand. The word "Gobi" is here often used for a desert; usually, however, it is called "dasht," or simply "kum" (sand). There are many curious tales in circulation among the people living on the border of the desert; some of them relate that the sand hides ruins of old cities containing enormous treasures of gold and silver. A great many people make long excursions into the desert in search of these treasures.

During my stay in the forests of Khotan Daria, and while trying to find the things I had lost, I employed a man of the name of Achmed, a hunter from Tavek-kel. This man and his two sons made a living by hunting marals, selling the horns to the merchants at Khotan. On one of these expeditions he had gone in an easterly direction from Tavek-kel towards Keriya Daria. The sand was not very deep, and after six days' march he had discovered what seemed to him to be the remains of a former city, consisting of small one-story clay houses. In these houses he had seen about two hundred corpses, of which, however, only the bones and some rags of clothing (of the Chinese kind) were left. Several of the women wore jewels, in the shape of bracelets and necklaces. He was afraid to touch anything, as he thought he would be punished by some evil spirit. Some of these people had apparently died in a sitting position; others, again, had died while working. I made arrangements with Achmed to accompany me to the place, which he said he would be glad to do. If this story is true, it seems to be clear that this town had been buried in sand by a similar catastrophe to that which laid Pompeii in ashes.

A comparison between Yarkand Daria and Khotan Daria will show that these two rivers are very unlike. There is only one thing they have in common—a narrow strip of woodland runs along the banks of both rivers. In the case of Khotan Daria, the vegetation is wilder and thicker. Along the banks of Yarkand Daria, the woodland is often interrupted by a steppe or by marshes, especially near the mouth.

The woodland along Khotan Daria is without interruption to the junction, and afterwards only for a very short distance. The land between Buksem and Khotan I have not yet investigated. As soon as the woodland along Khotan Daria ceases, the sand commences, without leaving any room for steppe or marshland. I found that the mounds commenced only at a considerable distance from the left bank of Yarkand Daria, or near the holy grace, "Ordan Padisha." From the right bank there is three days' march before deep sand (Chong-kum) is reached, although mounds of different sizes may be met near to Merket.

Yarkand Daria is the principal river of East Turkistan; Khotan Daria is merely an arm of the former. Yarkand Daria is full of water the whole year. In the winter-time it freezes, and the ice covers a considerable part of the land that was flooded during the summer. During the latter season the water rises to a considerable height. As late as September 27 this year, I found near Kusherab (about twenty-four hours from Yarkand), that the river carried as much as 5000 cubic feet of water per second, width 250 feet, and greatest depth 10 feet. In the month of June the quantity of water is considerably larger. On March 8 this year, I found that the river at Lailik carried 2400 cubic feet per second, width 190 feet, and greatest depth 6 feet. In the summer-time the water is of a yellow-greyish colour, and very thick. In March it is clear about 1.9 inch below the surface. At the two mentioned places the river has its greatest depth near the right-hand bank. This was even the case near the town of Tong (the river is here called Baskan Daria), where the water with considerable force rushes against the rocks on the right-hand bank. At this point it is difficult to cross the river. It is only by the aid of "tulums" (goatskin filled with air) that we were able to cross over on September 23.

On the way from Lailik to Ordan Padisha, I discovered two old river-beds parallel to the present Yarkand Daria. This circumstance, in connection with the fact that the river has a constant tendency to encroach upon the right bank, seems fully to prove that it is moving eastward, just as Ann Daria, Sir Daria, and several of the principal Siberian rivers (in accordance with the rules laid down by Baer). With this in view, I crossed the dry river-bed on May 5. On the right bank I found small impressions in the ground containing water. Parallel to the present river-bed, but on the western side, I found a like impression covered with *tograks*. This is, no doubt, part of an old river-bed, which is getting more and more covered with sand. The river-bed takes naturally a very long time to move, and the trees get time enough to follow. Far away to the west of the river we had found a single *tograk* at a considerable distance from the forest. It is not at all unlikely that the before-mentioned terrace-formed clay-hills and the round stones we found also are connected with this moving of the river.

All the year round there is plenty of water in Yarkand Daria, and in many places ferry-boats are used. This is not the case with the Khotan Daria. Only during the early part of the summer is there any water in the river worth mentioning; ferry-boats cannot be used except at Khotan. In the summer-time the traders and the caravans ride through the forest; in the spring, through the river-bed, which is as hard and even as a first-class country road. The flood comes by the end of May or beginning of June, but it takes a long time to reach the mouth. In the autumn the water falls quickly, leaving many ponds, which freeze in winter. The ice melts early in the spring, and causes a small flood, just as in the Yarkand Daria. This only lasts for about three weeks, leaving a muddy bottom, where water may be found at a depth of 1 to 2 feet. When the water gives out in the spring, there remain a number of small lakes in the river-bed, and, as a rule, in places where the current has made channels and formed whirlpools, and where the water has been very deep. In these lakes *tograks* are often found (swept down by the current), and *kamish* grows abundantly around the banks. These lakes may be found as far down as the mouth of the river. Here the caravans usually stop to water their animals. These channels in the river-bed are seldom more than 3 feet below the bed itself, on the right-hand side of the bank; on the left and in the middle the difference is about 1 foot. When the water is shallow the bed remains dry, and is covered with fine sand, not a single stone is to be found; the stream has not had power enough to carry stones as far as Buksem. On the other hand, we found much driftwood, whole branches of the *tograk* lay strewn around. The wooded banks are only slightly higher than the river-bed, and in the summer-time the water is said to extend far into the forest. The two rivers are chiefly different in this respect: the bed of the Yarkand Daria, as far as the junction with the Kashgar Daria, is sharply marked, and has the form of a deep channel; while the Khotan Daria's bed is shallow and wide, and can only be clearly distinguished when passing through the woodlands. The former river carries enormous quantities of water, and has consequently much more power, falling at a greater angle than the Khotan Daria, whose slowly running water naturally has less strength to make sufficient impression. The Khotan Daria also runs through the most difficult parts of the desert, where all the sand which is flying round increases the size of the bed. As the mounds chiefly move south-westward, and more and more fill the Takla-makan, it is also very likely that they are contributing their share towards forcing the river eastward.

From Yarkand to Terek-lenger there are many towns; between Lailik and Maralbashi there are only "otangs" (postal stations), consisting of a few houses and a Chinese postmaster. The high-road runs along the left bank of the river, and consequently this side is the most important. On the right bank lay only the district of Merket, a highly

cultivated piece of land with many houses. This partiality on the part of the people in building towns is certainly not casual, but may be attributed to the fact that the river is moving eastward. The towns on the left-hand side are also situated at a considerable distance from the river. Round the Khotan Daria there are only a few towns in the neighbourhood of Khotan, but not a single house to be found along the river-side. The few people who live here are mostly shepherds, who look after the cows, sheep, and goats belonging to the so-called "bayer" (rich people and merchants) in Khotan. We met a few of these shepherds about a day's march to the north of the point where we found the river, after coming out of the desert. On account of their trade, these people lead a complete nomadic life. They sleep where they find a chance, in the open air or in small huts built of branches and bushes. There are no cornfields along the river, and no Chinese mail is carried this way. Once in a while caravans travel between Khotan and Aksu-Kuchar. From the southern part of Khotan they carry dried grapes, apricots, and other kinds of fruit; also cotton and pats. They return with horses, mules, and Russian groceries. The communication is generally kept up by the aid of mules; I very seldom saw horses and camels used. The tradesmen had to provide themselves with food for the whole voyage, which takes from eighteen to twenty days. The traffic on this road is, however, merely of a local character. The trade of India, Russia, and China goes a different way, and does not touch this part.

A few words to explain the maps.

(1) Shows our march between the two rivers; scale 1 : 1,000,000. I am sorry to say that my astronomical daybook had already been sent home, and I cannot, therefore, make use of any of the five fixed points. I did not take any astronomical observations during the whole latter half of my voyage, because I had to use all my strength to save my life. Next winter, when I return to the Khotan Daria, I intend to take a few observations along the river, particularly at Masar Tagh, and, if possible, at Buksem. The maps are consequently based upon topographical material only. I used the compass from sixty to seventy times a day, which shows how the sand compelled us to walk in constant turns. In order to determine the distance, I measured every morning from a certain point 440 yards; then I noted how many minutes and seconds it took the camels to cover this distance. Every time I took a sounding I noted down the exact time. In the same way I continued during the seven days I walked, after the caravan had been destroyed. Having no astronomical observations to go by, it is probable that I shall have to revise these maps after my return to my native country.

(2) Shows the march between camps 11 and 12, a distance of 2·35 kilometers, scale 1 : 10,000.

I kept a meteorological daybook from April 10, when we left

Merket, and up to May 1, when everything had to be abandoned; consequently, there are no observations taken during the last four days' march. I always took my observations three times a day (7 a.m., 1 p.m., and 9 p.m.), this being the rule at the Russian weather bureau at Musgab, Margelan, Taschkent. To enable me to determine the absolute altitudes, I used a thermo-hypsometer and three aneroid barometers. This thermo-hypsometer, when tested in melting ice on February 19, 1895, showed a temperature of -0.1° . My readings will therefore have to be reduced by one-tenth of a degree. On the same day the readings from Petrovsky's mercury barometer were—

Fuess, 932 = 649.9 mm.; temperature of instruments, 14.7° .

„ 764 = 648.0 „ „ „ „ „ 16.1° .

The readings from his aneroid barometers (Negretti and Zambra) were—

10,843 = 650.0 mm.

10,004 = 646.5 „

The readings from my own three French aneroid barometers were—

(1) 638.0 mm.; temperature of instruments, 13.6° , and 19° in the air.

(2) 647.9 „

(3) 646.0 ..

THE SEYCHELLES.*

By Dr. A. BRAUER.

PRIVAT-DOCENT Dr. A. Brauer has recently spent a year in the Seychelles for zoological and geological researches, with the view of ascertaining the true zoo-geographical position of the group. With the assistance of the English government officials, Dr. Brauer was able to make a thorough examination of not only the chief island, Mahé, but of the more important of the smaller islands. The Seychelles, which lie between $8^{\circ} 33'$ and $5^{\circ} 35'$ S. lat., and $55^{\circ} 16'$ and $56^{\circ} 10'$ E. long., cover an area of about 102 English square miles, and include about eighty islands, only about eighteen being inhabited. The largest are Mahé, Praslin, Silhouette, La Digne, Curieuse, St. Anne, Frigate. The Seychelles, strictly so called, rise from a submarine bank covered by 10 to 40 fathoms of water, the depth increasing suddenly towards the Amirante islands to between 1500 and 2000 fathoms. In contrast to Mauritius and Réunion, which are of volcanic origin, and to the Chagos Archipelago further north, as well as the Amirante, Aldabra, and other small groups to the southward

* Abstract of paper read at the Berlin Geographical Society, June 16, 1896.

between the Seychelles and Madagascar, which are of coralline formation, the Seychelles are wholly composed of granite, and they derive from this certain distinctive characters. The tops of the mountains are mostly crowned by detached blocks, having the appearance of ruins; their slopes rise in high terraces with steep banks, rent by vertical and horizontal fissures, and in places castellated walls and turrets of fantastic outline are formed by the overhanging or precipitous cliffs, and the detached masses surmounting them. In fact, the greater part of the country at all elevations is strewn with granite blocks of every shape and size.

The presence of these boulders is in some respects unfavourable to plant life, but, on the other hand, they prevent the washing away of the fruitful soil by torrential rains. The characteristic appearance of the granite country is largely due to the innumerable gorges cut into the rock by the rain-water and the quartz particles carried along with it. Laterite is the chief product of the weathering of the granite, and only where the primeval forest remains do we find a layer of humus of any thickness on the ground. In the middle and north of Mahé and on Silhouette the mountains rise steep from the sea, and in Mon Plaisir, on Silhouette, the Three Brothers, Mount Harrison, etc., they reach a height of 2600 to 2800 feet, while Morue Seychellois, on Mahé, rises to about 3300 feet. In the other parts of Mahé and on the other islands the mountains are lower, and are faced by wide coast plains of coral sand. The coast being steep, and fringed in most places by a coral reef, the islands are on the whole rather inaccessible; the smaller islands can only be reached by small vessels, and even these are often exposed to considerable danger. The coral reefs are in general of the usual formation: round the living reef, which goes steeply down to from 10 to 12 fathoms, extends a plateau of varying width, consisting of detritus broken off by the surf. Nearer shore the bottom consists of coral sand, and close in the sand is deposited in dunes. Between the live reef and the land is a wide uniform channel. One would naturally classify the Seychelles reef as a barrier reef, but it must not therefore be supposed that it was formed, like many barrier reefs, by a displacement of the coast; for, notwithstanding the common belief that the Seychelles have for long been and are still undergoing depression, raised coral reefs can be found on almost all the islands, and there is abundant evidence that elevation is still going on. It is true that actual uplifting can only be proved definitely for a height of 80 feet, but, from the positions of many of the granite masses, it seems probable that the amount is much greater. On the Aldabras also coral-rag was found at a height of 50 feet.

The climate of the Seychelles is characteristic. As a rule the heat is quite bearable. The south-east monsoon prevails from June to October, and the north-east monsoon from December to April, the hottest

season occurring in the intervening calms during May and November, when the temperature rises to about 95° Fahr. The principal rains fall between December and April. During winter most of the islands receive little or no rainfall, but the higher central parts of Mahé and Silhouette are an exception to this rule, and the rivers are never dried up. The rainfall recorded at Mahé in 1895 was 98·4 inches. Scarcely a day passes on which Morue Seychellois does not appear cloud-capped from Mahé for at least a few hours. Severe thunderstorms are rare. The prolonged torrential rains may in the circumstances give rise to landslips, but the famous slip in 1862 was not of this nature, the cause being rather a local disturbance which dislodged masses of mud and stones.

The Seychelles are exceedingly healthy. Malaria is almost unknown; dysentery and anæmia are more common. The island of Curieuse is specially set apart for the isolation of lepers, and, although the writer saw only four, trustworthy witnesses assured him that the number amounted to as much as 10 per cent. of the whole population. The healthiness of the islands is largely due to the abundant supply of good water. In Mahé alone, no less than 133 rapid streams bring pure water down from the mountains; and only in the south part of the island, and in some of the smaller members of the group, where the sandy plains and ridges absorb the rivers before they reach the sea and so form swamps, is the climate at all unhealthy.

Vegetation is luxuriant. The coast strips are covered with coco-palms. Up to a height of 1000 to 1100 feet, most of the older forest has been cleared, and in some parts only grass and bush grow on these slopes, but others are cultivated, and produce cacao, vanilla, coffee, bananas, pineapples, oranges, lemons, cloves, etc. Considerable tracts of the original forest which once covered the whole islands are still to be found in the centre of Mahé and on Silhouette and Praslin. Most of these are now fortunately government property, and their total destruction is prevented by stringent regulations. The most remarkable plant of the islands is the coco de mer (*Lodoicea seychellarum*), which has its home in certain limited districts in Curieuse and in two small valleys in the north of Praslin, although isolated specimens occur in other islands. The coco de mer does not grow by itself like the coco-palm, but interspersed with other trees. The young palms send out their eight or ten leaves, each 16 to 20 feet long, without a trunk, but the magnificent crown of the older specimens spreads itself over the other trees on a stem 60 or 70 feet high. The seed takes a year to germinate, the first leaves appear in thirty-five years, and seven years are required for the ripening of the fruit. Sometimes one finds two or even three or four double fruits in one shell, and this peculiarity, taken along with the fact that the plants are dioecious, and therefore difficult to cultivate, greatly reduces the commercial value of the tree; at present the fruits are chiefly sold as curiosities at 4s. to 10s. each. Only the strenuous

efforts of Horne, the former director of the Botanic Gardens at Mauritius, have prevented the total disappearance of the coco de mer from the Seychelles and the globe.

Unlike the flora, the fauna of the Seychelles is poor, but it nevertheless includes a number of interesting forms. Rats and mice are a great pest; they destroy nearly every cacao crop, and greatly damage the coffee plants. Thirteen species of birds are peculiar to the islands, and amongst reptilia may be noted the great land tortoise (*Testudo elephantina*), which specially haunts the Aldabras. The fauna is a remainder of that of a once extensive land region, but whether its poverty is the result of deforestation or of some event in the history of the islands is not yet known.

The first settlement of the islands was begun by creoles from Mauritius and Réunion about 150 years ago. In the middle of this century negroes were introduced from the Mozambique coast by the government, as labourers; and besides creoles and negroes, we now find a few Europeans, Indians, and Chinese, numbering in all seventeen to eighteen thousand. The creoles seem to have occupied themselves at first in making the most of the treasures found on the islands, especially the forests, and in piracy; but since the English took possession attention has chiefly been turned to cultivation, first of the coco-palm and sugar-cane, and more recently of cacao, vanilla, cloves, and coffee. Many other plants could be cultivated and larger harvests obtained in so rich a soil, if the creole did not add to his qualities of amiability and hospitality those of drunkenness, untrustworthiness, thoughtlessness, and laziness. Coco-nut oil and vanilla are the chief exports, and will remain so, as they require least labour. Most of the creoles are paupers, or in the hands of money-lenders, and their spendthrift, good-for-nothing habits frustrate most of the government schemes for development. Although the Seychelles have been in English hands for nearly a century, the feeling of the inhabitants has remained almost wholly French. French is the common language; at least, the creoles speak a simplified and degenerate French patois, and the negroes employ a similar tongue. Nor can we expect much change so long as French is exclusively taught in the Catholic schools; and the hands of the government are tied, inasmuch as the treaty taking over the islands includes an undertaking not to interfere with the language or religion. A great blow at the prosperity of the islands has been the discontinuance, during the present year, of the Messageries Maritimes line between Mahé and Aden, and between Mahé and Mauritius. The British-India line between Bombay, Mahé, and Zanzibar is now the only connection with Europe.

The old idea of establishing a sanatorium at the Seychelles has much to recommend it; climate, scenery, and cheap living are all in its favour, and Mauritius, Zanzibar, and East Africa would ensure a large number of visitors.

CAPTAIN YOUNGHUSBAND'S TRAVELS IN ASIA.

CAPTAIN YOUNGHUSBAND has given in a single volume * a connected account of his journeys in Asia. The facts of most of the expeditions recorded in the book have already appeared in the Society's monthly publication ; but apart from the greater fulness with which the incidents of travel are described, the book is distinguished from the hurriedly prepared papers by the results of much thought and study, comparisons, and suggestions made possible by the wide experience which the author has now obtained of nature and man on the mountain border of India and in the plains of Central Asia. It is in many ways an ideal book of travel, full of novelty and adventure, instinct throughout with enthusiasm and with generous sympathy for nature and for men. Simple and straightforward as the narrative is, there is not a word that can hurt the feelings of any fellow-traveller, or even of any Russian or Chinese official, missionary, or servant with whom the author had to do. Captain Younghusband has educated himself by travel in a way which might well excite the envy of a University man, and he has retained a modesty so unaffectedly expressed that we must believe him to be in large measure ignorant of his own attainments. He regrets the want of scientific and technical training with which he started ; but the first journey showed him the necessity for this easily acquired knowledge, and he speedily made himself thoroughly proficient.

Captain Younghusband has published his book because he wishes to allow others to share the pleasure he has himself experienced in visiting distant scenes, and he characteristically says—

“ There are others, too, whom I hope my book may reach—some few among those thousands and thousands who stay at home in England. Amongst these there are numbers who have that longing to go out and see the world which is the characteristic of Englishmen. It is not natural to an Englishman to sit at an office desk, or spend his whole existence amid such tame excitement as life in London, and shooting partridges and pheasants afford. Many consider themselves tied down to home ; but they often tie themselves down. And if a man has indeed the spirit of travel in him, nothing should be allowed to stand in the way of his doing as he wishes. And one of the hopes I have as I write this book is, that it may tempt some few among the stay-at-homes to go out and breathe a little of the pure fresh air of Nature, and inhale into their beings some of the revivifying force and heightened power of enjoyment of all that is on this Earth which it can give.”

The first journey recorded in the book is a short trip to Dharmasala, made on leave from Rawal Pindi in 1884, to visit the home of the

* ‘ The Heart of a Continent : a Narrative of travels in Manchuria, across the Gobi Desert, through the Himalayas, the Pamirs, and Chitral, 1884-1894.’ By Captain Frank E. Younghusband. London : John Murray. 1896.

author's uncle, Robert Shaw, who was, with Hayward, the first Englishman to cross the Himalayas to Turkestan. It was this visit which determined Younghusband to become a traveller, and led him to eagerly accept the invitation of Mr. H. E. M. James to accompany him to Manchuria on his visit to the Ever-White Mountain.* The taste of hard living and rough travelling stimulated the young officer to make a more ambitious effort, and in place of returning to India by sea he obtained permission to go by land, which he did, crossing the Gobi by a new route to Kashgar, and thence re-finding the ancient Mustagh pass and traversing it at imminent risk.†

This journey earned the Royal Geographical Society's gold medal in 1890, and when two years later an officer was wanted to inspect the passes over the Karakoram from the north with reference to the Kanjut raids, Captain Younghusband was intrusted with the service, carried it out successfully, and returned through the valleys of Hunza and Nagar. In 1890 he had an opportunity of making his more important explorations in the Pamirs ‡ on the way to Kashgar, where he spent the winter, and on the return journey he visited the Pamirs again, and had many adventures with Russian officers and others.

The next service recorded was in 1892, when acting as British agent in the newly annexed territory of Hunza, and then in a similar capacity in Chitral. The narrative stops before the war, the record of which, from Captain Younghusband's and his brother's correspondence to the *Times*, forms the subject of another work of thrilling interest.

Two additional chapters are devoted to the missionary question in China, Captain Younghusband strongly upholding the value of the efforts of the best class of missionaries, and to impressions of travel. The last is perhaps the most interesting chapter of all, although its interest is philosophical rather than geographical. It reflects the long lonely journeys through the literally pathless deserts, and the bewildering maze of unknown mountain valleys, the intercourse with people of the most varied character, stolid Chinamen, keen Turki and Afghan merchants, light-hearted faithful Ghurkas, impetuous Kanjuts, and cunning, deceitful Khirgiz; nor are higher types wanting in the chance companionship of European travellers, French missionaries, and Russian officers. The outcome of this chapter is the conviction, based, not on *a priori* reasoning, but on patient first-hand investigation of the evidence, that the supremacy of European powers in Asia is due to no intellectual superiority over native races, but to higher moral character alone.

* *Proceedings R.G.S.*, 9 (1887), p. 531.

† *Ibid.*, 10 (1888), p. 485.

‡ *Ibid.*, 14 (1892), p. 205.

THE GEOGRAPHY OF MAMMALS.*

By W. L. SCLATER, M.A., F.Z.S.

No. V.—THE ORIENTAL REGION.

SECT. 1.—BOUNDARIES OF THE ORIENTAL REGION.

THE Oriental is the smallest of the six regions into which the Earth has been divided for the study of zoological distribution. On the west it includes the great peninsula of India and its attendant island of Ceylon. Its boundary on this side is probably the Suleiman range of hills, though the fauna of Western Sind and the Punjab, which lie between that range and the Indus, is intermediate in character between those of the Oriental and Palæartic Regions. Beyond this range the boundary runs eastwards along the slopes of the Himalayas, at an elevation of from 9000 to 10,000 feet above the sea-level. Above this height Palæartic forms are chiefly met with, below it Oriental forms mostly prevail. Eastwards of Sikkim the boundary between the Palæartic and Oriental Regions cannot be laid down with certainty, owing to our little acquaintance with the eastern part of Tibet and the adjacent portion of China. What knowledge we have of the fauna of this Region is due almost entirely to the celebrated French missionary, Père David, who made considerable researches in Moupin, a small mountain territory, situated at the extreme western edge of the Tibetan plateau. Père David's collections have been mostly described by Milne-Edwards (2). An examination of the list of the mammals obtained by him in this district shows that the fauna has a character intermediate between those of the Oriental and Palæartic Regions, besides containing a considerable proportion of peculiar forms. As, however, most of the Oriental genera extend even further north into the Chinese province of Kansu, and some even cross into Japan, countries which are otherwise well within the Palæartic Region, it will be most convenient to draw the boundary of the Oriental Region to the south of Moupin. Beyond this point again our knowledge of the distribution of the mammals is very scanty, and though the northern part of China appears to be distinctly Palæartic, and the southern Oriental in its affinity, there is, so far as we know, a considerable admixture of forms all over this part of Asia. Probably the most convenient boundary will be found to be that adopted by Wallace—the northern edge of the basin of the Yang-tze-Kiang. This is, no doubt, to a great extent an artificial boundary, but such a fault is unavoidable in the present instance, as there is here no natural frontier to separate the two regions. In addition to the south-eastern part of Asia, the Oriental Region includes within its boundaries all the large and important islands lying between the continent and the Australian Region. The principal of these are the Chinese islands of Formosa and Hainan, the large group of the Philippines, together with Sumatra, Java, Borneo, and the adjacent islands up to Wallace's line. With the exception of Celebes, all these islands are truly continental in character—that is to say, are separated from the mainland by seas of less than 100 fathoms of depth. But Celebes is in some respects anomalous, and will be considered in greater detail below.

The boundary between the Australian and the Oriental Regions called Wallace's line, as having been first pointed out by that distinguished naturalist, runs between the two small islands of Bali and Lombok. Bali is connected by shallow water, and also by its zoological relationships, with Java; while Lombok agrees in character with Timor and the other Australian islands further east. From Bali the boundary of

* Continued from vol. vii. p. 296. Map, p 428.

the Oriental Region runs in a north-eastward direction, between Celebes on the one side and the Sula islands and Gilolo on the other.

SECT. 2.—GENERAL VIEW OF THE MAMMAL-FAUNA OF THE ORIENTAL REGION.

The Oriental Region lies almost wholly within the tropics. The greater part of the country within its borders enjoys a bountiful rainfall, and is covered with luxuriant forests; the only portion which is less favoured being the north-western part of India and the strip of country along the northern shores of the Persian Gulf. In these districts there is very little rain, and desert conditions and a desert fauna, somewhat resembling those of the African Sahara, prevail.

The fauna of the Oriental Region presents, on the whole, a striking contrast to that of the Australian Region. The characteristic features of the latter are doubtless due to the long isolation to which it has obviously been subjected, whereas the Oriental Region as regards its characteristic forms is more nearly allied to the neighbouring Palæarctic Region, from which probably the bulk of its inhabitants has been derived.

The Oriental Region contains representatives of eight out of the nine orders of terrestrial mammals, the monotremes alone being wholly absent, while the marsupials are barely represented by two species of *Cuscus* (phalanger) found only in the island of Celebes, which have been obviously derived from the neighbouring Australian Region.

The edentates, like the marsupials, are also represented only by one genus, *Manis* (the pangolin), which the Oriental shares with the Ethiopian Region.

The Oriental further resembles the Ethiopian Region in the multitude and variety of its forms of ungulates; but while the rhinoceroses, the wild asses, the elephants, and the antelopes are common to both, the Oriental Region possesses in addition deer, wild sheep, and wild goats. These three last-named groups have never established themselves in the Ethiopian Region, though a single goat (*Capra walie*) has penetrated as far as the highlands of Abyssinia. But a considerable number of species of all of them are found in the Palæarctic Region.

Among the rodents of the Oriental Region the squirrels are especially numerous, there being upwards of fifty species found within its limits, nearly all of which are arboreal in their habits.

Although there are no families of carnivores peculiar to the Region, there are a considerable number of genera of civets (*Viverridæ*) not found elsewhere. The bears (*Ursidæ*), too, which are quite unknown in Africa, are characteristic members of the Oriental fauna.

Among the insectivores we find two peculiar families. One of these has been formed for the reception of *Galeopithecus*, the so-called "flying lemur," an animal of about the size of a small cat, with thin flaps of skin between the fore and hind limbs and tail, which enable it to make flying leaps from tree to tree. The other family (*Tupauidæ*) contains two genera. One of these, *Tupaia*, with at least twelve species, is an abnormal shrew with a curious external resemblance to the squirrels, with which, however, it has no real connection. The other, *Ptilocercus*, is distinguished from *Tupaia* by its naked tail, which is provided at the end with a bilateral fringe of long hairs. Both these families are confined to the Malayan portion of the Oriental Region.

Bats are numerous in the Oriental Region, and a very large number of the genera extend eastwards into the Austro-Malayan islands. Only four genera, each with a single species, are peculiar.

Finally, among the primates there are, first, three genera of lemurs. Two of these are peculiar, but belong to the family *Lemuridæ*, and have their nearest allies

in Africa. The third (*Tarsius*), which forms a family of itself, is practically confined to the Region, although it has slightly overstepped its boundaries, being said to occur in one of the smaller Austro-Malayan islands between Sumba and Timor. Besides the lemurine primates, six genera of true monkeys are found in the Oriental Region. Three of these, the proboscis monkey of Borneo (*Nasalis*), the gibbons (*Hyllobates*), and the orangs of Sumatra and Borneo (*Simia*), are strictly endemic; while the other three, although highly characteristic of this Region, have extended their range slightly across its frontiers.

Summarizing these results, we shall find that the Oriental Region contains only two truly endemic and one quasi-endemic families out of a total of thirty-six which occur within its limits. These are the *Galeopithecidae* (flying lemurs), *Tupaidae* (tree shrews), and *Tarsiidae* (tarsiers).

The total number of genera found in the Region is 113, out of which 38 are peculiar; 11 extend their ranges slightly beyond the limits of the Region, and 64 are widely spread. On reducing these figures to an average, it will be found that the Oriental Region contains about 38 per cent. of peculiar genera, or, if the quasi-endemic genera be added, about 45 per cent. In either case, this shows a much lower percentage of peculiarities than has been shown to exist in the three regions previously considered.

SECT. 3.—SUBDIVISION OF THE ORIENTAL REGION.

The Oriental Region, as regards its mammals, may be most conveniently divided into four subregions. These are—

1. The *Indian Subregion*.—This comprises the whole of India proper from the Suleiman range and the lower slopes of the Himalayas to Cape Comorin. A line drawn northwards from Calcutta to the Himalayas, forms the approximate eastern boundary between this subregion and the next. There should also be included in this subregion the island of Ceylon, and probably the narrow, low-lying strip of desert country between the Persian Gulf and the central plateau of Persia.

2. The *Burmo-Chinese Subregion*.—This subregion includes the portion of Sikkim below 10,000 feet, Assam, China south of the northern water-parting of the Yang-tze Kiang, the islands of Formosa and Hainan, and all the countries of the Indo-Chinese peninsula (Cochin China, Siam, and Burma), its southern land-boundary being approximately a line running to the north of the Malay peninsula from Tavoy on the west, to Bangkok on the east, at about 15° N. lat.

3. The *Malayan Subregion*.—The Malay peninsula, together with the great islands of the East Indian archipelago, Sumatra, Java, Borneo, and the Philippines, forms a third division, which may be called the Malayan Subregion.

4. The *Celebesian Subregion*, containing only the island of Celebes.

This subdivision of the Oriental Region differs from that adopted by Wallace in two important points:

(a) In the combination of Wallace's Indian and Ceylonese Subregions into one—the Indian Subregion.

(b) In the transference of Celebes to the Oriental Region, and the formation of a new subregion for its reception. The reasons for these changes may be here briefly considered. First, as regards Ceylon, there are nineteen genera of mammals found in the Indian Subregion, which do not extend their range further eastwards into the Burmo-Chinese Subregion. Of these, thirteen are to be met with also in the Palæarctic and Ethiopian Regions, leaving only six confined to the Indian Subregion. These six are—

(1) *Tetraceros* (four-horned antelope).

- (2) *Antelope* (black buck).
- (3) *Boselaphus* (nylghai).
- (4) *Platacanthomys* (spiny rat).
- (5) *Melursus* (Indian bear).
- (6) *Loris* (slender lemur).

Of these, *Loris* alone is characteristic of Southern India and Ceylon (the Ceylonese Subregion of Wallace). *Melursus* is found in Ceylon, but occurs also all over the peninsula of India from the Himalayas southwards. *Platacanthomys* inhabits the western Ghats and the Animali hills of Southern India alone, and not Ceylon; the remaining three genera are distributed over the whole of the Indian peninsula, but do not reach Ceylon.

There is, therefore, only one genus of mammals confined to the Ceylonese Subregion of Wallace, and this hardly seems to afford an adequate reason for separating it from the Indian Subregion proper. The chief ground for so doing, according to Mr. Wallace, is the existence there of a peculiar family of snakes—the *Uropeltidæ*, or rough-tails, which are entirely confined to Wallace's Ceylonese Subregion. Examples of these reptiles, however, have been recorded in India as far north as Ganjam, in 20° N. lat., and it seems probable that they may eventually be found all over the peninsula south of the great plains of the Indus and the Ganges.

Secondly, as regards Celebes, this island certainly presents a difficult problem to the student of geographical distribution. But so far as the mammals are concerned, the only Australian element in Celebes consists of two species of phalanger and a few bats; the remaining forms, although many of them are very peculiar, have been, doubtless, originally derived from the Oriental rather than from the Australian Region. It seems more logical, therefore, on the whole, to make the island of Celebes a separate subregion of the Oriental rather than of the Australian Region. This position, however, will be considered in greater detail in the account of the subregions.

SECT. 4.—THE INDIAN SUBREGION.

The Indian Subregion has a very close resemblance to the Palæarctic Region. This is more especially the case in the north-western districts, where the country is practically rainless, and the fauna, owing to similarity of condition, is in many respects closely allied to that of the neighbouring desert regions of Central Asia. This desert district of the Indian Subregion includes the narrow strip of coast land to the north of the Persian Gulf, the Punjab, Rajputana, and the northern part of the Bombay Presidency. The greater part of the peninsula of India south of the great plains is occupied by the high, and rather dry, plateau of the Deccan and of Central India, which is covered with a thin and scanty jungle. The southern slopes of the western Ghats and the greater part of Ceylon enjoy an abundant rainfall, and are clothed with a tropical forest, in consequence of which their faunas present many points of resemblance both to each other and also to that of the Malayan Subregion, which has similar physical conditions.

Our knowledge of the Mammals of this and the next subregion is very fairly complete, owing to the excellent handbook recently published by Mr. W. T. Blandford (1).

The scaly anteater (*Manis*), which, with slight specific modifications, is also found in all the other subregions as well as in the Ethiopian Region, is here the sole representative of the edentates. The subregion is well provided with members of the various families of ungulates. Three peculiar genera of antelopes, which are not found beyond the limits of the subregion, have been already mentioned; other genera, such as the gazelles (*Gazella*), the goats (*Capra*), and the sheep (*Ovis*), are

found in other parts of the world as well as in this subregion, but are absent from the remaining subregions.

All the families of ungulates are common to this and the Ethiopian Region, except the deer family (*Cervidae*), the entire absence of which from Africa, south of the Sahara, has already been commented upon.

The rodents do not present any marked features of interest in this subregion. One genus, *Platacanthomys*, a small dormouse-like member of the family *Muridae*, is found only in the hills of Southern India, otherwise the genera are mostly widespread forms.

Among the carnivores the cats are numerous and large. This subregion is the proper home of the tiger, which, however, has extended itself throughout the whole region, and even across its boundaries westwards into Persia and Trans-Caspia, and eastwards far into China and Manchuria. The lion, too, which is essentially an animal haunting dry and comparatively barren countries, is a member of this division of the Indian fauna. It was formerly much more abundant in the peninsula, but is now, apparently, restricted to a small area in Western India.

As in the case with the ungulates, so here, with the exception of the bears (*Ursidae*), all the families of Indian carnivores also range into Ethiopia.

The insectivores of this subregion need not detain us long. A tree-shrew (*Tupaia*), an outlying member of the genus very abundantly represented in the Malay countries, is found in Southern India; the other genera, the hedgehogs (*Echinaceus*) and the shrews (*Crocidura*), are widely spread throughout the Old World.

Among the bats of this subregion we find that not only there are no peculiar genera, but that even the species in nearly all cases have an extended range beyond its limits. Out of about forty species, six alone are confined to the subregion.

The slender loris is found only in Southern India and Ceylon, and is the single representative of the lemurs in this subregion. It is a strange-looking creature, with long spidery arms and no tail. Like most of its race, it is arboreal and nocturnal in its habits.

Indian monkeys all belong to the two large genera, *Macacus* and *Semnopithecus*, both of which are characteristic of the Oriental Region, although two or three species of the former genus have strayed over into the Palearctic Region.

The following table shows, in a succinct manner, the origin and distribution of the mammals of this subregion. The species in the first line, reckoned as "Endemic," are confined to the subregion; those called "Oriental" do not occur beyond the boundaries of that Region; those catalogued as "Palearctic" are common to that Region and to the Indian Subregion; the "Ethiopian," in the same way, are found alike in the Ethiopian Region and the Indian Subregion. The "Paalæogean" genera are those which are found in the Indian Subregion and in more than one of the other three regions of the Old World. Finally, the "Cosmopolitan" genera are those found in the New World as well as the Old.

	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chitrop- tera.	Pri- mates.	Total.
Endemic	0	3	1	1	0	0	1	6
Oriental	0	1	1	1	1	0	0	4
Palearctic	0	1	2	1	0	0	2	6
Ethiopian	1	2	1	2	0	0	0	6
Paalæogean	0	4	4	4	2	12	0	26
Cosmopolitan	0	3	3	5	0	3	0	14
Total	1	14	12	14	3	15	3	62

From the above-given table it will be seen that the relations of the Indian Subregion are about equally divided between the Palearctic and Ethiopian Regions; the largest number of genera are registered as "Palæogean," and far the greater number of these are common to the three regions of the Old World. The relations of this subregion to the Australian Region are very slight; with the exception of *Canis*, it is only among the bats that we find any common genera.

SECT. 5.—THE BURMO-CHINESE SUBREGION.

Owing to our imperfect knowledge of the fauna of the central part of China and of Tibet, it is impossible at present to draw up a complete list of the mammalian genera inhabiting this subregion, and it is consequently out of the question to lay down anything but a very uncertain boundary between this subregion and the neighbouring Palearctic Region. It is probable, however, that even when Western China and Tibet have been thoroughly explored, it will still be difficult to trace an absolute frontier between the Palearctic and Oriental Regions. As we already know, Northern China and Japan contain a considerable number of purely Oriental species. Even the tiger, usually associated with tropical jungles, ranges through China into the valley of the Amoor and the island of Saghalien, where a most severe Arctic winter is met with. In the same way, two species of a typically Oriental genus of monkeys are found in North-East Asia—one (*Macacus speciosus*) in Nipon, the largest of the Japanese group of islands; the other (*Macacus tcheliensis*) in the mountains north of Peking.

On the other hand, a good many purely Palearctic forms extend into Southern China. This is more especially the case among the birds, which have hitherto received a preponderating share of the attention of the naturalists and collectors in the Chinese Empire.

Passing over the edentates, represented, as in the Indian Subregion, by two species of scaly anteater (*Manis*), we come to the ungulates of the Burmo-Chinese Subregion. Here we remark the disappearance of the antelopes, and the great development of the deer family (*Cervidæ*), of which no less than fifteen species are found in this subregion. One of these (*Elaphodus*) is a curious little deer with very small simple antlers and large canine teeth; it was first described by Milne-Edwards from Western Tibet, and subsequently a second species of the same genus was discovered in Southern China. Another small deer, for which a separate genus (*Hydropotes*) has been rightly formed, has no trace of antlers at all, and in other respects differs much from the remaining members of the family. This form is entirely confined to Southern China. A third peculiar genus, belonging to the *Bovidæ*, is the takin (*Budorcas*). This ox-like antelope is also found in Western Tibet, but extends its range southwards to the Mishmi country in the north of Assam. The takin is one of the very few of the large ruminants that has never been met with or shot by European sportsmen, and our knowledge of it is entirely derived from the natives.

The Burmo-Chinese, like the Malayan Subregion, is the most frequented haunt of the squirrel family (*Sciuridæ*). No less than thirty-two species, referable to the genera *Sciurus* (the true squirrel) and to *Pteromys* and *Sciuropterus*, the flying squirrels, are found here alone. The only rodent supposed to be truly endemic is *Hapalomys*, a long-tailed rat found in Burma.

The Burmo-Chinese carnivores do not call for any special remark; one genus alone (*Helictis*) is strictly endemic. It contains three or four species of small badger-like animals with arboreal habits.

Among the insectivores of this subregion only one genus is endemic. This is *Soriculus*, containing some small shrew-like animals found only in Sikkim and

Assam. Several species of mole (*Tulpa*), as also *Anurosorex*, and *Chimarrhogale*, belonging to the shrew-family (*Soricidæ*), extend from the Palearctic Region into this subregion, but no farther.

The bats of Burmo-China need not detain us long; most of the genera are widely spread, and a very large number of them extend across Wallace's line into the Austro-Malayan islands—a distribution shared by hardly any other of the Oriental genera of mammals.

One genus of the *Lemuridæ*, *Nycticebus*, is common to this and the Malayan Subregion; it bears a certain resemblance to the Indian genus *Loris*, but is distinguished by its somewhat stouter aspect and its still more sluggish habits.

Among the monkeys of this subregion, in addition to the two genera *Macacus* and *Semnopithecus*, inhabiting also the Indian Subregion, a genus of the anthropoid apes occurs. This is *Hylobates*, members of which are commonly known as gibbons; they are slender animals, with very long limbs and no tail, and are entirely restricted to the forest districts, being exclusively arboreal in their mode of life.

The following summary of the Burmo-Chinese genera of mammals has been drawn up exactly in the same way as the previous list, except that under an additional heading, "Australian," are placed two genera common to the Oriental and Australian Subregions:—

	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Pri- mates.	Total.
Endemic	0	1	1	1	2	0	0	5
Oriental	0	0	1	4	3	2	2	12
Palearctic	0	4	1	3	3	1	2	14
Ethiopian	1	2	1	2	0	1	0	7
Australian	0	0	0	0	0	2	0	2
Paalæogeon	0	1	3	1	1	11	0	17
Cosmopolitan	0	3	3	6	0	3	0	15
Total	1	11	10	17	9	20	4	72

SECT. 6.—THE MALAYAN SUBREGION.

The Malayan Subregion lies entirely within the tropics, and almost the whole of it is covered with a luxuriant tropical jungle. It is here, consequently, that we find the Oriental fauna in its highest state of development, and with the least admixture of forms belonging to other regions. With the exception of the Malay peninsula, the whole of this subregion consists of islands, which, however, are separated from the main continental mass by comparatively shallow water, so that an elevation of 100 fathoms would obliterate the whole of the sea between the various islands, leaving them connected with one another and with the Asiatic continent. There can be no doubt that these islands, all of which have very rich faunas, have been stocked from the mainland, and that a study and comparison of their component parts will go far to enable us to trace out the past history of the Region, and to find out what changes have taken place from time to time in the distribution of land and sea.

If a careful analysis of the mammalian genera of the subregion be made, it will be found that the greater number of the genera found on the mainland extend to all the three larger islands, Sumatra, Java, and Borneo, and that of the remaining genera the larger proportion are common to the Malay peninsula, Sumatra, and Borneo, and are not found in Java. This would seem to indicate that Java was separated from the mainland before Sumatra and Borneo, and this view is further

borne out by the fact that the individual species of a genus are frequently common to the Malay peninsula, Sumatra, and Borneo, whereas in Java they are replaced by slightly different forms. The Philippines, though connected with Borneo by two chains of islands, so that the straits separating the group from Borneo are nowhere very wide, contain a poor mammal-fauna as compared with Borneo. Only about fourteen genera, exclusive of bats, have reached these islands, and, with one exception, these are all widespread. But it must be recollected that the mammal-fauna of the Philippines is still very imperfectly known.

The following table gives the figures relating to the distribution of the genera within the subregion (excluding bats):—

Number of genera that occur in—

(1) The Malay Peninsula, Sumatra, Borneo and Java	...	...	...	...	...	...	...	...	36
(2) The Malay Peninsula, Sumatra and Borneo	...	...	...	...	...	...	...	...	6
(3) The Malay Peninsula and Borneo alone	...	...	...	...	...	...	...	...	3
(4) The Malay Peninsula, Sumatra and Java	...	...	...	...	...	...	...	...	2
(5) The Malay Peninsula and Java alone	...	...	...	...	...	...	...	...	1

As regards the Philippines, the total number of mammal genera (exclusive of bats) is fourteen, thirteen of which occur also in the Malay Peninsula and islands; one is confined to the Philippines alone; in addition five Malayan genera reach Palawan, a large island lying between Borneo and the Philippines.*

Although the Malayan Subregion does not contain any endemic genera of ungulates, there is one form the distribution of which is so remarkable that special attention must be drawn to it. This is the tapir, one species of which is found in the Malay Peninsula, Sumatra and Borneo, the only other tapirs now existing in the world being met with in Central and Southern America. This is one of the most interesting cases known of what is termed "discontinuous" distribution, but the explanation of it is not very difficult. If we turn to the records of paleontology, we find undoubted remains of the members of the genus *Tapirus* recorded in the Miocene formation of France, in North America, and also in the Pliocene of China. There can be no doubt, therefore, that the tapir, which is a harmless beast, destitute of all means of offence and defence, has been driven out of these northern countries into the tropical forests of South America and Malaya, where the absence of competition has enabled it to survive.

Among the Malayan rodents we find the squirrels (*Sciuridae*) even more abundant than in the last subregion. Two of the species belong to a separate genus (*Rhithrosciurus*) which does not occur elsewhere. There are also two endemic genera of rats (*Muridae*)—one (*Phlæomys*) from the Philippines, the other (*Pithechirus*) from Sumatra and Java.

A genus of porcupines (*Trichys*), which differs from *Atherura* in several important cranial characters, is confined to Borneo.

Three genera of Malayan carnivores are worthy of special mention. One of these is *Hemigale*, not very far removed from the palm-cats, with two species, a

* This calculation was made before Mr. John Whitehead's new discoveries in the highlands of North Luzon (see *Ann. N. H.*, ser. 6, vol. xvi. p. 160) were announced by Mr. Thomas. These embrace five new generic forms of rodents, and there are probably more to follow.

second one having been recently discovered by Mr. Hose in the mountains of Borneo. The second is *Cynogale*, also belonging to the same family. The latter, which is semi-aquatic in its habits, and bears a superficial resemblance to an otter, is found in the Malay Peninsula, Borneo, and Sumatra. A third endemic carnivore, *Mydaus*, which, like the American skunk, is remarkable for the very powerful odour emitted from its anal glands, was originally described from the mountains of Java, but has since been obtained from Sumatra and Borneo.

Of the insectivores by far the most important genus in the Malayan Subregion is the tree-shrew (*Tupaia*), of which at least a dozen species are here found. The tree-shrews are small animals, of the general appearance of squirrels, that live chiefly among the branches of trees, and, like the squirrels, sit on their haunches and use their fore limbs for holding their food. An allied genus, with an elegant double fringe of long hair to its tail (*Ptilocercus*), is confined to Sumatra and Borneo.

Tarsius, belonging to a distinct family of lemurs, inhabits the forests of most of the islands of the subregion, as well as Celebes. It is a small animal, about the size of a squirrel, deriving its name from the fact that the tarsal bones of its foot are enormously elongated.

Among the monkeys, in addition to the three genera found also in the Burmese Subregion, we have the proboscis monkey (*Nasalis*) of Borneo, very remarkable for its large and projecting nasal organ. Finally, in Sumatra and Borneo we find the orang (*Simia*), of which there are probably two species, although this is by no means certain. These large man-like apes, which form, along with the gibbons, and the African chimpanzee and gorilla, the family *Simiidae*, inhabit the low swampy country near the coast; they may be distinguished at once from their African cousins by the reddish-brown colour of the long hair with which they are clothed. In some respects they are the most closely allied to man of the anthropoid apes.

The following is a summary of the Malayan genera of mammals constructed on the same plan as in the case of the other subregions. It will be seen that, while the total number of genera has not increased very much, the number of endemic genera is nearly doubled, as compared with those of the other two subregions.

	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Insecti- vora.	Chiro- ptera.	Pri- mates.	Total.
Endemic	0	0	4	3	1	1	2	11
Oriental	0	1	1	4	3	3	3	15
Palaearctic	0	2	1	2	1	0	2	8
Ethiopian	1	2	1	2	0	1	0	7
Australian	0	0	0	0	0	2	0	2
Palaogeon	0	1	3	1	1	12	0	18
Cosmopolitan	0	3	3	5	0	3	0	14
Total	1	9	13	17	6	22	7	75

SECT. 7.—THE CELEBESIAN SUBREGION.

As already mentioned, the island of Celebes presents a problem of considerable interest to the student of geographical distribution. Celebes is separated from the other islands, both to the eastward and to the westward, by seas of considerable depth. Compared with the other Malayan islands, its fauna is scanty. This fact,

and the very peculiar shape of the island, suggest a possibility of its having been formerly of greater extent, and of having been subsequently reduced by subsidence.

We will first review the mammal-fauna, and then try and deduce, from a study of it, our conclusions as to its past history.

In Celebes alone of the Oriental Region we find representatives of the marsupials characteristic of the Australian Region. These consist of two species of *Phalanger*, which differ from those of the Australian islands only in slight particulars.

The next interesting animal of this fauna is the babirusa, a wild pig remarkable for the enormous size of its upper and lower canine teeth, which form, as it were, two pair of horns on the upper side of the head. Another peculiar ungulate, now generally referred to the widespread genus *Bos*, is the anoa, which shows many primitive characters, and is entirely confined to the island.

The mice and squirrels of Celebes are fairly numerous, and most of the species are peculiar to the island; one rat forms a special genus.

Carnivores are very scarce in Celebes; insectivores have not been recorded at all. The bats, which are numerous, comprise a considerable number of Australian forms, and one peculiar genus.

Among the primates, *Tarsius* of the other Malayan islands is also found in this subregion. Finally, one of the most remarkable of the animals of the island is the black ape of Celebes, belonging to a genus (*Cynopithecus*) intermediate between the macaques and the baboons. *Cynopithecus* appears to have found its way from Celebes into the adjoining island of Batchian, which belongs to the Australian Region.

The following table shows the mammals of this subregion arranged in a form like those of the other subregions:—

	Marsu- pials.	Eden- tata.	Ungu- lata.	Ro- dentia.	Carni- vora.	Chiro- ptera.	Pri- mates.	Total.
Endemic	0	0	1	1	0	1	?1	4
Oriental	0	0	0	0	1	2	1	4
Australian	1	0	0	0	0	2	0	3
Palaëgean	0	1	1	2	1	9	1	15
Cosmopolitan	0	0	2	1	0	2	0	5
Total	1	1	4	4	2	16	3	31

From this summary it will be seen that the total number of mammal-genera that occur in Celebes is thirty-one, the greater number of which (twenty in all) are placed under the headings of Palaëgean and Cosmopolitan. These are all widespread genera, which do not afford us any particular clue to the origin of the Celebesian fauna. Nine out of the twenty are genera of bats, which, as has before been remarked, are by nature much less restricted in their range than the true quadrupedal mammals. Of the remaining eleven only two (*Mus* and *Sus*) have any extensive distribution in the Australian Region; the others, although they have, in one or two cases, managed to struggle into adjoining islands belonging to the Australian Region, can in no sense be viewed as Australian genera.

Of the genera registered in the table as "Australian," two are bats, which have apparently reached Celebes from the more easterly islands of the Australian Region, where they have a wide distribution; the other is the genus *Phalanger*, which has been already alluded to as being the only member of the marsupial order found in the Oriental Region.

The endemic genera of Celebes are four in number, and judging from their

affinities, it is impossible to believe that they have any relation to the animals now living in the Australian Region. Everything points to their being remains of a very ancient fauna, which must have been originally derived from the Asiatic continent.

The presence of the three Australian genera in Celebes does not in any way require the supposition of an ancient land-connection with that Region. This is obviously so in the case of the bato, and the phalanger is a strictly arboreal animal, and might easily have been drifted across a narrow strait on floating timber. On the other hand, to account for the greater proportion of Oriental forms found in the island, we are driven to the conclusion that at some time or other there was some sort of land-connection between Celebes and the mainland of Asia. These are the principal reasons for transferring the island of Celebes from the Australian to the Oriental Region.

SECT. 8.—THE PAST HISTORY OF THE ORIENTAL MAMMAL FAUNA.

Considerable controversy has arisen from time to time with regard to the similarities that undoubtedly exist between the faunas of the Oriental and Ethiopian Regions. Some writers have urged that, in order to account for this, some form of direct land-connection must have existed at one time or another across the Indian Ocean between Southern India and South Africa. Others have maintained that the points of similarity between the two Faunas have been exaggerated, and that no such land-connection is required to account for the facts which can easily be explained on the supposition of a southward emigration of northern forms due to glacial cold.

If we go back to the early part of the secondary epoch of geological time, we find, very well developed in India, a geological system known as the Gondwana, composed of sandstones and shales, which appear to be of fluviatile origin. These beds have long been a problem to geologists, as they cannot be at all satisfactorily correlated with any formations in Europe. In South Africa, however, we find a series of beds, also doubtless of fresh-water origin, known as the Karoo formation, which contain a nearly similar set of fossil remains, and in New South Wales, again, there are formations also agreeing in the characters of their fossils with the Gondwana beds. These facts, according to Mr. Oldham (3), our latest authority on this subject, are "inexplicable, unless there has been a continuous land-communication along which plants could freely migrate, and the conclusion is vastly strengthened when we remember that throughout the greater part, if not the whole, of this period, a very different type of flora was flourishing in Europe and North America."

This land-connection may be of use in explaining the distribution of some of the lower vertebrates, but is of no assistance so far as the mammals are concerned; because in those early times it is probable that none of the families or even orders of our present mammals had arisen. The best-known and richest of the mammal-bearing formations of India are the Manchhar beds of Sind, and the Siwalik deposits lying along the foot of the Himalayas. These beds, especially the latter, contain the remains of an extensive and exceedingly interesting mammalian fauna, which has hitherto been very inadequately explored, and will probably afford abundant opportunities of discovery to the palæontologist of the future.

The number of genera hitherto discovered in these formations amounts in all to about sixty, of which thirty-nine are still in existence, while twenty-five are extinct. Among the recent genera are a considerable number which, though still occurring in Africa, have become extinct in the Oriental Region; such are *Bubalis*, *Cobus*, *Oreas*, and *Strepsiceros*—all genera of antelopes, *Camelopardalis* (the giraffe), *Hippopotamus*, *Loxodon* (the African elephant), *Cynocephalus* (the African baboon), and *Troglodytes* (the chimpanzee), while others still survive in India.

The most remarkable feature, however, of the Siwalik fauna is the fact that, while certain of the genera are only found in Miocene beds in Europe, and not in more recent deposits, the greater number are only known from the Pliocene and Pleistocene out of India, so that it is very difficult to fix the age of the Siwaliks as compared with the formations of Europe.

Beds containing a somewhat similar fauna, in most cases not so rich, have been discovered in Greece, near Athens, at Samos, and in one or two other localities, at least, in South-Western Europe; while north of the Alps nothing of the sort has been found of a corresponding age. The most plausible explanation of the whole matter, therefore, so far as we can say at present, is that the increasing cold at the end of the Miocene and the beginning of the Pliocene times gradually drove the northern inhabitants southwards. It thus came to pass that, at that period of the world's history, the mammalian faunas of Southern Europe, South-Eastern Asia, and of India were so nearly uniform as to constitute these countries, as regards their mammals, one widely extended Region.

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DR. NANSEN'S NORTH POLAR EXPEDITION, AND ITS SCIENTIFIC RESULTS.*

By Professor H. MOHN.

THE object of this expedition was to explore the regions around the North Pole, which had remained quite unknown, on account of the immense difficulties offered to exploration by the physical features, the high latitude, and the severe climate of those parts of our globe. If Fridtjof Nansen has now succeeded in overcoming these difficulties, so as to have crossed a large part of the formerly inaccessible seas round the pole, and has collected such invaluable information and materials for a better knowledge of those latitudes, this was due, first and foremost, to the fact that he is a man of science, who, with his mastery of all that had been done, and the penetration of his genius, could gain an insight into the unknown; and that, with unsurpassed practical sense, he knew how to make the arrangements necessary to secure that his journey, from beginning to end, should be a unique success.

The information about Nansen's journey which we have at our disposal is almost entirely limited to what has come to general knowledge through the press. It is evident that such information contains only the very first rays of the light which will be thrown by the observations of the expedition upon this part of our globe (when they are known in full), but already those first glimpses indicate conclusions of such importance and width, that it will be welcome to the reader to have a preliminary sketch of the scientific results which already have been won by Nansen and his admirable and gallant companions.

As is known, Nansen based the plan of his journey on the assumption that there

* Translated from the Christiania *Morgenbladet*, September 6, 1896.

is, to the north of Franz Josef Land, a current which flows from the open sea in the north of the New Siberia islands to the open sea which lies between East Greenland and West Spitzbergen. Some relics from the wrecked *Jeannette* gave the first hints for suspecting the existence of that current, and its existence was rendered still more probable through the study made by Nansen of different drift products which were found both in Greenland and on Greenland ice in Denmark strait. The *Fram* had to enter that current, and this it succeeded in doing, and, as was foreseen, the *Fram*, embedded in ice, was drifted by the current in the direction indicated. That at certain times, especially in summer, the drift would take place in a direction opposed to its general course, was nothing but what could be, and was, foreseen, in consequence of changes in the direction of the winds in the polar sea, the probability of which was indicated by various meteorological considerations. That continuous drift of the *Fram* for three consecutive years, 1893 to 1896, was thus a considerable triumph for meteorology, and not a small one for oceanography. The ice, under the influence of the prevailing winds, is in continuous drift, and the conception of a fast ice-sheet covering the polar sea has thus now to be abandoned.

During that drift the North Polar expedition made its greatest discovery, namely, a wide deep sea towards the North Pole, having a relatively warm temperature in its depths. From what was known through previous expeditions—the voyages of the *Vega* and the *Jeannette*, as well as the British and American polar expeditions—it was supposed that the North Polar sea is a shallow basin which has ice-cold water in its depths, and is always covered with floating ice. The journey of the *Fram* has astonished the world by its discovery of quite different conditions. From the open sea which lies on the north-west of the New Siberian islands, the sea-bottom sinks deeper and deeper towards the north and west, and we thus have a deep sea-basin which, by its depths attaining as much as 2000 fathoms, appears to be a continuation of our own polar sea, situated between Greenland on the one side, and Norway and Spitzbergen on the other side. Some soundings made in the later part of the journey of the *Fram*, on the north of Spitzbergen, show that the circumpolar basin is continued without interruption in the European polar sea, which was found by the Norwegian North Atlantic expedition to have a depth of more than 2000 fathoms on the south-east of Jan Mayen; and by Nordensjöld's *Sophia* expedition, to have a depth of 2650 fathoms halfway between Greenland and Spitzbergen, and of 1370 fathoms on the north of Spitzbergen.

The depths which were found north of Franz Josef Land and Spitzbergen, in connection with the disappearance of animal life, as also the structure of ice, which were noticed both by Nansen and the *Fram* as they reached their highest latitudes, unavoidably bring us to the supposition that in all probability the sea round the North Pole is a deep sea, covered all the year round with a tightly packed drifting ice.

The distribution of temperature in that circumpolar ice-sea is, however, most remarkable. The upper layer, down to a depth of about 100 fathoms, was found to be everywhere below the freezing-point, the temperature being in places as low as half a degree Centigrade below zero (i.e. between 32° and 31° Fahrenheit, and occasionally as low as 31.1°); that is, a temperature which the North Atlantic expedition found to prevail over most of our North Polar sea (or North Atlantic) in its deepest layers. But in the circumpolar sea, Nansen's expedition found, below the 100 fathoms' level, a temperature *above* the freezing-point, also by about half a degree (i.e. nine-tenths of a Fahrenheit degree), and, so far as may be gathered from the available information, this temperature extends to the very bottom.

However, on the north of Spitzbergen, that passage from temperatures below the freezing-point to temperatures above it took place at a depth of 500 fathoms, and the warmer temperature was maintained to the bottom.

The unexpected discovery of a deep sea, containing water whose temperature is above the freezing-point, in the vicinity of the North Pole, promises to explain a great deal of the life of the globe in a quite different way from what has hitherto been considered as the right explanation. And, by the way, it is worth noticing that just as Nansen's greatest discovery in Greenland—namely, that its interior contains one of the poles of cold of the Earth—was made notwithstanding that his thermometers were not able to show the lowest degrees of cold, so also the sounding apparatus taken on the *Fram* was far from being able to measure depths of 2000 fathoms. But Nansen is the man to create means where there were none, and the sounding apparatus which was made proved to be of the most modern sort; it was made out of iron wire taken from an iron cable.

So far as we can judge for the moment, the only way in which warm water can enter the North Polar basin is that it should come from the current of warm water which the North Atlantic expedition found, in 1878, off the western coast of Spitzbergen. There we have warm water, originating in the warm current of the North Atlantic—the Gulf Stream taken in its widest sense—which has ice-cold water beneath it, and runs over the banks of Spitzbergen northwards towards the sea on the north of Spitzbergen, which was explored by the *Fram* during the last days of its drift with the ice, from which it seems to run further north and east into the circumpolar basin. That in its upper layer this sea is covered with ice, and has a temperature below the freezing point, depends of course upon the length of the winter, but also upon the smaller salinity of the upper layer. One need only think of the masses of fresh water which are poured into that basin by the great rivers of Siberia and Arctic America. The water of the Gulf Stream, being salt, on the contrary, has a greater density when it cools down, and the fresh water remains in the upper layers; it may also, on account of its greater density, flow to the deepest parts of the sea. But that its temperature does not sink below zero is one of the most wonderful phenomena which a North Polar expedition could have discovered.

The numerous and accurate observations on the direction and force of the wind, of the currents and drift of ice on the sea surface, of the temperature and salinity of water at different depths, which were carried on on board the *Fram* all the time, will furnish invaluable material for the study of the mechanism of oceanic currents. We have already a direct connection between the results obtained through the study of the North Atlantic currents by the Norwegian North Atlantic expedition, and those of Nansen's expedition, which are a most brilliant further development of the former. We have, moreover, the pleasure to mention that the Danish East Greenland expedition, on board the *Hekla*, under Captain Ryder, has also noticed on the Greenland banks the presence of warm water beneath the cold—a fact which is of the greatest importance for understanding the conditions which were found by the *Fram*. And we are also sure to obtain more information for the comprehension of the North Atlantic currents from the just-returned Danish *Ingolf* expedition, under Commander Wandel.

When we think, at the same time, of what we have lately learned about the influence exercised by the sea-currents of the polar sea and the distribution of temperature over its surface upon the weather in Northern Europe, and especially in Norway and Sweden, we are entitled to expect from all these sides such new data as cannot but improve our present system of weather forecasts, and thus will have a substantial economical importance.

This brings us to consider the importance of Nansen's North polar expedition for meteorology. The members of that expedition, provided with the very best meteorological instruments, have uninterruptedly made meteorological observations. For three years the *Fram* was in this way a first-class meteorological station, at which, besides the reading of the usual instruments, self-registering apparatus recorded at every moment the pressure of the air and the temperature. All instruments were continually verified and compared with the standard instruments. We need hardly, therefore, insist upon the importance which the three years' work of a standard meteorological station, situated within 4 to 5 degrees from the pole, will undoubtedly have in extending our knowledge of the conditions of the atmosphere, both in those regions and elsewhere. We can already trace the influence of the relatively warm deep sea in the fact that the lowest temperature observed on the *Fram* was -52° Celsius (-61.5° Fahr.), while in the Kara sea we find already -53° (-63° Fahr.), and at the Russian station at the mouth of the Lena -70° Celsius (-94° Fahr.) was observed.

For both the meteorologist and the hydrographer, the sledge-journey of Nansen and Johansen and their wintering are of the greatest importance. They have ascertained that between Franz Josef Land and the latitude of $86^{\circ} 14'$ there is a sea, mostly covered, of course, with ice, but no land. And during the whole of that journey they have continued to make meteorological observations, just as Nansen made them on the Greenland ice-cap.

For the interval of time from March, 1895, till the summer of 1896, meteorologists will thus be enabled to construct daily weather charts embodying the observations of the *Fram*, of Nansen and Johansen, of Jackson on Franz Josef Land, and of Ekroll in East Spitzbergen, which charts will represent a quite unique development of polar studies. It will be most interesting to see if it be possible to find any connection between the weather in that part of the polar regions and the weather which we have had at the same time. We have had both a cold and a mild winter during these two years.

A series of researches, whose chief interest is for pure science, but which also have a certain practical bearing, were carried on on board the *Fram* concerning the magnetism of the Earth. Most perfect instruments, which had been made for that special purpose, had been taken by the expedition. It is the venerable director of the "Deutsche Seewarte," in Hamburg, Prof. Dr. G. Neumayer, to whom the expedition owes its thanks for having been provided with such instruments, and in the able hands of Lieut. Scott Hansen they were continually in use. The calculation of the magnetical observations which were made at the international circumpolar stations during the years 1882-83 has shown that our knowledge of the Earth's magnetism is utterly incomplete, and that observations in both the North and South Polar regions are badly wanted. Now, the observations on board the *Fram* will fill up, at least, one of these gaps. They are looked forward to by physicists with the greatest interest.

Moreover, it is known that with the introduction of iron ships, the use of the compass becomes much more difficult than it formerly was on wooden ships. In order to be able to use the compass on board an iron ship, we must know the distribution of magnetism on the Earth's surface, and its variations from spot to spot, and in time as well. These variations must be calculated by the navigator in advance; but to do that, we must be in possession of the most exact knowledge of the laws of terrestrial magnetism. The observations on board the *Fram* will accordingly be of the greatest value for both science and practice.

In connection with the above, we may mention the numerous observations of auroræ, which were made on board the *Fram* by Dr. Blessing, who also took an active part in the deep-sea observations and everything relating to them.

We are also happy to say that the astronomical observations which were made on board the *Fram*, as well as during the sledge journey of Nansen and Johansen, for the determination of latitudes and longitudes, were mostly made with the instruments prepared at Christiania, by the instrument-maker, C. H. G. Olsen, who has also constructed the Mohn anemometer, with which the velocity of the wind was measured at the regulation hours.

Of purely geographical results, we may name the discovery of the new island in the northern part of the Kara sea, and of several new islands off the coast of Siberia. Payer's map of the northern part of Franz Josef Land was found by Nansen quite misleading. It will be Jackson's work to give us a new map of that archipelago.

Nansen has also made some geological observations on the north coast of Siberia, which bear testimony to its having been under an ice-sheet, while it was formerly maintained that Siberia had not undergone glaciation.* The observations upon the life of animals and plants evidently could not be many or of striking importance, on account of the very character of the regions which were explored. But it is not implied by this—the contrary being far more probable—that a biologist like Dr. Nansen should not have had opportunities for making such observations as are sure to throw an interesting light upon the conditions of organic life in the polar seas and on the deserts of the polar ice.

And, finally, there is one result, of the highest scientific interest, which must be mentioned, and which we owe to Dr. Nansen. He has found out, and proved the advisability of, new methods for journeys through the wilderness of the North Polar seas. First of all, we must mention the design of the *Fram*, which he invented, and which was so successful that the ship proved in all respects to be what Nansen's experience, forethought, and practical sense expected it to be. Nansen has next foretold and shown what may be achieved with dog-sledges and kayaks for progress over the polar sea, with all its even and uneven surfaces of ice, and its open spaces between the ice and near the islands. And he has proved that it is possible for men to maintain life and energy enough to be able to do scientific work, by adopting a mode of life which corresponds to that indicated by Nature itself to the Eskimo inhabitants of those northern parts of the Earth. Of course, this life necessitates such men as Nansen and his comrades.

It is also most remarkable to learn how all the members of the expedition kept well, and fit for work, during the whole duration of the expedition. This is a brilliant proof of the excellent way in which Nansen, aided by the best scientific advice, organized his expedition.

It will take not a little time before the observations made during Dr. Nansen's expedition can be published, after having been worked out in a scientific way, so as to be ready to be taken in connection with other observations of the same kind. The work which will contain all these results will be a shining light in science, and we shall have the joy of knowing that that light shines from our mother-country, and that it is due to one of its most gallant sons, Fridtjof Nansen.

* Baron Toll's observations had already been to the same effect.—*Note by the translator.*

THE MONTHLY RECORD.

EUROPE.

The Distribution of Rainfall in North-Western Germany.—The variations of rainfall are so puzzling and mysterious in all their ways, that it is not surprising that many rainfall maps suffer greatly from the corrections applied to the data on which they are founded. It is known in a general way that the rainfall of a country usually distributes itself according to certain more or less definite types, but our knowledge of these types is rarely accurate enough to make, for example, the calculation of the mean rainfall at a station from a few years' observations by differentiation at all a safe process. It is, however, just such knowledge that is of supreme practical importance. For example, it is frequently assumed that in these islands the rainfall increases by about 2½ per cent. for every 100 feet rise above sea-level, an assumption that a very small amount of investigation will show to be very wide of the mark in any particular case; it seems that west of the main watershed the rate of increase is usually a great deal less, and east of it a great deal more, although it is almost impossible to assign a general numerical quantity which has any meaning. Again, a knowledge of local variations of rainfall may be of immense value in applying the general terms of district weather forecasts, as appears from Mr. Dickson's 'Report on the Hay Harvest Forecasts' to the University Extension College at Reading (published in 'Report of Meteorological Council,' 1895). The last instalment of the *Forschungen zur deutschen Landes- und Volkskunde* consists of a paper by Dr. Paul Moldenhauer, of Kiel, on the distribution of rainfall in North-Western Germany, and is a model of careful statistical research. Dr. Moldenhauer confirms the general features of the distribution worked out by former investigators, and the more abundant material at his disposal enables him to add some conclusions of a general nature which we should like to see extended to this country. Of the two factors usually considered as modifying rainfall—distance from the sea and elevation above it—the latter is relegated to a less important position, and made to yield to a third, viz. exposure with respect to the rain-bearing winds. The favourable or unfavourable conditions of exposure can evidently not be expressed numerically: Dr. Moldenhauer contents himself with a division under a number of heads; distance from the source whence the rain-bearing winds derive their moisture; amount of shelter received from mountains, not greatest immediately on their lee side, but at some distance; position of mountains to leeward, the rainfall being sensibly increased even some distance away on the weather side of a range; position of the station itself on a slope, the rainfall being greater on a weather than on a lee slope *at the same elevation*. The increased rainfall on the weather side of a small range may extend for some distance on the lee side, but if the summit is a plateau the rainfall gradually decreases from the weather side leewards. The conditions may be summed up in the statement that places at the same elevation receive more rain the more freely they are exposed to the rain-bearing winds, a result not nearly so much of a truism as it looks. By comparing stations at equal elevations only is it possible to get rid of the effect of altitude, and obtain a comparative view of "freedom of exposure." Dr. Moldenhauer finds, for the area with which his paper deals, that the west and north sides of the Rhine hills north of the Moselle and Lahn are the "most exposed," then come in order the Teutoburger Wald, the Harz, the Hunsrück, Spessart, Vogelsberg, the rest of the Rhine hill country and the Solling, and finally the Thüringer Wald and the Rhön-gebirge. A paper by Herr Otto Rubel, in the *Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen*, on the rainfall of Upper Alsace, forms along with Dr. Moldenhauer's

an important contribution to our knowledge of the climatology of Western Germany. Herr Rubel is not, of course, in a position to make generalizations extending beyond the restricted area which he makes his special study, but he elucidates some points of interest with regard to the seasonal distribution of the rainfall in Alsace-Lorraine. On the lower plains summer is the wettest season of the year, and winter the driest, while the hill stations show most rainfall in autumn and least in spring, and the intermediate stations indicate a gradual transition from the one type to the other. Snow is most frequent in Upper Alsace in December, with, however, a secondary maximum in March. Thunderstorms occur oftenest in June, and they are rare in winter.

Temperature Observations in the Weissen-See.—The *Geographische Abhandlungen aus den Reichslanden Elsass-Lothringen* contains a short note by Herr H. Hergesell on temperature observations made in the Weissen-See (Alsace Lorraine) at Urbeis during August, 1893, with the view of ascertaining the origin of the "Sprungschicht," or layer of rapid temperature change found at varying small distances below the surface. The observations indicate that even with very strong insolation the position of this layer does not change during the day, and that during the night the surface falls to a temperature as low as the lowest observed on the under side of the "Sprungschicht," thus supporting the conclusion that the existence of this layer is due to the sinking of the surface waters cooled by nocturnal radiation.

The Pitch-wells of Keri in Zante.—Prof. Constantine Mitzopoulos, of Athens, communicates to the seventh number of *Petermanns Mitteilungen*, 1896, some remarkable facts and theories connected with a recent eruption of these wells in the extreme south of the island of Zante, which were described from personal observation by Herodotus, and have frequently been described since. The Zantiotes believe that in these wells is to be found the cause of the frequent earthquakes with which their island is visited, and Prof. Mitzopoulos is convinced, from facts that he has recently ascertained, that, though wrong in this idea, they are right in regarding these wells as a sign of the volcanic nature of their island. During an eruption of these wells which took place on the 13th (25th) of January, 1895, a number of stones were shot out of the well, and a small sackful of these stones were sent to the minister of the interior. On examining these stones, Prof. Mitzopoulos found them to be pieces of pumice, a substance unknown on the Ionian islands or in the west of Greece generally. They were of about the size of an apple, porous, and floated on water, and most of them were impregnated with a carbonaceous substance, and coated over with a crust of the nature of obsidian. From the inquiries which Prof. Mitzopoulos caused to be made on the spot, he is satisfied that the pumice is of local origin, and must be derived from a Tertiary, perhaps pre-Pliocene volcano, now buried to a great depth under later deposits. He believes that the large bay at the south end of Zante must represent the crater of this volcano; that the place where the pitch of Keri is produced must lie at a greater depth than the accumulations of pumice; and that the buried volcano is not quite extinct, but periodically emits hot gases, which not merely burn and coke the layers of petroleum and pitch, but also bring about a superficial melting of the lumps of pumice accumulated at a higher level.

The Pays de Caux.—The chalk cliffs of France, from near the mouth of the Somme to that of the Seine, are the seaward limits of the Pays de Caux. A slight elevation in the west has fractured this land perpendicularly to the coast. When the fissure is large it forms the thalweg of a river, at whose mouth a town has sprung up, such as Tréport, Dieppe, Saint-Valéry, and Fécamp; and the narrower rifts may allow a road to reach a fishing village, resorted to by Parisians in the

summer months. The fissure is often prolonged out to sea, and forms a channel for ships, recognizable from the top of the cliffs by the different shade of the greenish water, and often by the direction of the smoke of the towns. Inland the country is undulating; the light porous soil, watered by abundant rain, supports rich pasture, on which the rows of cows, each fastened to a stake, can eat their daily circle of grass almost all the year round. The sea-breezes are strong, and trees grow in the hollows. The vine of the south is replaced by the apple-orchards, which surround the scattered farm buildings and prevent any extended view from them. This is in marked contrast to the compact wooden farm buildings of the Vosges, open to the south, but protected by the pine forest on the north; or to the red-tile stone buildings of Provence, with a screen of reeds, up which the vines climb and yield a welcome shade. Every land, as Professor Thoulet points out in an article on the chalk cliffs of Normandy in the May number of the *Revue Scientifique*, has its characteristic buildings, which reflect the nature of the country. The somewhat monotonous picturesqueness of the landscape between Dieppe and Rouen is characteristic also of the Norman villages and towns, whose names end in *ville*, whose houses lack distinction, whose churches are ornamented with the same style of pointed spires, and whose local dignitaries, according to the professor, all resemble each other in most respects.

ASIA.

The Sundarban of Bengal.—In the *Proceedings* of the Linnæan Society, April, 1896, is the annual address by the President of the Society, Mr. Charles Baron Clarke, F.R.S., at the anniversary meeting, in which he refers to the Sundarban (or Soondreebun as he spells the word) of Bengal. He first pointed out that the name "Soondreebun" means the forest or "bun" of "Soondree," the Bengali name for *Heritiera fomes* (*Buch. Ham.*). The address is full of geographical, zoological, and botanical points of great interest, and it is not possible to give more than a brief review in this place. The Sundarban is some 150 miles in length, and may extend from 40 to 60 miles inland, possibly occupying 8000 square miles of country. Mr. Clarke explains the formation of this river delta as follows: "The water escapes from the channels both by cutting through the banks and by flowing over them. The water in a main channel, having a strong current, carries a great quantity of silt; but directly it spreads over the bank or slips out by a canal into the vast swamp behind, it loses its velocity and drops some of its silt. The chief deposit of silt thus takes place near the streams, and in this way their banks become the most elevated portion of the country." The banks of the creeks, and indeed the whole land, are only some 2 or 3 feet above high-water mark; and on the night of October 31, 1876, a storm-wave 10 feet high passed over both banks of the Magna and the islands in its mouth; 98,000 people were drowned. The Sundarban consist of: (a) areas of mud over which the tide flows at high water, and which are covered by scattered mangrove vegetation; (b) large swampy meadows or jungles of tall grass; (c) the dense jungles of "Soondree," established on firm mud, and invaded by creeks of every size. Attempts have been made to reclaim portions of the Sundarban by building mud-clay banks, but these have always been so completely riddled by a small crab, that the crops have been submerged during the rains. The *Rhinoceros sondaicus*, tiger, buffalo, and axis deer are abundant in these grass jungles. All are able to swim with ease. The tiger has been known to reach a vessel moored more than a mile from any land, but he cannot catch the wild boar in the water. Mr. Clarke remarks, after giving an instance of an elephant's swimming power, that an elephant could swim from Calais to Dover without difficulty, and that a buffalo

can cross the Brahmaputra in flood. "Burisal guns" can be heard over a large area of the Sundarban. The most important part of the address is a tabulated list of the characteristic vegetation, *i.e.* that found in the Sundarban, and not in the Bengal plain for 100 miles outside it. This contains 69 species, and the distribution in longitude is shown by means of vertical lines drawn at the points where the best-marked "breaks" in the distribution occurred; the proportional abundance of each species, as deduced from Herbaria, is also shown by means of figures. The range of every species may be said to be continuous, as the exceptions in the table are few in number. Westward, 18 plants extend to Mascarenia, and 14 to the East Coast of Africa. Only 32 extend to the Pacific islands, and but 8 to America. Mr. Clarke points out that the numbers of species in common diminish regularly as we proceed from the centre, following the law of frequency, or something approaching thereto. Thus, of the 69 Sundarban plants considered, 53 are found in Burma, 45 in the Malay peninsula, 43 in Malaya, 32 in tropical Australia, 30 in tropical China, and 31 in Polynesia. There is no strong line of demarcation west of the Sundarban, but a more strongly marked line at Ceylon. The two boundary-lines to the Sundarban characteristic plants run very nearly along zoologic lines of demarcation. Mr. Clarke remarked, in conclusion, "that in our present very limited biologic knowledge, an investigator should look round well to discover the simplest case, that in which he may observe and record the action of the smallest number of causes acting at the same time."

AFRICA.

Teneriffe.*—Dr. Hans Meyer's book is at once a satisfactory and interesting geography and guide book, without which no serious visitor should dream of going to Teneriffe. From his general account of the geography of the island we take the following notes. Teneriffe is one of the group of volcanic islands known to us as the Canaries. They lie at the intersection of two depressions, one running north and south in the East Atlantic, and the other forming the great Mediterranean trough that girdles the Earth. Parallel to such abrupt depressions and on their slopes are the regions of greatest volcanic activity; and to volcanic action these islands owe their origin. The old view that Teneriffe was formed of the peak and its base is erroneous, for in middle Miocene times the island consisted of three volcanic islets, now united, owing to repeated eruptions between them. They now form the apices of the large triangular island. Biological corroborates geological evidence that there was no Tertiary Atlantis here of which these fortunate isles are the remains. The plants of the cloud-zone on Teneriffe are closely allied to the mid-Tertiary floras of Central and Southern Europe; and the animals are such as could easily pass over the sea from the continent by natural means, or those that have been brought by man, and give no evidence of a land-connection with the continent. In the lower portion of the island the trade winds blow. When the sea to the north is still relatively cold in spring, the clouds enfolding the mountain-side are fewest and thinnest; they increase during the summer, and are a maximum in winter, which is the wet season. The trades are not so constant then, north-westerly winds and sometimes hot blasts of dry wind from the Sahara being common from November to February. Above about 6000 feet the anti-trades blow. The trades are the rain-bearers to these isles, and more moisture reaches the northern than the southern slopes, so that the former are more wooded. Dr. Meyer brought home a collection of skulls of ancient inhabitants of the island. These and

* 'Die Insel Tenerifa. Wanderungen im canarischen Hoch-, und Tiefland.' Von Dr. Hans Meyer. Leipzig: Hirzel. 1896. Price 8 m.

some others have been discussed by Dr. F. von Luschan in the appendix. In his general chapter Dr. Meyer presents a connected account of these ancient inhabitants, from which we make some extracts. Before historical immigrations to the Canaries three races existed there. In the westernmost island dwelt a little round-headed, low-visaged race, of which we know nothing, although it is surmised they may be related to similar men of small stature of which we have evidence in the western outskirts of Europe. After them came the tall, fair, long-skulled Guanchos, an athletic race, troglodytes in Teneriffe, making poor pottery and good leather, with palæolithic implements. These pastoral peoples, with a patriarchal organization, are related to the Berbers, and their speech is akin to that of the oldest Berber tribes of the continent. The wedge-shaped inscriptions on some pottery, and especially that cut in the rocks of one of the islands, resemble Berber and old Numidian forms, but they have not yet been deciphered. Such inscriptions may be the work of one of the other races on the islands. A third type of man lived in those of the fortunate isles nearest the continent, and gave rise to a mixed race with the Guanchos in the middle isles. These were a dark mesocephalic people of medium stature, of somewhat higher culture, at least neolithic, than the powerful Guanchos, who became their masters. An account of historical immigrations to the Canaries is also given.

AMERICA.

Hydrography of the United States.—Mr. Frederick H. Newell, chief hydrographer, United States Geological Survey, contributes to the *National Geographic Magazine* for April a brief statement as to the work done under this head by various bodies in the United States. The Weather Bureau measures and records the precipitation. The Geological Survey (Division of Hydrography) endeavours to trace the course of the precipitated water on or below the surface of the ground, and, with a view to answering questions that may arise under this head as to the probable supply of water locally available for power, irrigation, or municipal supply, is collecting and putting upon record all obtainable data concerning deep wells, whether successful or not, and in making examination of the water-bearing rocks at the surface or in underground workings. The Engineer Corps and the Mississippi and Missouri River Commissions examine navigable rivers; the Coast and Geodetic Survey maps the navigable tidal waters of the United States as far outwards as the oceanic abyss; and the Hydrographic Office of the Navy brings together and publishes maps, charts, and everything of interest to mariners relating to foreign lands.

The Cape Region of Lower California.—Since 1888 the California Academy of Sciences has sent out a number of expeditions for the scientific exploration of Lower California and other parts of Mexico. In the fifth volume of the *Proceedings* of that Academy, an account is given of the results of the expedition of September to November, 1894, which was to the southern end of the peninsula. The expedition was under the leadership of Mr. Gustav Eisen, who writes the account. Its main object was to collect various forms of lower animals for scientific study, but the account referred to describes the geographical features, climate, and vegetation of the region explored, and is accompanied by a map of the region (from La Paz to Cape San Lucas) on the scale of about 1 : 500,000, and another (also new) on a smaller scale (about 1 : 2,300,000), of the entire peninsula. Between about 23° and 23° 45' N. there stretches a sierra, or rather a series of sierras, culminating in a peak of about 8000 feet in height. It is described as a granitic mass of upheaval showing signs of glacial action, chiefly in the form of enormous moraines, especially on the east side. To the east of the sierra is the valley of the San Jose

del Cabo. East of that there occurs a non-fossiliferous limestone formation, while the east coast of the district appears to be chiefly composed of volcanic stratified red rocks. The whole coast of the peninsula, as high as the bay of Todos Santos (31° 45' N.) on the west side, and La Paz (24° 10' N.) on the east side, is frost-free, and so also is the valley of the San Jose for about 15 miles up. These parts, accordingly, are suitable for the growth of pineapples, coffee, and other tender tropical plants. The rainfall of the south end of the peninsula is scanty, but of the tropical type, falling in heavy downpours chiefly in summer—July or August to October or November. A second rainy period, characterized by still more violent showers, may occur in January. The rainfall has never been gauged, but "it is safe to say" that at the upper end of the San Jose valley the summer fall amounts to about 20 inches. At San Jose del Cabo itself it is probably less than 12 inches. The water of the San Jose is used for irrigation, but so extravagantly that it does not irrigate one-thirtieth of the extent of ground that it might do. The fauna is a mixture of temperate and tropical forms. Fruits are not numerous, but two, the red-fruited cactus (*Cereus Thurberi*) and the "ciruela" (*Cryptocarpa procera*), an ally of the pistachio, with a juicy yellow fruit enclosing a fine-flavoured nut, are mentioned as of peculiar excellence. Shrubs and low trees form the prevailing vegetation, which is densest between 1000 and 6000 feet. The richness of the flora in flowering plants is remarkable.

Changes in the Fauna and Flora of California.—In the fifth volume of the *Proceedings of the California Academy of Sciences*, M. H. H. Behr gives a number of examples of changes of this kind brought about directly or indirectly through the influence of settlers within the last forty years or so. The successful conquest of native American by European forms has long been well known, and in the case of plant-life has been explained by the increased intensity of the struggle for existence in the vegetation of the Old World due to the long-continued practice of agriculture and the consequent survival of the most vigorous and adaptable forms. This obviously does not apply to aquatic vegetation, and it is a familiar fact that the fresh-water vegetation of the British Isles has been largely displaced by a form of American origin. As a pendant to this, it is interesting to note that one of the examples mentioned by Mr. Behr is the replacement of the aquatic vegetation round San Francisco by a coarse but luxuriant African weed, the *Cortula coronopifolia*. Mr. Behr's paper also furnishes various examples of insect adaptation to altered conditions, and some striking instances of chains of effects by which, one disturbance of existing conditions leading to another, considerable changes in the animal and plant life are brought about.

The Olympic Country, Washington State, U.S.—The *National Geographic Magazine* for April contains an article on this district by the late S. C. Gilman, c.z., based largely on his own explorations. The country consists of the peninsula in the north-west of the state of Washington, between Puget Sound and the Pacific, bounded on the south by Gray's Harbour (46° 55' N.) and the Chehalis river, which afford deep-water navigation for 30 miles up, leaving only a neck of 25 miles between the head of this navigation and the nearest point of Puget Sound. The area of the peninsula is about 5700 square miles, of which about 3000 square miles are occupied by the Olympic mountains, a group in the interior taking its name from Mount Olympus, a cluster of sharp jagged rock-peaks rising through an ice-cap, the highest of them to the height of 8150 feet. The northern, eastern, and southern sides of the peninsula are partially settled, the west side scarcely at all. On this side, from Cape Flattery, the north-western point, to Point Grenville (about 47° 20'), bluffs 100 to 250 feet high border the ocean, the remaining 25 miles of coast-line on the west

having a broad, smooth, hard sand-beach. A few miles off the middle of the west coast is Destruction island, so called on account of the numerous wrecks on its reefs and the neighbouring coast. It is now surmounted by a lighthouse of the first order 80 feet high. On the mountains above 4000 feet the timber is very scrubby and scanty; below that it is good and thrifty, but is varied by thousands of acres of the finest grazing-land, available from the 1st of June till December. Between the mountains and the coast are about 1300 square miles, or 830,000 acres of comparatively level valley and bench lands, about 25,000 acres being composed of rich bottom lands along the various streams, while the rolling uplands have an excellent but rather heavy clay soil, not draining readily, and hence encouraging the growth of fine bodies of large cedar, but affording abundant facilities for artificial drainage. The clear, cold, rapid streams teem with salmon and trout. There are several outcrops of very good coal, but in seams too small to be of any value. A deposit of limonite has been worked for some time near Port Townsend (in the north-east of the peninsula). A map accompanies the report.

Finlay and Omenica Rivers, British Columbia.—The Parsnip river from the south-south-east, and the Finlay (310 miles) river from the north-north-west, unite and pierce the Rocky mountains as the Peace river (757), which is called the Great Slave river (240) beyond Lake Athabasca, and the Mackenzie river (965) beyond the Great Slave lake (90). The figures in brackets represent the approximate mileage of each section, the total length of the Finlay-Peace-Mackenzie river being over 2360 miles. Near its source the Finlay expands into a long, very narrow lake-like reach of about 18 miles, surrounded by mountains of the Peak range 4000 to 5000 feet above it, with numerous isolated glaciers descending to 2500 feet above the river. The Omenica river joins the Finlay from the west shortly before it is joined by the Parsnip. The country through which it flows is mountainous, except near its mouth; in the lower part of its course the slope is rapid, but higher up it is slighter, and the river flows through "basin-like alluvium-filled depressions, which point to crustal movements of some magnitude." This region was surveyed topographically and geologically by Mr. R. G. McConnell in 1893 (see 'Canadian Geological Survey, Annual Report,' vol. vii. pt. C.). The following paragraph from his report describes the district in general terms: "From the eastern edge of the Rocky mountains west to Tacla lake, with the exception of the longitudinal valleys of the Finlay river and Tacla lake, no flat lands of any importance are met with. The whole region is ridged up into a succession of lofty ranges. The valleys and the lower slopes of the mountains are, as a rule, densely timbered with the monotonous evergreen forest so prevalent in the north. The principal varieties are the white spruce (*Picea alba*) and the black pine (*Pinus Murrayana*). The latter is usually found on dry, sandy, and gravelly flats and ridges. The smooth- and rough-barked poplars (*Populus tremuloides* and *P. balsamifera*) occur in some abundance locally, but are usually confined to the valley. The summits of all the higher mountains are bare, as the forest seldom ascends in this region beyond an elevation of 5200 feet." Gold is found everywhere, but the number of miners is much less than it used to be early in the seventies. Mining might be profitable were it not for "the absence of easily navigable waterways, and the mountainous and swampy nature of the surrounding country." Highly argentiferous galena exists in the Omenica region, and arquerite or silver-amalgam is of common occurrence on Silver creek and two of its tributaries. But transport difficulties prevent the development of the country, much of which still remains to be explored.

Seriland.—This name has been given by a surveying party of the Bureau of American Ethnology to a rough mountainous district on the coast of the Mexican

state of Sonora, between about $28^{\circ} 50'$ and $29^{\circ} 20'$ N., lying opposite the island of Tiburon, in the Gulf of California, and isolated by an expanse of desert plains from the mountains of the Sierra Madre. It is inhabited by a people "isolated in language, belief, custom, and sympathy as in habitat," who regard intermarriage with other peoples as a capital crime. Until 1895 the interior of the district, as well as of Tiburon, was never surveyed, and most of it never seen by white men; but now a survey of both has been made, sixteen stations, including the culminating point in Sierra Seri, having been occupied for control and for sketching in Seriland. The characteristic feature of the interior of the district is the abrupt transition from rugged mountains to smooth plains of similar rock overspread with a thin covering of fragmental *débris*. There is practically no soil, the scanty moisture and the slow-growing plants that compose the meagre flora not producing humus.—W. J. McGee and Willard D. Johnson in the *National Geographic Magazine* for April, where there is a map of Seriland and the Isle of Tiburon.

The Discovery of Glacier Bay, Alaska.—Doubts having been raised on this point, Eliza R. Scidmore writes to the *National Geographic Magazine* for April to claim the honour for Professor Muir, on the ground that he first fulfilled the conditions of finding the bay and bringing its wonders to the knowledge of the world.

AUSTRALASIA AND OCEANIC ISLANDS.

The Cook Archipelago.—Henry Greffrath contributes to the sixth number of *Petermann's Mitteilungen*, 1896, an interesting account of the present condition of this small group. The group lies between $18^{\circ} 15'$ and $21^{\circ} 47'$ S., and 157° and 160° W., and consists of the islands of Mangaia, Raratonga, Aitutaki, Atiu, Mitiaro, and Mauke, together with the small uninhabited Hervey islands. As is well known, the islanders were cannibals until after the introduction of Christianity by the Rev. John Williams in 1821. In 1835 the request of the queen of the Avarua tribe on Raratonga, that the islands should be placed under British protection, was acceded to, and the British flag was hoisted on the islands in October, 1838. The islands are described as having a dry and healthy climate, cool and pleasant for the tropics. Fever and dysentery are rare. Yet the population has steadily declined since the introduction of Christianity. Estimated by the Rev. Mr. Williams in 1821 at 16,000, it now numbers only about 9000. The diminished birth-rate and the prevalence of tuberculosis are mentioned among the causes of this decline, and Mr. F. J. Moss, the British resident subject to the governor of New Zealand, blames the bad feeding of the pigs, and the insufficient cooking of the flesh of those animals, on which the inhabitants appear largely to live. Much fertile land still lies waste and uncultivated, but there is no room for large plantations. Raratonga, the most beautiful and fertile of the group, and the chief seat of trade, is only 25 miles round. The most important products are coffee, oranges, bananas, and other tropical fruits, copra, and cotton. Coffee of the finest quality and excellent oranges grow everywhere without special care. Hurricanes are unknown. In June, 1891, an assembly of delegates from all the islands, which met on Raratonga, adopted a federal constitution for the group. To each island is left the regulation of its own internal affairs; but a federal parliament, in which Raratonga, Mangaia, and Aitutaki are each represented by three deputies, and each of the other three islands by one deputy, meets every year on Raratonga, and is entrusted with the management of the public revenue, the post-office, and other matters of general interest. There is no military or police force, for neither crimes nor misdemeanours occur. The only taxation consists in an import duty of 5 per

cent. *ad valorem*. The external trade is mainly with New Zealand, California, and Tahiti. Raratonga is 1653 (statute) miles from Auckland. The value of the imports in 1894 was £22,433; that of the exports, £20,665. Since January, 1895, English money has formed the currency. Before that the Chile dollar was in use. Numerous openings in the coral reef surrounding Raratonga lead into safe harbours. A macadamized road goes all round the island. Once a month an English newspaper, on which the natives lay great value, appears in Raratonga under the name of *Torea*. On that island the London Missionary Society maintains a seminary for the training of young people for teachers for New Guinea and the eastern islands of the Pacific.

Travelling in the New Zealand Alps.—With reference to the statement by Mr. Fitz Gerald in his paper describing his explorations in the New Zealand Alps, that men are not procurable to act as porters on the glaciers, Mrs. Anna von Lendenfeld writes to the effect that she and her husband on their expedition had no difficulty in procuring three men at the rate of ten shillings per day, who for three weeks carried provisions over the Tasman glacier to their camps on the Sinda Ridge and in the Malte-Brun valley. One of these accompanied them to the summit of the Hochstetter Dom, and on another occasion two of the men ascended over the most crevassed part of the Tasman glacier to search for them when they had remained a day longer than had been arranged. She thinks it due to the New Zealanders themselves, and to any intending visitors to the mountains, to put on record this experience, which differs so much from Mr. Fitz Gerald's.

POLAR REGIONS.

Arctic Exploration.—Interesting communications have been published by Mr. Harmsworth, and presented to the British Association by Mr. Montefiore-Brice, on the work which has been carried on in Franz Josef Land during the past year under Mr. Jackson. It is evident that Mr. Jackson is carefully mapping the island group, and taking methodical daily scientific observations which cannot but be of the greatest value. But as it is hoped that Mr. Montefiore-Brice will read a paper to the Society on the subject during the coming session, it is unnecessary to enter into details at present. Dr. Nansen arrived at Christiania in the middle of September. His progress homeward has been a triumph, and his reception at Christiania enthusiastic without precedent in Norway. The President, Sir Clements Markham, and Lady Markham, and the Secretary, Mr. Keltie, had the honour of taking part in the Christiania celebration. The presence of the President of the Royal Geographical Society was evidently highly appreciated, and especially his warm expressions of admiration for Dr. Nansen and his work, to which he gave utterance at the dinner of the Norwegian Geographical Society. As soon as Dr. Nansen gets his book out of hand, he will come to England to give an account of his expedition before our Society. It is hoped that this may be at the opening meeting of the new session; but due notice will be sent to all the Fellows.

MATHEMATICAL AND PHYSICAL.

Oceanography of the Red Sea.—A further instalment of Prof. J. Luksch's report on the physical researches in the Red Sea during the winter 1895-96 has just been issued. Previous to the *Pola* expedition the British Admiralty charts showed three main lines of soundings in the Red Sea, corresponding to the courses of submarine cables. The individual soundings were at intervals of about 15 miles, the Gulf of Suez being rather more closely surveyed, while in the Gulf of Akaba no soundings appeared at all. The *Pola* has added no less than 103 new soundings—

57 in the Red Sea itself, 7 in the Gulf of Suez, and 39 in the Gulf of Akaba; and has thus provided sufficient material for the construction of the isobathic chart, appended to the Report, of the basin north of Jeddah, showing lines of 100, 270, 550, 820, and 1100 fathoms. The relief of the sea-bottom as shown by the chart may be briefly described. Between Ras Mohammed (the southern extremity of the Sinai peninsula) and the latitude of Jeddah there are two depressions of over 550 fathoms, separated in about latitude $25^{\circ} 30'$ by a submarine ridge rising to 320 fathoms. The northern depression is about 160 miles long, and varies in breadth from 20 to 40 miles, attaining its greatest depth of 635 fathoms in lat. $26^{\circ} 8' N.$, long. $25^{\circ} 27' E.$ The other depression extends south of Jeddah and beyond the region visited by the *Pola*, its width varying from 20 to 60 miles; the deepest sounding obtained was 1200 fathoms. Depths of 100 to 300 fathoms are found near the coast—in fact, immediately outside the coral reefs; within the reefs the depths run to about 50 fathoms. The northern end of the first depression slopes steeply up to 40 fathoms in the Straits of Jubal, leading into the Gulf of Suez; and to 70 fathoms in the Straits of Tiran, leading into the Gulf of Akaba. Although the bottom of the Gulf of Suez slopes slightly downwards, the depth nowhere exceeds 45 fathoms, and over the Bank of Tor there is only 4 fathoms. The Gulf of Akaba is entirely different in form, as it contains an area 50 miles long and 10 broad below the 500-fathom line. Prof. Suess has drawn the writer's attention to the remarkable similarity between the basins of the Gulf of Akaba and the Dead Sea; both are of great depth and have very steep banks, especially on their eastern sides. Prof. Suess is of opinion that the soundings of the *Pola* prove that the Gulf of Akaba lies in a prolongation of the "Jordan fissure," and serves as a connecting link between it and the "East African channel" in the south of the Red Sea. The temperature observations of the *Pola* show increased heating of the waters of the Red Sea, not only from north to south, but from west to east, at all depths to 350 fathoms, the north to south increase being specially marked in the Gulf of Suez, and the west to east in the Gulf of Akaba. These results are simply an extension of those exhibited by the maps published by the Meteorological Office last year, and they are shown to hold good in the extended form at least from November till the middle of April. Salinities are everywhere high, reaching near the Egyptian coast as much as 40.9 *pro mille*; the variations in general are in the opposite sense to those of temperature. The transparency of the water is on the whole low, the discs ceasing to be visible at depths between 130 and 170 feet, and there seems to be, as usual, a complicated relation between this and the colour of the surface, as numbers 4 and 5 of Forel's scale occur most frequently. The form of sea-disturbance is characteristically that of high long waves of short period, the sea getting up and falling very quickly.

The History of the Oceans.—Prof. Suess gives an account in the *Comptes Rendus* of a work on the classification of pelagic fossils in the Trias, recently presented to the Vienna Academy of Science by MM. de Mojsisovic, Waagen, and Diener. Utilizing the collections at Calcutta, Stockholm, and St. Petersburg, besides material obtained from different parts of Siberia, M. de Mojsisovics, following M. de Hauer, has devoted his attention to the Trias of the Alps and the Arctic Trias; M. Waagen has monographed the Trias fossils of the Salt range, and M. Diener described those of the Usuri. M. Diener was sent out by the Vienna Academy in 1892 to Tibet, in order to complete his observations in the Central Himalaya, and his expedition, strongly supported by the Indian Government and reinforced by Messrs. Griesbach and Middlemiss, greatly enriched existing collections. The general classification shows that the Trias in its typical development can be divided into distinct zones like the Jurassic beds, but the remarkable

conclusion is that amongst the thousands of pelagic fossils examined, not one could be regarded as identical with forms found in the basins of the Atlantic or Indian Oceans, and it would therefore follow that at that period the Pacific Ocean covered parts of Peru, California, Japan, and Australia, and extended westward in two great branches, one across Siberia to Spitzbergen, and another across Central Asia to the basin now known as *Tethys*, which included parts of the present Mediterranean. It is easy to understand that the advance of the alpine flexures towards the Black Forest region and Bohemia about the middle of the Miocene period might form a new line of division, cutting the inland basin in two and separating the regions of the Rhone and Danube. No doubt the immense foldings which occurred at the end of the carboniferous period contributed largely to the formation of what we now call the Old World, but on looking at the recent ocean basins, like the Atlantic or the Indian Ocean, we observe that mountain ranges, and indeed the whole structure of the adjacent continents, are often cut through transversely by the coast-line. One notices, also, that the three triangular masses of land which form so remarkable a feature of the Earth's surface—Africa, India, and Greenland—belong exclusively to the more recent period; and it therefore appears that the formation of the Atlantic and Indian oceans has been due to some phenomenon quite distinct from mountain flexure, perhaps successive subsidences such as are seen in parts of the Mediterranean. The triangular land-masses are probably analogous to what is observed on a small scale in the south of the Crimea. The total amount of water on the planet being regarded as constant, the birth of the newer oceans by vast subsidences would itself contribute to the drying up of the older basins and the incorporation of the ancient *Tethys* on the continent—that is, the union of Eurasia and Indo-Africa. In the Eocene time one arm of the ocean passes from Europe to Turkistan, and reaches the desert of Gobi near Yarkand; the first Mediterranean horizon traverses Asia Minor and penetrates into Persia; finally, traces of "Tethy-dian" communication disappear, and we reach the complex succession of events in the last period of the history of the present Mediterranean.

The Movements of Water in Rivers.—Under the title of "Observations on Changes in River-courses, the Current-line, and Accompanying Phenomena," Professor J. Rein has contributed to *Petermann's Mittheilungen* (part 6, 1896) a paper on various matters not usually touched on in English works on physical geography, and some of them little attended to even in German works on the subject. First he corrects a dictum of Peschel's. Peschel, he says, was rather a theorist than an observer of nature when he wrote 'Neue Probleme der Erdkunde' (Leipzig, 1870), p. 130), "If the slope of a region is everywhere the same, it is a mechanical impossibility that any union of two river-beds can take place." Professor Rein points out, on the contrary, that if a river flows through loose material, any accidental obstacle, such as a sunk boat or a tree-trunk anchored by its roots so that sand and silt accumulate in the rear, is enough to bring about a change in the course of the river at high water. More frequently, however, this takes place from one of two causes, (1) in consequence of the structure of the ground, or (2) in consequence of the usually unequal mechanical force with which two rivers act when they unite. The course of a river formed by the union of two streams in most cases has a direction different from that of either of the streams forming it. Theoretically, the resulting river-course is deducible from the parallelogram of forces, and the numerous deviations from this rule must be ascribed chiefly to the hindrances offered by the nature of the ground, such as the rocky bank which causes the Rhone to continue the direction of the Saône on receiving that river at Lyons, and the Weser to assume the direction of the Aller, where it receives that tributary at Verden. The momentum of a river depends of course on its velocity, but this is a

function of four factors of very different value, the fall of the river-bed, the depth of the water, gravity, and friction. Apart from gravity and friction, the mean velocity (V) of a river may be expressed by the formula $V = \sqrt{\frac{F}{U} \cdot \frac{h}{l}}$, where F stands for the superficial area of the transverse section of a river, and U for the line wetted by that section—that is, the sum of the bottom and sides; and $\frac{h}{l}$ is the expression used by hydraulic engineers for the fall of a river-bed, l being a certain length of the river-course, and h the difference in altitude between the upper and lower ends of that portion of the river. The magnitude of the frictional resistance c (corrasion) on the bottom and at the sides of a river depends on the roughness and the pressure. In standing water the pressure is proportional to the depth, but this does not apply to rivers, in which the pressure arises from the momentum of the current. As this varies greatly from different causes, friction also is a very variable magnitude, but Professor Rein, following Professor Möller of Brunswick, gives a formula by which friction can be expressed. The formula is $c = \alpha v^2$, in which α stands for an empirical magnitude depending on the density (specific gravity) of the river, and v is the velocity of the current at a certain distance from the bottom. The current-line of a river, in German *Stromstrich*, is defined by Supan as “the line connecting the points of greatest superficial velocity;” in general it lies immediately above the deepest furrow of the bed—that is, what may be called the valley-line, though the German term *Thalwey*, by which it is designated, is usually retained both in English and French. Among the phenomena connected with the current-line the most interesting is the convex arching of the surface of a river sometimes observed, especially at high water. Where the current-line is in the middle of the river, this arching takes the form of an arc of a circle, or a parabolic curve; but where the current-line is near one bank (as at the concave shore of a curve in the course of the river), the profile of the arch is steeper on this side, more gradual on the other. Prof. Rein mentions various instances of this arching from his own observation. At the so-called “Krummbogen” of the Lahn, near Marburg, it often amounts to at least half a metre. At the sharp bend of the Rhine at Basel, the current-line is only at a short distance from the steep bank on the left, and on that line the surface of the river reaches its greatest height. The arching is considerable, and can be observed the whole year through. It is specially noticeable from the concave bank of the river. From the corresponding bank of the river at the curve near Bonn, looking over to Beuel, the phenomenon can scarcely be observed at all, but this Prof. Rein attributes to an illusion of perspective. That the surface of the river actually slopes down to the right bank at the ordinary level of the river was shown in the ice-drift of January, 1894, when the river was low, the air calm, and yet the ice-masses were all drifted to the Beuel side. The arching of the surface of the Niagara is specially noticeable in the rapids and the whirlpool, but the amount has been greatly exaggerated. In Appleton’s ‘Guide to the United States and Canada’ (New York, 1892), p. 187, it is said that the middle of the river is 30 feet higher than the sides. In Baedeker’s ‘Nordamerika,’ it is said that the middle of the stream in the whirlpool is 6 to 7 metres (19½ to 23 feet) higher than the sides. Trustworthy determinations of the amount are not known to Prof. Rein, but both of these estimates are much in excess of the truth. In Niagara, as elsewhere, the cause of the phenomenon is not to be found in the massing in the middle of the waters rebounding from the banks, nor in the whirling up of water from below, nor in a wave-like motion of the water. The true explanation is given by Dabuat in § 463 of his ‘Principes d’hydrauliques.’ “If from any cause a column of water, which is enclosed in a body of water without

definite limits, or is confined between firm walls, begins to move with any velocity, then the pressure which it previously exercised on the surrounding water or the firm wall is diminished by the amount which corresponds to the velocity of this movement." To restore the equilibrium, accordingly, a higher column or stratum of the moving water is necessary. It is to be noted that current-line and arching are disturbances of the hydrostatic equilibrium, and do not occur or are speedily obliterated where, as in sluggishly flowing water, there is time to restore the equilibrium. It is the very unequal amount of lateral pressure and velocity along the cross-section by which these phenomena are brought about. With regard to Niagara, Prof. Rein also mentions that in the forty-eight years 1842-90, the Canadian fall has retreated 104.51 feet, and the American fall, on the other side of Goat island, 30.75 feet; but points out that the rate of this retreat has been erroneously employed by celebrated geologists like Lyell and Hall, to calculate the time taken to form the whole gorge from the edge of the terrace $7\frac{1}{2}$ miles below the falls, because the magnitude of two important factors required for this calculation, the different degrees of resistance offered by the different Silurian strata through which the gorge has been formed, and the force of the water when concentrated in a single fall and a narrow bed, as it once was, is unknown.

Pendulum Observations in America.—By permission of the superintendent of the U.S. Coast and Geodetic Survey, Mr. G. R. Putnam has communicated to the Philosophical Society of Washington an interesting paper on recent pendulum observations, chiefly in the Mississippi basin. The uncertainties connected with the methods of reducing the results of such observations to sea-level are still considerable, but there are undoubted indications that the great depositing area of the Mississippi is in almost perfect hydrostatic equilibrium, the transfer of weight due to the river's action being compensated by corresponding deformations of the surface. Mr. Putnam gives a calculation of the amount of polar flattening of the Earth deduced from observations at thirty-three American stations, and the result, $30\frac{1}{2}$, if smaller than the value usually accepted, is perhaps nearer the truth, and in any case is interesting as being obtained from a small number of stations situated within a narrow range of latitude.

Photographic Surveying.—We may draw the attention of those interested in the application of photography to surveying to a paper by Mr. George Heimbrod in No. 4, vol. iv. of the *New Zealand Surveyor*. The paper is of too technical a nature for us to give even a summary of its contents here, but it contains a number of sound formulæ, applicable by both logarithmic and graphic methods, for the systematic reduction of photographic pictures to the corresponding angular values. A discussion is also given of the errors incident to photogrammetric apparatus and the methods of eliminating them; these come under the heading of lenses, determinations of the image distance, influence of errors of adjustment, and errors due to shrinkage of the photographic film. Mr. Heimbrod promises a paper on the application of photography to the determination of latitudes and longitudes, and we may look forward with interest to the results obtained by the other workers, presumably employing the methods of Dr. Schlichter.

GENERAL.

Annual Report of the Russian Geographical Society for the Year 1895.—The Annual Report of the Russian Geographical Society for the year 1895 is, as usual, full of interest. The important results obtained by the expeditions of Roborovsky and Kozloff in Central Asia, as well as of Vilkitsky on the coasts of Siberia, have already been mentioned in the *Geographical Journal*. M. M.

Berezovsky has also returned from his expedition to the mountain borderlands of the Tibet plateau in Hansu and Sey-chuan, with rich natural history collections. During the year 1894 he visited the Sue-shan mountains, the foothills of the Sue-bao-shan, and the desert Tsao-di, in the system of the Yellow river. J. B. Spindler has made during the year a complete hydrographical survey of Lake Chuskoye, or Peipus, and now prepares the maps and his report; while a series of smaller expeditions was at work within Russia itself and in the Urals for the ethnographical exploration of Karelia, Western Russia, and the land of the Cheremesses and the Bashkirs. A very interesting excursion was made by Prof. Mushketoff for the study of the main range of the Caucasus and its glaciers, which have all been on the decrease for the last twenty-six years. The publications of the Society were very numerous during the year. In the first rank stands the history of the Society for the last fifty years—a monumental work written by P. P. Semenov, and published in three volumes, to which a new map of Russia in Asia (130 miles to the inch) is appended. This work has not yet been received in London. The other publications are: (1) One volume of the 'Works of the Tibet Expedition,' by M. V. Pyevtsoff; (2) the first volume of the travels of the brothers G. E. and M. E. Grum Grjimallo; (3) the first volume of the 'Works of the Russian Polar Station on the Lena' (the other volumes of the same work having been published previously, the part devolved upon Russia in the International Meteorology Scheme is now completed); (4) the volume on 'Meteorology' of the 'Scientific Results of Prjevalsky's Journeys,' written by Dr. A. I. Voieikoff; (5) the 'Atlas des Isanomales et des Variations Séculaires du Magnétisme Terrestre,' by A. Tillo; (6) the fifth volume of the *Geographical Annuary* of the Society, which contains the zoo-geographical work for the years 1891-93, and a bibliography of the statistical and economical literature in Europe for the same years; (7) two volumes of the *Memoirs*; (8) the *Izvestia* or *Bulletin* of the Society; (9) one volume, in twelve parts, of the *Meteorological Review*; (10) one volume of the periodical *Living Antiquity* (*Zhivaya Starina*), which is the organ of the ethnographical section of the Society. The following works are being printed: (1) The third volume of 'Addenda to Ritter's Asia,' dealing with the mountains in the east of Lake Baikal; (2) the third and last volume of the 'Works of the Tibet Expedition' (already out); (3) a large work, 'The Yakutes,' by V. L. Yaroshevsky; (4) 'Mongolia and the Mongols,' by A. M. Pozdnéeff; (5) a large work, 'Tables Fondamentales du Magnétisme Terrestre,' by A. Tillo; (6) the sixth volume of the *Annuary*; (7) Grombchevsky's map of the Pamirs, on a scale of 13 miles to the inch; and (8) a full index of all the publications of the Society for the last fifty years (already out). A number of works, including two more volumes of 'Addenda to Ritter's Asia,' and the reports of the expeditions of V. A. Obrucheff, Baron Toll, and J. B. Spindler, are in preparation. The medals of the Society were awarded this year as follows: The Constantine medal to M. A. Rykacheff for his thirty years' work on the meteorology and physical geography of Russia. His memoirs on the distribution of atmospheric pressure in Russia; the diurnal range of the barometer; the distribution of winds over the Caspian and the White seas; the tides in the atmosphere; the times of freezing and thawing of the rivers of Russia, based upon observations at 921 different stations; the diurnal variations of temperature over the oceans in the tropical zone; the variations of the levels of the rivers of Middle Russia; and his lectures on meteorology, are the chief of his contributions to science. The Count Lütke medal was awarded to Admiral Makaroff for his large work on the depths and the temperature and density of water in the Northern Pacific, based upon the observations made during the years 1836-1889 on board the corvette *Vityaz*. His

maps showing the distribution of surface temperature in the North Pacific for different months are of great value, and especially the map which shows the distribution of temperatures at a depth of 400 metres, on which map one sees the very high deep-sea temperature of 16° C. in the east of Japan, and the low temperature of 4.5° located no more than 400 miles to the north-east of the above maximum region. The Prjevalsky premium was awarded to M. Berzovsky for his journeys in the borderlands of Tibet, and two Prjevalsky medals to J. A. Schmidt for the extensive geodetical work he has done during twelve different expeditions to Central Asia and Siberia, and to Dr. H. A. Fritsche for his many years' magnetical, geodetical, and hypsometrical measurements in China, Mongolia, Siberia, and Russia. Small gold medals were awarded to Dr. F. F. Müller for magnetical measurements in East Siberia, and to A. A. Lebedintseff for his researches into the chemical composition of water in the Black, Azov, and Marmora seas. Eighteen silver medals were awarded for various valuable communications to the Society, or for work done in connection with different expeditions; and four bronze medals for meteorological observations and various services rendered to the Society's expeditions.

New Geographical Society.—A new sub-branch of the Amur branch of the Russian Geographical Society has been opened this year at Vladivostok, under the name of "Society for the Study of the Amur Region." It is organized on the same principles as the Siberian, Caucasian, and other branches of the Russian Geographical Society.

CORRESPONDENCE.

Makran.

Simla, June 30.

MAY I be permitted to offer a few remarks in reply to the criticisms on my *Makran* paper, which have appeared in the May and June numbers of the *Geographical Journal*.

I am exceedingly obliged to those gentlemen who are kind enough to offer new lights and suggestions on my crude contributions. I am beyond the reach of good libraries, and should not have much leisure to read even if I had the opportunity. This, however, I do not regard as a good reason for reserving such information as I may pick up from time to time until I have opportunity for digesting it thoroughly, for it too frequently happens that such opportunity never comes at all. I must thank Mr. Curzon for giving me new authorities on the subject of *Makran*, which I hope hereafter to be able to consult. Meanwhile, I must demur to his argument that the name *Makran* is of Dravidian origin because it existed during the Dravidian occupation of the country. The Dravidians themselves were but immigrants, and it is unlikely that they brought the name with them. If I still incline to an "appropriate" derivation, it is because this somewhat unimportant question is never likely to reach an authoritative solution.

General Haig's criticisms require a much longer letter than you would care to find space for, so he must pardon me if I am brief. The name *Panj Gur* is locally derived from the "five tombs" of certain chiefs who fell in a local fight within recent history. The tombs are pointed out, and there is, I think, no doubt about the derivation of that particular name.

Having recently had business relations with the governor of *Bampur* in demarcating the *Perso-Baluch* frontier, I can assure General Haig that the "*Fahraj*"

east of Bampur is in the Karman district, and that the country around Bampur is not locally recognized as Makran.

When General Haig says that my identification of "the Fahraj, said to have been near Tubaran, with the Bampur Fahraj, is out of the question," the mistake is General Haig's own. If he reads the text of my paper carefully, he will see that I identify St. John's Fahraj, in Narmashir, as the Fahraj of Idrisi, which was near Tubaran. This appears to me to fall in well enough with Idrisi's geography; and I think it is perhaps a little dangerous to assume that that author was referring to another district and had mixed up his descriptions, until we are quite certain that existing facts do not tally with his writings. About this part of Eastern Persia we shall hear more from Captain Sykes hereafter.

About Rasak I am open to conviction, my chief difficulty being to account for the extent of the Sarbaz ruins, and the absence of available space for a city of any magnitude at the place now called Rask, or Rasak.

As regards the identification of Fahal-fahra with "Tall Fahra," i.e. the "Mound of Fahra," which General Haig thinks may have been the modern Fahraj, I am quite disposed to accept the general's view. It is a new light to me, and certainly fits in better with the Arabic itineraries. Bintah, I may add, is often called Band to this day.

When we come to the Sindh-Makran route, it is only fair to my identifications to say that they are based on actual surveys. There cannot be the slightest doubt that the main direct route from Debal to Makran is that which I have described, and there are the ruined sites of important places on the route almost precisely as Idrisi places them. Why should he again have been muddling his geography? I am quite aware that there are other routes north of this one, but this is the one which is now, and, I think, always must have been, the route chiefly followed between the Indus Delta and lower Makran. Idrisi's description of Manjabari will apply to no other place than Manja Pir.

On a recent march from the Persian frontier to Kalat and Quetta *via* Panjgur, I had little difficulty in identifying Labi (called by almost the same name still), and was astonished at the extent of Arab remains. The fort at Kej (or Kiz) still dominates the valley, some 3 miles from Kalatak, and the whole Panjgur route is crowded with the ruins of Arab irrigation works. For the first time I heard them ascribed to Arabs by a Baluch authority.

I must conclude by a reference to General Haig's last paragraph, in which he says the Kalmats are Baluch in origin and in no way connected with the famous sectaries known as Karmati. Such evidence as is available at present tends to show that the Kalmats are of Arab origin, though unconnected with the Rinds of Baluchistan, and that they migrated through Makran to the Indus Delta. Whether they are connected with the architectural remains usually ascribed to them is doubtful. As to the present existence of Karmatians in Sind there can be very little doubt.

Whilst I am about it, perhaps I may be allowed to say a word or two on another subject which has been rather incorrectly treated in the correspondence pages of your *Journal*. In laying down the Afghan boundary from the Hindu Kush, between Chitral and Kafiristan (which was done *pari passu* with the Chitral imbroglio), we found that the river flowing through Kafiristan from the west into the Chitral or Kumar river, and correctly called Arnawai by McNair and Woodthorpe, was also called "Bashgol" and "Lundai Sin." At the same time, a smaller and comparatively insignificant stream flowing from the east, and debouching into the Kunar just opposite the Bashgol, or Lundai Sin, was also called Arnawai. Since then I have discovered two other Arnawai, several Bashgols, and one other very

important Lundai Sin, which is also called the Swat river. This, perhaps, may fairly illustrate the difficulty of dealing with boundary definitions loosely dependent on local nomenclature, and the necessity for exact technical processes in laying out a demarcation programme.

T. H. HOLDICH.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. Rd. = Comptes Rendus.	S. = Society, Société, Selakab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographic, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mitteilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

- Alps—Glaciers.** *Jahrb. Schweizer Alpenclub* 31 (1895-96) (1896): 249-266. **Forel and Du Pasquier.**
 Les variations périodiques des glaciers des Alpes. Par Prof. Dr. F.-A. Forel et Prof. Dr. L. du Pasquier.
- Austria—Bosnia-Herzegovina.** *Spelunca B.S. Speleologie* 2 (1896): 27-32. **Kraus.**
 Les eaux souterraines et les travaux hydrologiques officiels de la Bosnie-Herzégovine. Par M. F. Kraus, à Vienne.
- Austria—Carpathians.** *M.G. Ges. Wien* 39 (1896): 251-299. **Bomer.**
 Prof. Dr. Anton Rehmans's (Lemberg) neues Karpathenwerk. Von Dr. Eugen v. Bomer. *With Map.*
- Austria—Moravia.** *Deutsche Rundschau G.* 18 (1896): 450-459. **Trampller.**
 Die Ochoser Höhle in Mähren. Von R. Trampller. *With Maps and Illustrations.*
- Eastern Europe.** **Joanne.**
 Collection des Guides-Joanne. États du Danube et des Balkans. Première Partie. Hongrie Méridionale—Transylvanie—Adriatique—Dalmatie—Monténégro—Bosnie et Herzégovine. Renseignements pratiques mis au courant en 1895 (pp. lii. and 280); Deuxième partie, Tome 1^{er}. Haute-Hongrie: Suisse Hongroise et Région des Tatras. Galicie.—Bukovine.—Roumanie. Tome II. Serbie.—Bulgarie et Roumélie Orientale. Paris: Hachette et Cie., 1893. Size 7½ × 4½, pp. i. and 172. *Maps and Plans.*
- Europe—Rivers.** *National G. Mag.* 7 (1896): 228-238. **Davis.**
 The Seine, the Meuse, and the Moselle. II. By William M. Davis. *With Map.*
- France—Artois.** *Globus* 69 (1896): 329-332. **Seelmann.**
 Das Deutschtum in Artois. Von Dr. Emil Seelmann. Bonn.

- France—Bordeaux.** *B.S.G. Commerc. Bordeaux* 19 (1896): 82–93, 321–331. ———
 Le climat de Bordeaux. Par F. C.
- France—Gascony.** *B.S.G. Commerc. Bordeaux* 19 (1896): 129, 170, 210, 238, 273, 289. Grandjean.
 Les landes et les dunes de Gascogne. Par C. Grandjean.
 A careful study of the sand-dunes of the Landes with regard to their physical features and their economic treatment.
- France—Lozère.** *Spelunca B.S. Spéléologie* 2 (1896): 32–33. Barbot.
 La Grotte des Capélans (Lozère). Par M. J. Barbot, à Paris.
- France—Meuse.** *Spelunca B.S. Spéléologie* 2 (1896): 14–27. Brocard.
 La Spéléologie de la Meuse. Par M. le Commandant Brocard à Bar-le-Duc (Meuse).
- France.** Joanne.
 Collection des Guides—Joanne. Paris. Par Paul Joanne. Avec 35 Plans et la liste des rues de Paris. Renseignements pratiques mis au courant en 1896. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. lxiv., 384, and 40.
 Itinéraire général de la France. Par Paul Joanne. Environs de Paris. Édition de 1889 avec des renseignements pratiques mis au courant en 1894. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. liv., and 440. *Maps and Plans.*
 Ditto. Auvergne et Centre. Édition de 1892 avec des renseignements pratiques mis au courant en 1896. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. xxxvi. and 376. *Maps and Plans.*
 Ditto. Bretagne, avec un Appendice pour les Îles Anglaises de Jersey et de Guernesey. Édition de 1892 avec des renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. xxxvi. and 464. *Maps and Plans.*
 Ditto. Bourgogne et Morvan. Renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. xxxiv. and 378. *Maps and Plans.*
 Ditto. Les Cévennes. Édition de 1893 avec des renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $6\frac{1}{2} \times 4$, pp. xxxvi. and 472. *Maps and Plans.*
 Ditto. Corse. Renseignements pratiques mis au courant en 1896. Paris: Hachette et Cie., 1892. Size $7\frac{1}{2} \times 5$, pp. lxiv. and 180. *Maps and Plans.*
 Ditto. Franche-Comté et Jura. Renseignements pratiques mis au courant en 1896. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. xlii. and 384. *Maps and Plans.*
 Ditto. Gascogne et Languedoc. Renseignements pratiques mis au courant en 1894. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. xxxii. and 388. *Maps and Plans.*
 Ditto. De la Loire et Gironde. Poitou et Saintonge. Renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. xxvi. and 290. *Maps and Plans.*
 Ditto. Le Nord. Renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. xxx. and 432. *Map and Plans.*
 Ditto. Normandie. Renseignements pratiques mis au courant en 1893. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. xl. and 514. *Maps and Plans.*
 Ditto. Provence. Paris: Hachette et Cie., 1896. Size $6\frac{1}{2} \times 4$, pp. 76, xxxiv., and 594. *Maps and Plans.*
 Ditto. Les Pyrénées en deux parties. I. Partie Occidentale. Paris: Hachette et Cie., 1896. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. 58, l., and 316. *Maps, Plans, etc.*
 Ditto, ditto. II. Partie Orientale. Renseignements pratiques mis au courant en 1895. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. xii. and [350.] *Maps, Plans, etc.*
 Ditto. Les Vosges. Renseignements pratiques mis au courant en 1894. Paris: Hachette et Cie. Size $7\frac{1}{2} \times 5$, pp. liv. and 516. *Maps and Plans.*
- Germany—Earthquake.** *Z. Ges. Erdk. Berlin* 31 (1896): 129–136. Gerland.
 Das südwestdeutsche Erdbeben vom 22. Januar, 1896. Von Prof. Dr. G. Gerland.
- Germany—Saxony.** *M. Ver. Erdk. Leipzig*, 1895 (1896): 15–135. Taute.
 Die Naturbedingungen in ihrer Bedeutung für den Verkehr der Oberlausitz. Ein Beitrag zur Anthropogeographie Deutschlands. Von Gustav Taute. *With Map.*
 An elaborate anthropogeographical study of the industrial region of Saxony, with the special object of showing the control of human relations by physical geographical conditions.

- Germany—Saxony.** *Deutsche G. Blätter* 19 (1896): 11-41. **Gebauer.**
Die Waldungen des Königreichs Sachsen. II. Von Heinrich Gebauer.
- Greece.** [Joanna.]
Collection des Guides-Joanna. Grèce. I. Athènes et ses Environs. Ce guide a été rédigé par M. B. Haussoullier. Paris: Hachette et Cie., 1896. Size 6½ × 4½, pp. ovi. and 242. *Maps and Plans.*
- Greece.** **Murray.**
Handbook for Travellers in Greece, including the Ionian Islands, Continental Greece, the Peloponnesus, the Islands of the Aegean, Thessaly, Albania, and Macedonia; and a detailed description of Athens, Ancient and Modern, Classical and Mediæval. Sixth edition. London: John Murray, 1896. Size 7 × 5, pp. oxx. and 992. *Maps, Plans, and Illustrations.* Price 20s. *Presented by the Publisher.*
- Greece—Keos.** *B.S.R. Belge G.* 20 (1896): 181-225. **Hautteccour.**
L'île de Kéos. Par H. Hautteccour. *With Map.*
- Greece—Zante.** *Petermanns M.* 43 (1896): 156-160. **Mitzopulos.**
Die Eruption der Pechquellen von Keri in Zante und ihre vulkanische Natur. Von Prof. Dr. Konstantin Mitzopulos in Athen. *With Maps.*
On the volcanic phenomena associated with the pitch wells of Zante.
- Holland—Agronomic Map.** **Lorié.**
Tijds. K. Ned. Aardrijks. Genoots. Amsterdam (2) 13 (1896): 227-263.
Beschouwingen over de Agronomisch-Geologische Kaart. Door Dr. J. Lorié.
- Holland—Colonial History.** *B.S. d'Études coloniales* 3 (1896): 7-33. **Delannoy.**
L'évolution de la politique coloniale de la Hollande au XIX^e siècle. Par Ch. Delannoy.
- Iceland.** **Thoroddsen.**
Nogle Iagttagelser over Surtarbrandens geologiske Forhold i det nordvestlige Island. Af Th. Thoroddsen. (Geol. Fören. i Stockholm Förhandl. Bd. 18. Häft. 3, 1896.) Size 8½ × 5½, pp. [42]. *Maps.*
- Italy—Calabria.** *Aus allen Weltteilen* 27 (1896): 329-336. **Fischer.**
Zur Hydrographie von Calabrien. Von Professor Dr. Theobald Fischer. Marburg.
- Italy—River Po.** *Science (N.S.)* 3 (1896): 759-761. **Adams.**
The Embankments of the River Po. By Frank D. Adams.
- Lipari Islands.** **Ludwig Salvator.**
Die Liparischen Inseln. Sechstes Heft: Alicuri. Prag: H. Meroy, 1896. Size 16½ × 13, pp. viii. and 30. *Maps and Illustrations.* *Presented by the Archduke Ludwig Salvator.*
- Norway.** *Globus* 69 (1896): 313-318. **Richter.**
Die norwegische Strandebene und ihre Entstehung. Von Prof. Dr. E. Richter. Graz. *With Illustrations.*
- Norway.** *P.R.S. Edinburgh* 20 (1895): 53-62. **Munro.**
On a Remarkable Glacier Lake, formed by a Branch of the Hardanger-Jökul, near Eidfjörd, Norway. By Robert Munro. *With a Plate.*
- Russia—Caucasus.** *Rev. G.* 39 (1896): 51-59. **Fournier.**
Le Caucase du Nord. La route de Grouisie. Le Caucase du Nord. Retour de Tiflis à Marseille par Constantinople. Par E. Fournier.
- Russia—Caucasus.** *Globus* 70 (1896): 42-45. **Hahn.**
Die grusinische Militärstrasse. Von C. Hahn. II. *With Illustrations.*
- Russia—Caucasus—Alagös.** *Globus* 70 (1896): 85-90. **Seidlitz.**
Pastuchows Besteigung des Alagös. Mitgeteilt von N. V. Seidlitz. Tiflis. *With Illustrations.*
- Russia—Finland.** **Boldt.**
Vetenskap. Meddelanden G. Föreningen Finland 3 (1896): 112-116.
Djupkarta öfver Lojo sjö, östra hälften. Af R. Boldt. *With Map.*
Bathymetrical map of Lake Lojo in Finland.

- Russia—Finland.** Hammarström.
Vetenskap. Meddelanden G. Föreningen Finland 3 (1896): 97-111.
 Iakttagelser öfver Lappajärvi sjö, speciellt öfver dess djupförhållanden. Af R. Hammarström. *With Map and Plate.*
 Observations on Lake Lappajärvi, with bathymetrical map and abstract in German.
- Russia—Finland.** Herlin.
Vetenskap. Meddelanden G. Föreningen Finland 3 (1896): 117-219.
 Palsontologisk-växtgeografiska studier i norra Satakunta. Af Rafael Herlin. *With Map and Plate.*
 Studies on the plant-palæontology of North Satakunda in Finland, with German abstract.
- Russia—Finland.** Hirn.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 30-35.
 Begleitworte zur Karte über die Verteilung der Wohnsitze in Satakunta und im südlichen Teile von Österbotten. Von Karl E. Hirn. *With Map.*
 Explanation of a map which practically shows the density of population in Finland by the number of dwelling-places per hundred square kilometres.
- Russia—Finland.** Hult.
Vetenskap. Meddelanden G. Föreningen Finland 3 (1896): 1-63.
 Vedväxternas utbredning i Finland. Af R. Hult. *With Map and Plate.*
 On the distribution of timber trees in Finland. A German abstract is given.
- Russia—Finland.** Rosberg.
Vetenskap. Meddelanden G. Föreningen Finland 3 (1896): 220-234.
 Vehkajoki's och Summajoki's mynningar. Af J. E. Rosberg. *With Map.*
 Studies on the mouths and deltas of two small rivers in Finland.
- Russia—Finland.** Rosberg.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 103-375.
 Bottenvikens finaka deltan. Af J. E. Rosberg. *With Maps.*
 An elaborate account of the river deltas on the northern part of the Gulf of Bothnia. In Swedish, with German abstract.
- Russia—Finland.** Rosberg.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 78-96.
 Några dynbildningar på Bottniska vikens ostkust. Af J. E. Rosberg. *With Map and Plate.*
 An account of the sand-dunes on the coast of the Gulf of Bothnia. In Swedish, with German abstract.
- Russia—Finland.** Thealeff.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 36-77.
 Dynbildningar i Östra Finland. Af Artur Thealeff. *With Map and Plate.*
 An interesting contribution to the knowledge of sand-dunes. With German abstract.
- Russia—Finland—Hangö.** Levander.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 97-102.
 Vindriktningar vid Hangö fyr. Af H. Levander. *With Plate.*
 On the direction of the winds at Hangö.
- Russia—Finland—Helsingfors.** Levänen.
Vetenskap. Meddelanden G. Föreningen Finland 2 (1894-95): 1-29.
 Lufttemperaturprevalenter i Helsingfors. Af S. Levänen. *With Diagrams.*
- Sweden—Geological Survey.**
 Sveriges Geologiska Undersökning. Ser. Aa: No. 110, Beskrifning till Kartbladet Sandhammaren, af Joh. Chr. Moberg (pp. 40); No. 111, Grisslehamn, af Edvard Erdmann (pp. 54); No. 112, Skanör, af N. O. Holst (pp. 30). Ser. A, No. 113, Vittejö, af Albert Blomberg (pp. 20); Stockholm, P. A. Norstedt & Söner, 1895). Ser. Bb: No. 8, Beskrifning till Agronomiskt geologisk karta öfver uggorna till Aas högre landbruksskola i Norge, af J. Jönsson (pp. 32; Stockholm, No. IV.—OCTOBER, 1896.]

1895). Ser. C: No. 135, Ueber archaische Ergussgesteine aus Småland, von Otto Nordenackjöld (pp. 128; Upsala, 1894); No. 136, Tvenne nyupptäckta svenska klotgraniter, af Helge Bäckström (pp. 24; Stockholm, Norstedt, 1894); No. 137, Meddelanden om jordstötter i Sverige, af E. Svedmark, III. (pp. 36; Stockholm, Norstedt, 1894); No. 138, Victor Öberg, Hottholmen i sjön Ralången, Robert Sieger, Flottholmen i sjön Ralången och vattenståndets oscillationer; E. Svedmark, Ytterligare om flottholmen i sjön Ralången (pp. 12, 6, 10; Stockholm, Norstedt, 1894); No. 139, Studier öfver bergarter från morån vid Visby, af Herman Hedström (pp. 23; Stockholm, Norstedt, 1894; size 9 × 6); No. 140, Geologisk beskrifning öfver Jemtlands län, af A. G. Högbom (pp. 108; Stockholm, Norstedt, 1894; size 12½ × 10); No. 141, Gerard de Geer; Om strandliniens förskjutning vid våra insjöar; Om kvartära nivåförändringar vid Finnska viken (pp. 16, 18; Stockholm, Norstedt, 1894; size 9 × 6); No. 142, Meddelanden om jordstötter i Sverige, af E. Svedmark, IV. (pp. 46; Stockholm, Norstedt, 1894); No. 143, Om Åhusandstenen, af Anders Hennig (pp. 42; Stockholm, 1894); No. 144, Studier öfver Vegetationen i vissa delar af Jemtlands och Västernorrlands län med hänsyn till det Geologiska Underlaget, af A. Y. Grevillina (pp. 18, 16; Stockholm, 1895; size 12½ × 10); No. 145, Praktiskt geologiska undersökningar inom Jemtlands län V. (pp. 76; Stockholm, 1895; size 12½ × 10); No. 146, Forakningaresor i Kirckjokks fjälltrakter åren 1892 och 1893 med särskild hänsyn till apatitförekomster, af Fredr. Svenonius (pp. 36; Stockholm, K. L. Beckmans, 1895; size 9½ × 6½); No. 147, E. Svedmark, Geologiska meddelanden från resor i Delarne och Helsingland; Orsa Finmarks geologi (pp. 44, 38; Stockholm, Norstedt, 1895); No. 148, Ueber das Nephelinayenitgebiet auf der Insel Alnö, von A. G. Högbom (pp. 102; Stockholm, 1895); No. 149, Om Lommalerans Ålder, af N. O. Holst och Joh. Chr. Moberg; Jämte ett tillägg om Foraminifer-erne i Lommaleret, af Victor Madsen (pp. 20; Stockholm, 1895); No. 150, Om Didymograptus, Tetragraptus och Phyllograptus, af Gerhard Holm (pp. 44; Stockholm, 1895); No. 151, Har det funnits mera än en istid i Sverige, af N. O. Holst (pp. 56, Stockholm, 1895); No. 152, Praktiskt Geologiska Undersökningar inom Gelleborgs län, etc., af Albert Blomberg (pp. 210; Stockholm, 1895; size 12½ × 10); No. 153, G. Holm, Om tvæne Gyroceras-formigt böjda Endoceras-arter; Om de endosifonata bildningarna hos familjen Endocerasidae (pp. 12, 28; Stockholm, 1895; size 9 × 6); No. 154, Nasafjälls zink och silfvergrufvor i Norrbottens län, af Fredr. Svenonius (pp. 28; Stockholm, 1895); No. 155, Till frågan om Lommalerans Ålder, af Gerard de Geer (pp. 14; Stockholm, 1895); No. 156, Silurisk Posidonomyaskiffer en engendomlig utbildning af skånes öfversilur, af Joh. Chr. Moberg (pp. 24; Stockholm, 1895); No. 157, Praktiskt Geologiska Undersökningar inom Hallands län, Med Bidrag af Länets Hushållningssällskap utförda genom Sveriges Geologiska Undersökning, III. (pp. 16; Stockholm, 1895; Size 12½ × 10); No. 158, Untersuchungen ueber die Grünsteine des westlichen Blekinge und der angrenzenden Theile schonaus, von Joh. Chr. Moberg (pp. 80; Stockholm, 1896; Size 9 × 6); No. 159, Nya Bidrag till kännedomen om de Svenska Hälleflintbergarterna, af Otto Nordenackjöld (pp. 36; Stockholm, 1896). *Maps and Plates. Presented by the Geological Survey of Sweden.*

Switzerland. *Quarterly J. Geological S. 52* (1896): 556-586. **Preller.**

Glacial Deposits, Preglacial Valleys, and Interglacial Lake-Formations in Sub-alpine Switzerland. By O. S. Du Riche Preller. *With Illustrations.*

Switzerland—Zürich. **Bosshard.**

Jahrb. Schweizer Alpenclub 31 (1895-96) (1896): 267-278.

Das zürcherische Oberland. Erklärung zum Hörnli-panorama. Von A. Bosshard.

United Kingdom—England.

Result of Astronomical and Meteorological Observations made at the Radcliffe Observatory, Oxford, in the years 1888-89, under the superintendence of Edward James Stone. Vol. xlv. Oxford: J. Parker & Co., 1896. Size 10½ × 6½, pp. xxiv., 232, xvi., and 72. *Presented by the Radcliffe Trustees.*

United Kingdom—England—Hertfordshire, etc. **Murray.**

Handbook for Hertfordshire, Bedfordshire, and Huntingdonshire. London: John Murray, 1895. Size 7 × 5, pp. viii. [20], and 260. *Maps and Plans. Price 7s. 6d.*

United Kingdom—England—London. **Baedeker.**

London and its Environs. Handbook for Travellers by Karl Baedeker. With 3 Maps and 20 Plans. Tenth Revised Edition. Leipzig: Karl Baedeker; London:

Dulau & Co., 1896. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. viii., 424, and 44. *Price* 6s. *Presented by Messrs. Dulau & Co.*

Thoroughly revised down to June, 1896.

United Kingdom—England—Southport.

Baxendell.

Borough of Southport. Meteorological Department. Report and Results of Observations for the year 1895. With Two Appendices. By Joseph Baxendell. Southport, 1896. Size $10 \times 7\frac{1}{2}$, pp. 32.

United Kingdom—England—Thames.

Penney.

Concise Navigating Directions for the River Thames, including all the pools, reaches, and channels; from London Bridge to the South Foreland and Orfordness; and for the English Channel to Beachy Head. Also for the ports of Dunkerque and Calais and the approaches to the Scheldt. By Stephen Penney. Second Edition. Illustrated by Nineteen Charts. London: J. D. Potter, 1896. Size $9 \times 5\frac{1}{2}$, pp. xxii. and 98. *Price* 7s. 6d. *Presented by the Publisher.*

An extremely convenient combination of sailing directions and charts, for the estuary of the Thames and for ports on the south-east of England.

United Kingdom—England—Worcestershire, etc.

Murray.

Handbook for Travellers in Worcestershire and Herefordshire. Fourth Edition. London: John Murray, 1894. Size 7×5 , pp. [16] and 168. *Maps and Plans. Price* 5s.

In this edition the counties of Worcester and Hereford, formerly published together with Gloucester, have a volume to themselves, compact and convenient like all the new editions of these guides.

United Kingdom—Ireland.

Cooke.

Handbook for Travellers in Ireland. Fifth Edition. Revised and Edited by John Cooke. London: John Murray, 1896. Size 7×5 , pp. x., [44.] and 566. *Maps and Plans. Price* 9s.

This is a thoroughly new and greatly developed handbook. The complete set of new maps and plans gives particular value to the book, and makes it in the best sense a traveller's companion.

United Kingdom—Scotland.

T.R.S. Edinburgh 33 (1896): 193-202.

Argyll.

Two Glens and the Agency of Glaciation. By His Grace the Duke of Argyll, E.G., K.T. *With Map.*

United Kingdom—Scotland.

Inglis.

The "Contour" Road Book of Scotland. A Series of Elevation Plans of the Roads, with Measurements and Descriptive Letterpress. By Harry R. G. Inglis. With 500 Diagrams and Maps. Edinburgh: Gall and Inglis, 1896. Size $6\frac{1}{2} \times 4$, pp. x. and 282. *Presented by the Publishers.*

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Appendices, Glossary, and Index. London: Whittaker & Co., 1896. Size $7\frac{1}{2} \times 5\frac{1}{2}$, pp. xii and 181. Price 7s. 6d. Presented by the Publishers.

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Climbs in the New Zealand Alpa. Being an account of Travel and Discovery. By E. A. Fitz Gerald, and with contributions by Sir Martin Conway, Professor T. G. Bonney, C. L. Barrow. With many illustrations from original drawings by Joseph Pennell, H. G. Willink, A. D. McCormick, Photographs by the Author, together with a new Map. London: T. Fisher Unwin, 1896. Size 10 × 7½, pp. xvi. and 364. *Price 31s. 6d. Presented by the Publisher.*

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Notes of a Journey from Israelite Bay to Coolgardie, Western Australia. By Arthur J. Wright.

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Cruise of the *Balena* and the *Active* in the Antarctic Seas, 1892-93. By William S. Bruce and Charles W. Donald, M.B. From the *Geographical Journal* for May and June, 1896. Size $10 \times 6\frac{1}{2}$, pp. 38. *Map*.

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The Cruise of the *Antarctic* to the South Polar Regions. By H. J. Bull. London: E. Arnold, 1896. Size $9\frac{1}{2} \times 6$, pp. 244. *Illustrations*. Price 15s. Presented by the *Publisher*.

Mr. Bull here gives what may be termed the owner's account of the Norwegian whaling expedition to the Antarctic regions sent out by the late Svend Foyn, to whose memory the book is appropriately dedicated, and a sketch of whose biography serves as introduction. The narrative is direct and interesting. There is no map, and the author appears to have suffered the not uncommon misfortune of losing confidence in the captain and differing in opinion from the other member of the crew who had previously described the voyage.

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The official description of the cruise of the *Antarctic* by the captain.

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Die Erforschung des Dirk Gerritzs-Archipels. Schlusswort gegen Dr. Joh. Petersen. Von H. Wichmann.

The last word on one side of a controversy the subject of which is not the most serious problem of Antarctic research.

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Neuere Mittheilungen über das André'sche Polarproject. Von O. Baschin. Sonderabdruck aus Nr. 11 der Zeitschrift für Luftschiffahrt und Physik der Atmosphäre. November, 1895. Size 10×7 , pp. [8.] Presented by the *Author*.

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A Plan to reach the North Pole by Balloon. By S. A. Andrée. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895' (Congress Report, pp. 211-228). Size 10 × 6½, pp. 18.
- Arctic Currents.**
The Geographical Society of the Pacific. An Examination into the Genuineness of the *Jeannette* Relics. Some Evidences of Currents in the Polar Regions. Report of the Special Committee appointed by the Council to Report upon the *Jeannette* Relics. San Francisco: J. Partridge, 1896. Size 10 × 7, pp. 16. *Illustration.*
A vindication of Dr. Nansen's reasoning on the *Jeannette* relics.
- Arctic Exploration.** **Markham.**
Arctic Exploration. By Rear-Admiral A. H. Markham. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895' (Congress Report, pp. 177-202). Size 10 × 6½, pp. 26.
- Arctic Projects.** **Payart.**
La Découverte du Pôle Nord. Par Eugène Payart. Extrait des Comptes-rendus du Sixième Congrès International de Géographie, tenu à Londres en Juillet, 1895 (Congress Report, pp. 229-238). Size 10 × 6½, pp. 10.
- Greenland.** **Globe 69 (1896): 235-239.** **Garde.**
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MATHEMATICAL GEOGRAPHY.

- Cartography.** **Rev. G. Italiana 3 (1896): 5-12, 75-82.** **Saija.**
Le proiezioni per ribaltamento. Contributo alla cartografia del prof. Giuseppe Saija.
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Comptes-rendus des séances de la Onzième Conférence Générale de l'Association Géodésique Internationale et de sa Commission Permanente réunies à Berlin du 25 Septembre au 12 Octobre 1895, rédigés par le Secrétaire perpétuel A. Hirsch, publiés par la Commission Permanente de l'Association Géodésique Internationale. 1^{er} Volume: Procès-Verbaux. Berlin: Reimer, 1896. Size 11½ × 9, pp. 310.
- Globes in Crystallography.** **Buchanan.**
On the Use of the Globe in the Study of Crystallography. By J. Y. Buchanan, F.R.S. From the *Philosophical Magazine* for August, 1895. Size 9 × 6, pp. [20.]
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- Time Division.** **Sarrauton.**
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La division décimale de l'heure et la division métrique du cercle. Par M. Gaston Moch.

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- Atmospheric Phenomena.** **P.R.I. 14 (1896): 638-648.** **Cornu.**
Phénomènes Physiques des Hautes Régions de l'Atmosphère. By Prof. Alfred Cornu.
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Les aurores boréales, d'après des publications récentes. Par E. Durand-Gréville.
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Propositions relatives à l'organisation d'un système international de stations sismiques. Size 9 × 6, pp. 14.
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Suggestion for a systematic observation in the Northern Hemisphere of Earth Waves and Vibrations travelling great distances. By John Milne, 1895. Size 11 × 8, pp. 4. *Presented by the Author.*
- Gravity Observations.** **C. Rd. 123 (1896): 1265-1268.** **Collet.**
Sur l'anomalie de la pesanteur à Bordeaux. Note de M. J. Collet.

- Geomorphology.** Die Geomorphologie als genetische Wissenschaft: eine Einleitung zur Diskussion über geomorphologische Nomenklatur. Von Professor Dr. Albrecht Penck, Wien. Separatdruck aus dem Berichte des Sechsten Internationalen Geographencongresses, London, 1895. Size 10 × 6½, pp. 18. **Penck.**
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- Limnology.** C. Rd. 123 (1896): 71-72. **Delebecque**
Influence de la composition de l'eau des lacs sur la formation des ravins sous-lacustres. Note de M. André Delebecque.
- Meteorology.** T.R.S. Edinburgh 37 (1894): 621-693. **Aitken.**
On the Number of Dust Particles in the Atmosphere of certain Places in Great Britain and on the Continent, with Remarks on the Relation between the Amount of Dust and Meteorological Phenomena. By John Aitken. With Plates.
- Meteorology—Wind Storms.** Nautical Mag. 65 (1896): 702-712. **Harding.**
Wind Storms. By Charles Harding. With Diagrams.
- Meteorology.** J.R. United Service I. 40 (1896): 669-690. **Hepworth.**
Meteorology: a Factor in Naval Warfare. By Lieut. M. W. Campbell Hepworth.
This paper discusses the effect of the weather on steam navigation, and calls attention to the importance of studying weather-charts in determining naval manoeuvres.
- Meteorology.** Observations météorologiques sur les pluies générales et les tempêtes. Nouvelle édition. Par Gaston Féral. Montauban, 1896. Size 9½ × 6, pp. 22. Presented by the Author. **Féral.**
- Meteorology—Dust in Air.** Rev. Scientifique (4) 5 (1896): 751-755. **Dufour.**
Les poussières et la transparence de l'air. Par M. C. Dufour.
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- Ocean Depths.** List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1895, from H.M. Surveying Ships, Indian Marine Survey and British Submarine Telegraph Companies. Published by order of the Lords Commissioners of the Admiralty. London: J. D. Potter, 1896. Size 13½ × 8½, pp. 44. Presented by the Hydrographic Department, Admiralty.
- Oceanographical Apparatus.** C. Rd. 123 (1896): 73-75. **Belloc.**
Sur un nouveau sondeur; appareil portatif à fil d'acier. Note de M. Emile Belloc.
- Oceanography—Apparatus.** P.R.S. Edinburgh 20 (1895): 252-254. **Dickson.**
On a New Water-Bottle for collecting samples of Sea-Water from Moderate Depths. By H. N. Dickson. With Illustrations.
- Oceanography.** A Retrospect of Oceanography during the last Twenty Years. By J. Y. Buchanan, F.R.S. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 × 6½, pp. 34. **Buchanan.**
- Oceanography.** P.R.S. Edinburgh 20 (1895): 315-322. **Gibson.**
On the Chemical Composition of Sea-Water. By John Gibson, Ph.D.
- Oceanography—Gulf Stream.** The Relations of the Gulf Stream and the Labrador Current. By William Libbey, Jr., D.Sc. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 × 6½, pp. 14. **Libbey.**
- Oceanography—Red Sea.** Vorläufiger Bericht über die physikalisch-oceanographischen Untersuchungen im Rothen Meere. October 1895 bis Mai 1896. Von Josef Luksch. Aus den **Luksch.**

Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe; Bd. CV. Abth. I. Mai 1896. Wien, 1896. Size 10 x 6½, pp. 32. *Maps.*

- Origin of Archipelagos.** *G.Z.* 2 (1896): 361-378. **Martin.**
Zur Frage nach der Entstehung des ost- und westindischen Archipels. Ein Vortrag von K. Martin. *With Illustrations.*
- Origin of Continents.** **Habenicht.**
Grundriss einer exacten Schöpfungsgeschichte. Von Hermann Habenicht. Vienna, etc.: A. Hartleben, [1896]. Size 9½ x 6½, pp. viii. and 136. *Maps. Presented by the Author.*
This will be separately noticed.
- Rock-forms.** *Globus* 70 (1896): 103-107. **Greim.**
Die Karren. Von Dr. G. Greim. *With Illustrations.*
An account of the peculiar class of rock-erosion forms known as Karren.
- Seismic Observations.** *Petermanns M.* 42 (1896): 165-169. **_____**
Vorschläge zur Errichtung eines internationalen Systems von Erdbeben-Stationen. *With Map.*
The proposed system of earthquake stations the position of each of which is exactly known includes Tokyo, Shanghai, Hongkong, Calcutta, Sydney, Rome, Tacubaya (Mexico), Port Natal, Cape Town, Santiago, and Rio de Janeiro.
- Speleology.** **Martel.**
Speleology. By E. A. Martel. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 x 6½, pp. 6.
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Ueber einen Gezeitenkolk im Adriatischen Meere. Von Dr. Halbfass.
- Tropical Soils.** **Passarge.**
Ueber Laterite und Roterden in Afrika und Indien. Von Dr. S. Passarge. Separatabdruck aus dem Berichte des Sechsten Internationalen Geographenkongresses, London, 1895. Size 10 x 6½, pp. 6.
- Underground Temperature.** *C.Rd.* 122 (1896): 1503-1506. **Lévy.**
Sur les sondages profonds de Charmoy (Creusot) et de Macholles près Riom (Limagne). Note de M. A. Michel Lévy.
On deep borings in France.
- Zöogeography.** *American J. Science* (4) 2 (1896): 63-69. **Ortmann.**
On Separation, and its bearing on Geology and Zöogeography. By Arnold E. Ortmann.
- Zöogeography.** **Lydekker.**
A Geographical History of Mammals. By B. Lydekker. Cambridge: The University Press, 1896. Size 8 x 5½, pp. xii. and 400. *Map and Illustrations.* Price 10s. 6d. *Presented by the Cambridge University Press.*
- Zöogeography.** **Cockerell.**
Notes on the Geographical Distribution of Scale Insects. By T. D. A. Cockerell. Proc. United States National Museum. Vol. xviii. 1894. Pp. 615-625. Washington: Government Printing Office, 1895. Size 9½ x 6.
- Zöogeography.** *Verh. Ges. Erdk. Berlin* 23 (1896): 245-256. **Matschie.**
Herr Paul Matschie: Geographische Fragen aus der Säugetierkunde. *With Map.*
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Extensive Migration in Birds as a Check upon the Production of Geographical Varieties. By Thomas H. Montgomery, Jr.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Anthropology.** *Z. Ges. Erdk. Berlin* 31 (1896): 155-192. **Panokow.**
Betrachtungen über das Wirtschaftsleben der Naturvölker. Von Hellmuth Panokow.
- Cartography in Oldenburg.** **Sello.**
Deutsche G. Blätter 18 (1895): 350-372; 19 (1896): 41-58.
Die oldenburgische Kartographie bis zum Ende des 18. Jahrhunderts. Von Archivrat Dr. G. Sello (Oldenburg).

Cassini's Maps.**Drapeyron.**

Les travaux géographiques de Cassini de Thury, auteur de la première carte topographique de la France. Par Ludovic Drapeyron. Extrait des Comptes-rendus du Sixième Congrès International de Géographie tenu à Londres en Juillet, 1895. Size 10 × 6½, pp. 12.

Columbus.**Peragallo.**

Disquisizioni Colombine. No. 4. La favola di Alonso Sanchez precursore e maestro di C. Colombo. Parte Prima. Con appendice extra intorno a Giovanni Verrazzano erroneamente confuso col corsaro Giovanni Florin; Nuovo documento. Studi Storico-Critici di Prospero Peragallo. Lisbon, 1896. Size 10 × 7, pp. 104. *Presented by the Author.*

Columbus and Las Casas.**Marcone.**

Sac. Antonio Marcone. L'autorità di Mons. Bartolomeo Las Casas nella nascita di Don Fernando Colombo secondo figlio dell'eroe scopritore delle Indie. Siena, S. Bernardino, 1894. Size 7½ × 5, pp. 66. *Portrait. Price 1s.*

Demography.**Ripley.**

Quarterly Publications, American Statistical Assoc. 5 (1896): 18-40.

Ethnic Influences in Vital Statistics. By W. Z. Ripley. *With Illustrations.*

This paper is largely a criticism of the views of M. Laponge on the effect of the crossing of races, and is illustrated by instances taken from the vital statistics of France and Belgium.

East India Company—Marine Records.

List of Marine Records of the late East India Company, and of subsequent date, preserved in the Record Department of the India Office, London, 1896. Size 13½ × 8½, pp. xxii. and 160.

Economic Geography.*Rev. G.* 39 (1896): 81-87.**d'Estrey.**

Le péril jaune. Par Dr. C^{te} Meyners d'Estrey.

On the emigration from China.

Economic Geography. Deutsche Bundeschau G. 18 (1896): 394-403, 438-450. **Oppel.**

Beiträge zur wirtschaftsgeographischen Statistik. Von Dr. Alwin Oppel in Bremen.

Eakimos.**Bryant.**

Notes on the most Northern Eakimos. By Henry G. Bryant. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 × 6½, pp. 8.

NEW MAPS.By J. Coles, *Map Curator*, R.G.S.**EUROPE.****Auvergne.****Boule.**

La topographie glaciaire en Auvergne. Par M. Marcellin Boule, collaborateur principal du Service de la Carte géologique: Fig. 1, Essai de reconstitution d'une partie des Anciens glaciers de l'Auvergne. Fig. 2, Topographie glaciaire dans le Nord du Cantal. Fig. 3, Ancien glacier de la Vallée de Malbo. Annales de géographie, t. v. pl. vii. No. 21. 15 Avril 1896. Paris.

England and Wales.**Ordnance Survey.**

Publications issued since August 7, 1896.

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Germany.

Halbfass.

Tiefenkarte des Arend-Sees in der Altmark. Nach eigenen Messungen entworfen von Dr. Wilhelm Halbfass. Neuholdensleben, 1895. Scale 1: 23,000 or 0·3 stat. mile to an inch. Petermann's 'Geographische Mittheilungen,' Jahrgang 1896. Tafel 13. Justus Perthes, Gotha. Presented by the Publisher.

Vienna.

Peip.

Chr. Peip's Taschenatlas von Wien und weiterer Umgebung. Enthält: 20 Karten in feinstem Farbendruck und einen Plan von Wien, innere Stadt, nebst Führer durch Wien und Umgebung von A. Kühnel. Stuttgart: Hobbing & Büchle, 1896. Price 4s. 6d. (Stanford.)

This pocket atlas of Vienna and the neighbourhood to the west and south of the city, contains twenty maps, on the scale of about two and a half statute miles to an inch. All means of communication are laid down, and the topographical features are clearly shown, the heights being given in metres. At the beginning of the atlas an index-map is given, by the aid of which the arrangement of the sheets is seen at a glance. There is a plan of the city of Vienna on an enlarged scale, together with a list of streets, etc., each of which has a letter and number, by use of which it may be easily found on the plan. The atlas also contains a guide to Vienna, which, in combination with the maps, should be of great service to persons visiting the district it includes.

ASIA.

India.

Government of India.

Statistical Atlas of India (Second Edition, 1895). Calcutta: Printed by the Superintendent of Government Printing, India. Map by the Survey of India Department, 1895. London: E. Stanford; Calcutta: Thacker & Co. Price 5s. Presented by the Government of India, Department of Revenue and Agriculture.

The original edition of this atlas was prepared in 1886 for the Indian and Colonial Exhibition. It has now been revised and enlarged with the aid of the census which has since been taken in India. It contains numerous maps and diagrams, illustrating the character of the country, its inhabitants and resources, as well as its commercial, financial, and educational conditions. The explanatory letterpress has been written by Sir E. C. Buck, Dr. W. King, Mr. J. Eliot, Mr. George Watt, Mr. B. Bebbenthorpe, Mr. J. E. O'Connor, and Veterinary-Lieut. H. T. Pease. As all unnecessary detail has been omitted in the maps which are intended to illustrate special subjects, for the sake of clearness, the map showing the main political and administrative divisions of the country may be referred to in cases where such details are required. There is hardly a subject connected with the present condition or future prospects of India on which this atlas may not be consulted with advantage, by students and those interested in the country.

Pamira.

Carte du Partage du Pamir. Avril 1895. Scale 1: 3,350,000 or 52·8 stat. miles to an inch. Annales de Géographie, t. v. pl. ix. No. 22. 15 Juillet. Paris: Armand Colin & Cie.

AFRICA.

Mafia Island.

Baumann.

Die Insel Mafia und die benachbarten Eilande nach den Aufnahmen von Dr. Oskar Baumann. (Kustenkonturen nach den brit. Admiralitätskarten.) Scales 1: 150,000 or 2·3 stat. miles to an inch, and 1: 75,000 or 1·1 stat. mile to an inch.

Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig.
Dritter Band, Erstes Heft. Leipzig: Verlag von Duncker und Humblot, 1896.

Matabeleland.**Fletcher and Espin.**

Fletcher and Espin's Map of Matabeleland. Compiled from the latest available information, including trigonometrical surveys by the following Government surveyors: Meears, J. M. Orpen; P. Fletcher, A.M.I.C.E.; B. A. Fletcher, A.M.I.C.E.; W. M. Espin; A. Stimms; W. M. Edwards; R. Cloete; E. C. Windley; A. Wayland. First Edition, 1896. Published by the Goldfields of Matabeleland, Limited. Scale 1: 506,880 or 8 stat. miles to an inch. Compiled by Fletcher and Espin, Bulawayo, Rhodesia. 4 Sheets. Price £1 6s. (Stanford.)

All the gold-bearing districts and the positions of the mines and native kraals are indicated on this map, as well as roads, post-stations, wells, native tracts, sites of battles, and other information that will be useful to persons visiting the country. The heights above sea-level of many places are given in feet, and the boundaries of districts are shown.

Ovamboland.**Bernsmann.**

Ovamboland und dessen Stämme und Dialekte der Lingua-Bantu. Entworfen und gezeichnet von F. Bernsmann. Scale 1: 1,450,000 or 23 stat. miles to an inch. Globus, Bd. 70, No. 5. Verlag von Friedr. Vieweg u. Sohn, Braunschweig.

Tunis.**Larminat.**

Etude sur les formes du terrain dans le sud de la Tunisie. Par Mr. le Capitaine de Larminat, détaché au Service géographique de l'Armée. Annales de géographie, t. v. pl. viii. No. 22. 15 Juillet 1896. Paris: Armand Colin & Cie.

AMERICA.**British Columbia.****Kirk.**

Part of the Trail Creek Mining Camp, West Kootenay, B.C. Compiled by J. A. Kirk, Land Surveyor, Roseland, B.C. March 1, 1896. Scale 1000 feet to an inch. Price 9s., with Pamphlet. (Stanford.)

This, as its title indicates, is simply a plan of a mining camp in British Columbia, the positions and extent of mining claims, with means of communication, and a proposed plan of the town of Roseland, being alone shown. The map is accompanied by a pamphlet containing particulars of the district and the development of the mining industry.

AUSTRALASIA.**Celebes.****Kruijt.**

Reiserouten nach dem Posso See (Central-Celebes). Ausgeführt u. gezeichnet von Missionar A. C. Kruijt im Jahre 1895. Scale 1: 5,800,000 or 88.3 stat. miles to an inch. Petermann's 'Geogr. Mitteilungen,' Jahrgang 1896. Tafel 12. Gotha: Justus Perthes. Presented by the Publisher.

New Guinea.**Finsch and Kunze.**

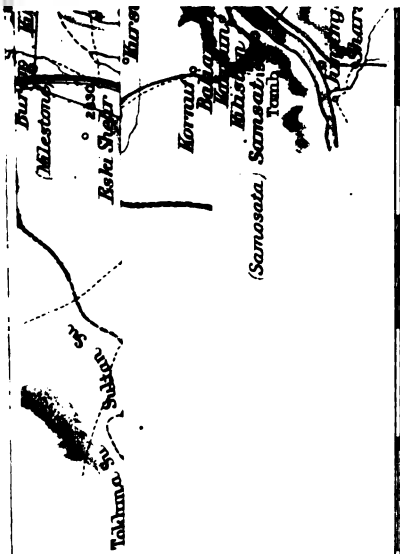
Kraker und G'bagebag Schutzgebiet der New-Guinea-Kompanie, Auf grund der Skizzen und Mitteilungen von Dr. Otto Finsch u. Missionar Georg Kunze entworfen und gezeichnet von P. Langhans. Scale 1: 250,000 or 3.9 stat. miles to an inch. Langhans: Beiträge zur Kenntnis der deutschen Schutzgebiete Bl. 10. Petermann's 'Geographische Mitteilungen,' Jahrgang 1896. Tafel 14. Presented by the Publisher.

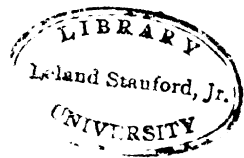
CHARTS.**United States Charts.****U.S. Hydrographic Office.**

No. 1493, Abrejos Point to Cape San Lazaro, West Coast of Lower California, 1896.—Pilot Chart of the North Atlantic Ocean, August, 1896. Published at the Hydrographic Office, Washington, D.C. Presented by the U.S. Hydrographer.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





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No. 5.

NOVEMBER, 1896.

VOL. VIII.

JOURNEY ROUND SIAM.*

By J. S. Black, First Assistant of Her Majesty's Consular Service in Siam.

WITHIN recent times the importance and magnitude of British interests in Siam have been, by the course of events in that country, brought prominently before the public. These interests arise from the presence of large numbers of British subjects and the investment of British capital in the various industries of the country. Our subjects are not only English people, but Indians, Malays, Burmese, and Chinese; in fact, every species of Asiatic who can lay claim to have been born in British possessions, and they are to be found not only at Bangkok, the capital of Siam, but are scattered in thousands throughout the most distant parts of the kingdom. The great proportion of this foreign population is composed of Burmese or Shans, who migrate from their homes into the adjoining Siamese territory as traders or gem-diggers. By virtue of the existing treaties with Siam, all her Majesty's Asiatic subjects are entitled to Consular protection and assistance, and the object of the journey which forms the subject-matter of the paper to-night was to hold district courts, settle a number of long-pending disputes between British subjects and Siamese in the provinces, and generally acquire information regarding the nature of British interests in these little-known regions.

I shall not in this paper allude to the details of my official business, but I may be permitted here to remark that I was occasionally extremely busy, and, after a hard day's work as Consular Court Judge (the Court sometimes consisting of a tent and the bench of a small camp table), I did not feel much inclined to worry the natives in search of that precise and scientific information which one ought to be able to

* Paper read at the Royal Geographical Society, April 27, 1896. Map, p. 540.
No. V.—NOVEMBER, 1896.]

present to such a learned body as the Royal Geographical Society. My journey was official, and naturally the greatest part of my attention was devoted to my official business, and, being versed neither in geology, zoology, nor any other "ology," I must crave the indulgence of this Society for venturing to lay before them such facts as would come under the observation of an ordinary traveller. The course of my journey, however, lay through some districts which have not to my knowledge yet been described, at least from the point of view from which I propose to treat them to-night, and geographical, as well as public, curiosity about these districts has been considerably heightened within the last few months. I might add that, having resided seven years in Bangkok, and devoted a large share of that time to the study of the Siamese language, I was in a position to communicate freely with the natives and obtain information at first hand; and thus I might say, with all modesty, I possessed an advantage, emphasized as it was by my official position, that is given to few travellers in a strange country.

Siam, as will be observed from the map, is, geographically speaking, roughly divided into two great basins—the basin of the Menam, and the basin of the Mekong. The course of my journey struck eastwards from Bangkok to the Talesap Lake, northwards through the western side of the Mekong basin, and, crossing the watershed south of Luang Prabang, I cut across the rough and hilly country of Northern Siam to Chiangmai, whence I descended the rivers Meping and Menam, a distance of nearly 600 miles, to Bangkok again. It is not possible, within the brief limits of such a lecture as this, to enter into the details of a journey which lasted six months, and during which I traversed over 2000 miles. I can, therefore, endeavour merely to describe new districts as concisely as possible, and treat generally of a few salient features such as might be imagined to be of interest to those who desire to add to their knowledge of this country.

Chantabun, which is situated 14 miles from the mouth of a stream of the same name, and lies 188 miles from Bangkok, was my first stopping-place—a place which has of late years been honoured with an amount of public attention which its intrinsic merits would not by any means have attracted to itself. It is generally spoken of as the second port of Siam, but it is a port in which only a few miserable canoes can be seen at any time, except on the one day of the week when a small Siamese steamer calls from Bangkok. Nor is its population considerable, for, on the authority of the Governor, that amounts to four thousand only, of whom at least one quarter are the descendants of Annamites who some generations ago migrated from their homes in Cochin-China. The whole province does not contain a population of more than thirty thousand, and this is concentrated on the Chantabun stream and near the coast. The Annamites, as well as many Chinamen, who are numerous in the province, are converts to the Roman Catholic faith, and their spiritual wants are

ministered to by a French missionary, assisted by several native pastors. The exports are insignificant in value, with the exception of pepper, which amounts to about £60,000 per annum. The pepper plant, the sight of which reminds one of the hop gardens of Kent, flourishes at the base of the Sabap hills, and is cultivated exclusively by Chinese. These industrious individuals have, as usual, the monopoly of all lucrative business in their hands, keep the best shops, and control the liquor and opium trade.

Chantabun is on the way to the sapphire and ruby mines, which are situated in the adjoining provinces of Battambang and Krat, and a



CHANTABUN.

number of Burmese reside here for the purpose of buying the precious stones from the diggers, and of trading in the necessaries of food and clothing required at the mines. These mines contain a population of over two thousand Burmese-British subjects, and here lay the chief scene of my official labours in this part of the country.

I might add, by the way, before leaving Chantabun, that the presence of the few French troops just outside the town have not produced any noticeable difference in the place, except that the price of chickens and eggs has been slightly enhanced—a fact which the old Burman in whose house I lodged was careful to communicate to me. The civil government is entirely in the hands of the Siamese authorities, and trade and business go on as usual.

The province of Chantabun is separated from the province of Battambang by a range of hills from 2000 to 3000 feet high, and one

peak—Sai Dao—is passed on the route which, judging roughly, must be 5000 feet high. It will thus be observed that Chantabun is not, as has sometimes been erroneously supposed, the port and outlet of the provinces of Battambang and Siamrap. These provinces drain into the Talesap Lake, and finally into the Mekong, whilst the province of Chantabun drains into the Gulf of Siam. Indeed, there would be little or no communication between the two places were it not for the fact that the sapphire mines are situated near the frontier of Chantabun.

Pailin is the name given to that place, and the journey thither, which is done by pack-bullock or elephant, occupies about four days. The narrow footpath—impassable for bullock-carts—winds its way through dense forest, and rises to a height of about 1000 feet. Though the scenery is rugged and varied, it is not nearly so impressive and picturesque as what I was yet to see amongst the wild and solitary grandeur of the Mekong gorges or the rapids on the Menam. At Pailin my duties detained me twelve days, and then I passed on to Battambang.

Battambang and Siamrap are provinces which have somehow gained the reputation of being extremely rich, fertile, and populous. In recent times these provinces have hardly ever been referred to except in euphuistic language describing their wealth, population, and magnificence. As no Consular official had ever been in this direction before, I was naturally anxious to explore this unusual land flowing with milk and honey, and scrutinize, if necessary, these vague and glowing accounts in the light of cold and relentless statistics. I must confess that any sanguine expectations I possessed were considerably shattered after I had traversed the province, seen Battambang the capital, and succeeded in getting a few figures about trade and population. It does not strike one at all as the richest and most populous province of Siam. In fact, in its present condition, it by no means comes up to the general standard of wealth of the Menam valley.

I do not speak of the potentialities of the place—far from it—as almost every part of Indo-China is capable of enormous development under proper European management, but I take things as they now stand. And what do we find? The population of the combined provinces of Battambang and Siamrap I estimate at about eighty thousand, and the import and export trades combined may be valued at about £80,000 per annum. I must state that these figures are only approximations, as *boná fide* statistics are not to be obtained in any part of Indo-China, and the data upon which even the most painstaking inquirer bases his results are necessarily very imperfect. My figures of trade were obtained from individual merchants and from calculations based on the amount of taxes, and population from rough guesses at the number of able-bodied men in the different subdivisions. In any case, the statistics are accurate enough to show that the terms of “rich, fertile, and populous” are hardly applicable to this part of Siam.

The town of Battambang itself is a scattered village of about four thousand inhabitants lying on both sides of the Sangkai stream, which, when I was there during the dry season, did not contain enough water to float an ordinary boat. Three miles beyond the town the cultivation of rice ceases, and nothing is to be seen but a vast expanse of treeless, grassy plain stretching out to the jungle which fringes the distant horizon.

The imports are chiefly cotton cloth for the clothing of the population, and small quantities of other articles, such as lamps, slippers, silks, looking-glasses, brass dishes, etc. The principal export is rice, and this



ON THE WAY TO THE GREAT LAKE, EAST SIAM.

amounts to about £20,000 per annum, and fish to about £15,000. The other exports are hides and horns, cardamums, mats, etc. The Siamese share of the fisheries of the lake is quite insignificant compared with that of Cambodia.

It is gratifying to learn that, in spite of the close connection which exists geographically between Battambang and Saigon, the cloth trade here is almost exclusively British, and is in the hands of two wholesale British Indian dealers. It is an extraordinary fact that British goods can be conveyed to Battambang overland from Bangkok, a long and toilsome journey of two days by steamer and about twenty days by bullock-cart, and yet undersell French goods in Battambang, though the latter can in the rainy season be brought up by steamer from Saigon in two days. In this season the Indian traders often get their cloth through Saigon by paying a heavy transit duty. The bulk of the exports naturally find their way to Saigon, but French imports are insignificant, and consist chiefly of liqueurs and brandy, silk goods, and knickknacks.

A rich spot, however, in this province is at the sapphire mines situated up amongst the hills at the sources of the Khonburi stream. It is a curious geological circumstance that a range of hills forms a distinct line of demarcation between the sapphire mines at Pailin and the ruby mines at Nawong, in the province of Krat. Sapphires are found on the northern slope of these hills, and rubies on the southern. The mines are of two kinds, surface and deep. The former are 2 or 3 feet deep, or, in fact, sometimes the surface of the ground is merely scraped with a piece of iron or stick, carefully powdered to bits with the hand, and stones picked out. The other mines are from 15 to 20 feet deep, and have generally an aperture of $4\frac{1}{2}$ feet square. The upper stratum of earth is loam, then loamy and clayey, and finally the ruby or sapphire layer is reached with a thickness varying from 4 to 18 inches. This layer is hoisted up with a rude crane and basket, and carried down to the nearest stream, where it is washed and carefully examined in little flat baskets with closely woven meshes. From the waterworn appearance of the fragments of rocks embedded in the layer, it would seem that the precious stones are not found in the original matrix, but have been washed down from the hills. A British company was formed some years ago to work the ruby mines, but, as the Burmese miners resented the right of the company of insisting upon all the stones being handed over at a price fixed by the company's expert, they left the mines in large numbers. No other class of men can be found to work in these pestilential and malarious jungles, and thus the production of stones and the existence of the company gradually came to an end. In 1895 another British company, the Siam Exploring Co., Ltd., received from the King of Siam the exclusive right of working the sapphire mines at Pailin, and they also bought up the rights of the former company at the ruby mines. The entire mining-field is thus in their hands, and there is no doubt but that it is a most valuable concession, as the annual output of stones from this region is very large. The mining district at Pailin covers an area of 6 miles long by $1\frac{1}{2}$ miles in breadth, and large portions of this are still untouched, and are doubtless gem-bearing. Immense quantities of cheap stones are found, but some of the Siam sapphires are as good as any that are brought into the market. The rubies do not bear so good a reputation. They are nearly all tinged with a dark "clarety" colour instead of that clear pigeon-blood hue so prized in this valuable stone. The difficulty that the company has to overcome—and it is by no means a small difficulty—is to get hold of the stones. In such an extensive area supervision of the miners is almost impossible, and, besides, the Shans, who up to the present have been working each man for himself, will not labour for wages, nor will they naturally give up good stones when they find them.

While at Battambang, the governor, who is a frank, genial young

man, and whose acquaintance I had already made in Bangkok, planned a deer-hunt for my distraction. Deer are hunted here in an extraordinary and, I should think, quite a unique fashion. They are, in fact, run down by ponies, and that in a remarkably short space of time. The ponies are small, hardy, and very active animals, as one may judge from their success in this hunt. The entertainment was got up in grand style, with twenty elephants and thirty ponies, and the ponies were ranged across the plain outside Battambang in a line extending about a quarter of a mile, whilst the elephants followed up behind with spectators. The deer, which are by no means small animals, but the ordinary *sambur* of these tropical countries, swarm in



A CAMBODIAN GIRL WEAVING CLOTH.

great numbers amongst the thick deep grass, and as soon as the head and horns of one was seen bobbing up and down as it bounded away like an arrow, the nearest half-dozen ponies started off after it at a break-neck pace. The natives ride barebacked, and, as the ground is full of depressions and empty water-holes, it is marvellous how well they retain their seats.

In three or four minutes' time we saw from our elevated perch the foremost rider stop and jump off. When the elephants came up, the deer was already nearly skinned, and a few moments afterwards it was cut in two, tied together with its own skin, and slung across the back of an elephant, there in readiness to carry home the spoil. The deer, it seems, drop down breathless, and the rider gives it the *coup de grâce* with his hunting-knife. I calculated the course of two of these runs, and put it down at three-quarters of a mile for the one and three miles

for the other. The spirited little ponies appear to enjoy the fun with as much zest as the men themselves, and one animal, whose rider was sent flying headlong into the grass, enthusiastically galloped riderless in to the death. The hunt lasted from nine in the morning till three in the afternoon, and in that time we caught four deer, and seven or eight escaped, either by superior speed or due to the fact that the ponies did not get the sight of them in time.

Battambang and Siamrap are provinces of the ancient kingdom of Cambodia, which, after centuries of struggle with Siam, varied with internal dissension, finally came under the suzerainty of the latter power towards the end of the seventeenth century. In 1867 France assumed a protectorate over the lower half of this tributary kingdom, and the possession of the remaining portion, Battambang and Siamrap, was by a Franco-Siamese treaty assured to Siam. The current speech of the country is Cambodian—a language which differs radically from Siamese—but Siamese is the official language, and all the officials, who are, one might say, both the aristocracy and the plutocracy of these Asiatic countries, speak both languages with equal facility. The present descendants of the once powerful Kmer race have, in their customs, religion, and general characteristics, much in common with the Siamese; but they are inferior to them both in physique, intellect, and morals. They are, indeed, notorious both for mendacity and petty pilfering.

From Battambang I descended the river Sangkai, crossed the Talesap Lake in three and a half hours, and proceeded to Siamrap, which lies about 10 miles from the shore. This great sea of fresh water, which measures nearly 100 miles in length and 20 at its greatest breadth, rises no less than 21 feet during the rainy season, and floods all the adjoining country for miles. In the dry season it is not more than 4 or 5 feet deep, and it is at this time, during the months of March, April, and May, that the surrounding population flock to its shores to catch the numerous fish.

Siamrap is itself a stagnant little place of about two thousand inhabitants; but the pretty rivulet here of pure sparkling water, with its old-fashioned water-wheels and its banks shaded by the wavy palm and cocoanut tree, forms a refreshing scene after passing through the low and swampy country that fringes the Talesap Lake.

I only stayed a day and a half in Siamrap, as my time was exceedingly limited, and as the only case I had to investigate was a trifling one of bullock theft, which I settled with the governor in about three minutes. The celebrated ruins of Angkor Wat and Angkor Thom lie about 4 miles from the village, but I do not intend to launch out into any disquisition on a subject which is now well worn. I might remark, however, that though I am not an enthusiast by any means about ruins, and particularly ruins of Indo-Chinese temples, of which we get rather

tired out there, even the most casual spectator cannot fail to be overwhelmed with admiration and amazement as he gazes upon these wonderful galleries, pretty side buildings, and lofty sculptured towers rising up before him in silent grandeur and magnificence. It is a solitary and desolate spot, and nothing is to be heard but the gentle sighing of the wind as it rustles the leaves of the melancholy palm trees, or whistles along the deserted corridors, now damp with age and infested with swarms of ghost-like bats. All round and in the centre of the ruined city itself grows dense and lofty jungle, and one can well imagine the beasts of the field holding high carnival amongst the fallen and broken pillars when the clear moon looks down upon these ancient monuments of human greatness. The imagination pictures to itself, too, the time when Angkor Thom, the city, was the capital of a powerful empire, and Angkor Wat the holy shrine and temple of the dense and busy population that once trod these jungle-covered plains; and now, though empire and race have long since disappeared almost without leaving a trace of their history, the immense blocks of stone which the hands of these people dragged here and piled high one upon another, the highways radiating from the capital, the stone bridges and distant scattered monuments, still remain to attest the former might and opulence of the country.

Before hurrying onwards, however, I inquired about the traditions lingering among the present inhabitants, and at my request the Governor ordered forth one of the oldest inhabitants of the place—a patriarch of seventy-five, who was represented to be the best repository of this vague traditional knowledge. As he squatted humbly on the ground before me, I regarded this curiosity with considerable interest, and enjoined him in judicial language to “tell the truth, the whole truth, and nothing but the truth.” This is what he said, as I took it down word for word—

“There was once a king of Angkor Thom, Chao Pratum Suriwong by name, and he had a son Pra Ketmala. Pra In came down from heaven and saw Pra Ketmala. He asked Chao Pratum Suriwong that Pra Ketmala might be taken up to heaven. He was taken up to heaven, but the smell of the Thewada (angels) being too strong for him to bear, he returned to Earth again, and then Pra In ordered Pra Weesanukam to build Nakon Wat. Pra Weesanukam accordingly came down and told Chao Pratum Suriwong to build the temple, and Chao Pratum Suriwong impressed men to do the work. Men to seven times the number that could stand within the walls of Angkor Thom were impressed, and they completed the whole building in seven days. When the building was finished, Pra Ketmala did not stay in it himself, but placed therein Pra Putta Kosa Chan, who had been a priest in Ceylon. Then Pra Ketmala went to Beng Melia, near Puompenh.”

Mythology is not a strong point with me, and besides there is no

time to construct ingenious theories from this little statement, but I put it on record, and perhaps the learned in these matters may find that it forms at least a condensed version of the already received notions about the construction and object of these wonderful structures.

The next portion of my journey lay through the western side of the Mekong basin, with the town of Korat as a halfway resting-place. Bullock-cart is the method of locomotion in this district, and as these crazy vehicles are dragged along at a pace of about $1\frac{1}{2}$ mile an hour, an ordinary day's march is a long and toilsome business. It was now the month of March, and the heat was becoming oppressive—so much so that I found it necessary, in order to get any progress at all out of the bullocks, to make my caravan travel during the coolness of the night, and rest, if possible, in some shady spot during the day. Our usual marching hours were from three in the morning till eight or nine, and then again from three in the afternoon till eight, and the average number of miles covered in that time was only about 15 or 16. I rode a pony myself, and a very small animal he was—so diminutive, in fact, that I could barely keep my feet off the ground; but he was a hardy little beast, and gallantly carried me all the way between Siamrap and Nongkhai, on the Mekong, a distance of nearly 500 miles. I sold him then for 30s., but as he only cost £2 originally, it could not be called an expensive ride, particularly as he ate nothing but burnt-up grass and a little rice.

The character of the country throughout the whole of this region is much alike, and becomes to the traveller exceedingly tiring and monotonous. The trail, as one may call it—for there is no pretence at road-making—winds through open jungle, the trees being about 30 feet high, and mostly mai rang, mai teng, and mai yang, as they are called in Siamese—resinous trees of the *Dipterocarpus* genus. The landscape is flat, with the exception of the rise up to the Korat plateau, and there the highest average level above the sea is about 800 feet, with a very gentle dip in an easterly direction towards the Mekong. The population, which is Cambodian up to and somewhat beyond Dong Rek hills and Lao north of that, is exceedingly scanty. In the neighbourhood of Dong Rek hills are found a race called Suey, who speak their own peculiar dialect in addition to Cambodian or Lao. They would appear to be the remnants of aboriginal tribes, and are, if anything, uglier, dirtier, and more primitive-looking than the surrounding Cambodians and Lao. The Korat people, who are also an ugly but sturdy race, seem to be a hybrid of Lao and the aboriginal Suey; but, from the neighbourhood of Cambodian settlements in this district, there is every probability that the limit of the ancient Kmer kingdom extended right up to Korat.

In and around the town of Korat, however, Siamese is the prevailing language, and the "panung," or Siamese loin-cloth, which is drawn

between the legs in the shape of trousers, is the usual dress of both sexes. The difference in the dress of the Lao is that the women wear a brightly striped petticoat instead of the "panung." The silk-worm is extensively cultivated, and the natives are skilful in manufacturing beautiful silks, some kinds of which bear a striking resemblance to Scotch tartans. They weave most of their own clothing, which consists only of this loin-cloth and a breast-scarf.

The whole of the Mekong region beyond 50 miles north and east of Korat is peopled by these Lao, a race who are as much akin almost to our own Shans as to the Siamese. The language differs both in character and sound from Siamese; but, as the Lao country has been under



SIAMRAP DURING THE DRY SEASON.

the domination of Siam now for a hundred and twenty years, Siamese is widely understood and spoken.

This extensive tract of country suffers from two great and serious evils—the want of inhabitants and isolation. The want of population may be exemplified by one fact, namely, that the largest town in the whole of the Mekong valley from Pnompenh to Luang Prabang is Nongkhai, and that place, as I was careful to ascertain, contains between 700 and 800 houses, or say a population—to be liberal in calculation—of about 5000. In Ubon there are 632 houses, and Korat is, I should think, somewhat larger. These three towns constitute the great centres of population in the whole of this immense territory. For days and weeks almost, even on the main routes of communication, a traveller will pass villages which number only a few squalid huts, and when I came to a place of two hundred huts it was thought a great event by all

my men, for in a metropolis of that size there was some kind of market where they might replenish the camp larder.

Why the population should be so scarce is difficult to say. In olden times war and bloodshed certainly ravaged the country; but now, from my own observation, I should think the principal check on the growth of population is pestilence. The year of 1895 may have been exceptional, but everywhere I went I saw signs of widespread epidemics of fever, small-pox, and cholera. In and around Korat and some other places this was particularly noticeable, as the people have the custom of sticking up in front of a house where there is illness, a little earthenware pot marked with blue or white bands. This was not done out of consideration, it seems, for the neighbours, but was a visible token of supplication for mercy to the demon of fever or cholera. The number of these pots in some places was perfectly alarming, and on more than one occasion we marched right into a village where cholera was rampant.

This region, too, is by nature cut off from communication with the outside world. Outlet by the Mekong on the east is barred by the precipitous rapids at Khone (or Khawn, as it is locally pronounced), and what trade there is has always tended in the direction of Korat. The route from Korat to Bangkok, again, is extremely difficult and dangerous, as it passes through a dense and dark forest, which has such a frightful reputation for fever that the name is always mentioned by the Siamese with bated breath—and with good reason too, for it is beyond doubt a most pestilential and malarious spot. The narrow and tortuous trail can only be traversed by pack-bullocks, and they take ten days to accomplish the journey to Saraburi, which is within three days of Bangkok by boat.

It is by this route that trade is carried on, and, considering the difficulties and cost of transport, it is rather surprising to find that there is any trade at all. Not that it amounts to very much, for, judging roughly in the absence of any reliable statistics, I should not be inclined to estimate the total import and export trade at more than £200,000 per annum. The imports consist, as usual, principally of cotton cloth and a few other articles of clothing, brass dishes and crockery, and the exports of cardamums, raw silk, gum benjamin, cattle, and hides. On account of this isolation, the inhabitants do not seem to possess that instinct for trade which renders a country valuable. They grow their own rice and tobacco, weave their own clothes of silk and cotton, and in many places, have not even got beyond a system of barter for their few wants, and of paying their taxes in kind.

Korat is important in one sense, as being the *depôt* for the whole of the Hinterland, extending even across to the left bank of the Mekong, but it cannot be said that this is a region which, in its present

condition, offers much attraction to a foreign market. Easy and cheap communication by railway would doubtless create a much larger demand for foreign commodities, but that will be naturally limited by the scarcity of population. Even judging liberally from the data which I accumulated on this journey, I do not think that the total population of the whole of the Mekong basin still remaining in the possession of Siam can, at the utmost, amount to more than 1,000,000. As for the left bank of the Mekong, it is, in comparison, practically uninhabited, as all the villages are situated on the right bank.

The whole of this country swarms with wild animals, and at different places are to be found wild elephant, tiger, leopard, bear, pig, and deer. I occasionally saw the huge, circular tracks of wild elephant on the path in the forest, and once or twice the spore of tiger in the vicinity of our camp attested the presence of that uncanny nocturnal visitor. Several times my faithful "boy" told me in the morning, with a tremor in his voice, that he had heard the roaring of a tiger during the watches of the night. I never had that luck myself, I'm sorry to say, as the deep and dreamless slumber of a tired wanderer generally made me oblivious to all the nightly sounds of the forest, however strange or weird they might be. I, however, had the pleasure, such as it was, of seeing a real live leopard at home in his native jungle. Not that I had any desire to call on the gentleman, and cultivate a closer acquaintance—an un-social disposition which, I rejoiced to see, was even more marked on the part of the leopard. It was early morning, and I was quietly trotting along on my Lilliputian charger, when a kind of exaggerated cat, so to say, slouched across the path. Without condescending to take the slightest notice of a British Consular official, he disappeared through the undergrowth at a rapid pace, and took with him, I might add, my hearty wishes for a *bon voyage*.

I heard of few fatalities of natives from attacks of tiger, but in several places I was informed of their depredations on ponies and cattle. Not only is the population scanty, but there is apparently such abundance of deer and pig that little necessity exists for beasts of prey to approach the haunts of men in search of food. At one place, however, near where we camped at the ruby mines, a native, who was sleeping out in the open with two others, was pounced upon by a tiger, and so severely mauled that he died. And in the north of Siam the sad story of an old woman who had been devoured by a hungry tiger—and a very bold and hungry beast he must have been to have tackled an old Siamese woman—kept our whole caravan in a state of excitement till the scene of the unhallowed repast was left far behind.

The journey from Siamrap to Korat occupied eighteen days, and that from Korat to Nongkhai fifteen days, and we suffered greatly from heat and want of water. Not that the temperature went up to abnormal heights, but on the close stuffy day that it reached 105° in

my double-roofed tent under the shade of trees, I felt it was quite as high as any human being would care to see it. This is the hottest season of the year, and the temperature, even in the substantial well-built house which I occupied in Korat, generally ranged up to nearly 100°, and remained over 90° till some time after sundown. The nights, luckily, were cool, the minimum in the early morning just before daybreak often marking 76°.

All the small streams were dried up, and the rivers reduced to mere dribblets of water. We depended for drinking-water on stray pools, which marked here and there what would be the bed of a stream in the rainy season, and as cattle and buffaloes had been wallowing in these for months back, the water was not, to put it mildly, of the sweetest and most inviting description. In the neighbourhood of Korat the surface of the ground is in some places covered with an excrescence of salt like hoar-frost, and the streams are brackish. Here part of my impedimenta was a cart-load of green coconuts, with which I quenched my thirst; but a sickly and disagreeable drink it is when taken in any quantity. The town of Korat, like many others in this district, depends for its drinking-water on an immense marsh outside the walls. When I was there in the height of the dry season, the water was so low that the people had to wallow through the mud and carefully dip up the precious fluid with dippers, and even when it was both boiled and filtered it did not lose its marshy taste and aroma. In the rainy season, again, there is plenty of water everywhere; too much of it, in fact, as communication by bullock cart is rendered extremely difficult, if not impossible. Altogether, on account of heat, want of water, a monotonous jungly country, a toilsome and dreary method of locomotion, disease and pestilence, I was glad to reach the banks of the mighty Mekong, and turn my back on this desolate country.

At Nongkhai I received a warm and cordial welcome from H.R.H. Prince Prachak, the Siamese Chief Commissioner, who not only lodged me in a specially built house and treated myself and men in a right princely fashion, but, to my astonishment and delight, presented me on arrival with a bottle of Bass cooled in ice made in his own royal ice-machine. He also distilled the brackish water of the place, and my recollections of this pleasant spot are mostly connected with the joys of revelling in an unlimited quantity of distilled water and Bass beer in ice.

It was at Nongkhai that I first gazed upon the great river of Indo-China, the Mekong. Even at this point, more than 1000 miles from its mouth, the Mekong is a magnificent stream, and the sight of this vast volume of water nearly half a mile wide, issuing from the unknown regions of Tibet and sweeping on grandly towards the distant ocean, gives rise to feelings of the deepest admiration and awe. My feelings of admiration and awe were, however, quickly changed

to those of dismay and abhorrence when I reached the Chiengkhan rapids, and spent eight long and anxious days battling against the surging and boiling waters, creeping cautiously round jagged rocks, pulling strenuously with ropes, shoving with boat-hooks, struggling and shouting, or simply sitting helplessly in the bottom of the rude dug-out with secret terror in my heart, as I gazed at the wildly hissing water, and speculated how far a body would be carried before it reached the surface of these boiling whirlpools. Twice we had to unload the boats and transport all baggage across the rocks and sand, but this was the most difficult season of the year, on account of the lowness



RAPIDS ON THE MEKONG.

of the water. The river, of which the average width above the rapids is about half a mile, with say an average depth of 4 or 5 feet, here gets contracted into a narrow rocky channel not more than 60 or 100 yards wide in places, shut in by black and sharply jutting rocks from 10 to 30 feet high. In the rainy season the water rises and spreads hundreds of yards beyond this little channel, and then small boats creep along the banks in a somewhat easier fashion. The different rapids or shoots of water, which are each distinguished by a local name, number fourteen in all, and are spread over a distance of 50 miles. The intervening spaces are, of course, not so difficult as the rapids, but during the whole of these eight days the ropes were hardly ever cast off the boats.

As the river here literally forces its way through a range of hills, the scenery is wildly picturesque. Rugged forest-clad hills rear their lofty heads at every turn, and, after surmounting a fierce and impetuous rapid, it was a great pleasure to paddle along smoothly for a space and quietly enjoy the ever-changing aspects of this delightful mountain and river scenery. Inhabitants were almost entirely wanting, and every morning I was awakened by the crowing of jungle fowl, the calling of wild peacock, or the loud prolonged and intensely mournful howling of monkeys.

Let us glance at the Mekong from a commercial point of view for a moment. It has been the hope of that gallant nation who now own the left bank of the Mekong from its mouth to the confines of the Chinese Empire, that it will prove a highway to the riches of that populous and secluded country. Now, the Mekong has never been, and one is tempted in a spirit of prophecy to add, never will be, a commercial highway to the south-west of China. There has never been any trade, even a local trade, between Yunnan and any of the middle or upper portions of the Mekong. What trade there is has found its way by land from the frontiers of the Shan States and Yunnan in a south-westerly direction towards Chiengmai and Burma, and trade does not choose a toilsome land journey by caravan in preference to a river journey without the best of local reasons. And when railway facilities are created for the assistance of this struggling trade, it is much less likely that it will be directed towards the barren and unpopulated region of the Mekong.

There are no less than three barriers to navigation where the rapids are particularly furious and impassable—(1) Khone, (2) Kemmarat, (3) Chiengkhan. The Khone rapids are the most difficult, and the little French gunboat, 90 feet long, which surmounted those of Kemmarat and Chiengkhan, had to be conveyed over a Decauville railway at Khone. The feat that Lieut. Simon has accomplished in the *Grandinière* is one that deserves the highest praise, as, in ascending these frightful rapids, he placed his own life and that of his crew unreservedly in the hands of the steersman for many days. Difficult as it may be to ascend, it is much more difficult to descend, and the *Grandinière* will probably have to remain permanently at Luang Prabang. Continuous steam traffic on the Mekong is beyond doubt chimerical. On the level reaches, between the different series of rapids it would be very convenient, doubtless, to have launches to convey the Government mails and stores, but I cannot imagine any commercial man in his sane senses undertaking to run steamers there on business principles. The local trade between Luang Prabang and Nongkhai, the two great centres on the middle Mekong, may amount to perhaps one hundred boats annually. But what kind of boats? Mere hollowed-out trunks of trees, for the primitive Lao of this region have not yet learned the art of boat-building; and even if these canoes were loaded with gold and silver instead of only cotton,

mats, silk, and salt, would the value of their trade be enough to justify a flotilla of steamers on the Mekong?

It was May 9, and the rainy season had begun, when I left the river at Paklai and struck across country to Nan and Chiengmai. I travelled now at the head of a train of twelve elephants, and, as the season was advancing and the streams getting full of water, we hurried on, marching generally from dawn to dusk, with frequent changes of elephants. The country is exceedingly rough and hilly between Paklai and Nan, and the roads are mere mountain paths, more often than not only the rocky beds of streams. It was marvellous with what patience and skill the



A STREET IN KOBAT.

ponderous elephants carefully toiled up precipitous ravines as steep as a staircase, and slid down fearsome inclines with all the facility of trained acrobats.

What a trumpeting and bellowing of content there was from these tired and fotsore elephants, as we halted for the night and unstrapped from their backs their howdahs and burdens; and what bustle, confusion, and shouting there was every morning getting them loaded again at the earliest break of dawn! Life then was reduced to a daily worry of packing and unpacking, as everything had to go into handy form to fill up the small recesses of the howdah. But once on the march, safely hoisted upon the back of my unwieldy Jumbo, I was comfortable for the day. The rain might fall in torrents, as it generally did, or the sun come out with blinding glare, but I was secure under

cover; and whether the elephants were slouching through a bog, or slowly zigzagging up the face of a hill, was a matter of indifference as far as my comfort was concerned. With a book, a sandwich, and a bunch of bananas for lunch, and a packet of Siamese cigarettes, I was happy for the day, and often went peacefully to slumber for an hour or two, even though it was rather a tight fit to squeeze inside the narrow limits of the howdah.

Soon after the watershed between the Mekong and Menam was passed, the character of the country and people changed for the better. Instead of passing through interminable flat jungly plains as in Eastern Siam, we traversed now a country of sparkling streams, fertile valleys, and beautiful blue hills. The people had the look of being more active and well-to-do; their houses were large and solidly built, and their temples substantially constructed of durable teak and brick. One of my men, who was a Chiangmai Lao—that is, tattooed from waist to knee in contradistinction to the Lao of the Mekong, who are only slightly tattooed on the thighs—had all along, during this journey, been sounding the praises of the Northern Lao country, and expressing his contempt for his brethren of the east. Now at every turn he was calling on his companions to admire the riches and beauties of his own country. Inwardly I assented to all he said, and felt that the change was most striking from the miserable, poverty-stricken Mekong valley to the flourishing Menam, where there was not only beauty of landscape, but the bustle and animation of business and material prosperity.

The extensive forests of teak are at present the chief source of the wealth of this country. Northern Siam divides with Burma the monopoly of supplying the world with this valuable timber, and the share that Siam annually turns out is valued at over a quarter of a million sterling. These teak forests are worked almost exclusively by Burmese British subjects, and the wood is bought and shipped by British firms to London. The amount of British capital invested in this industry alone must amount to at least a million sterling.

It is a curious fact that the zone of teak seems to stop at the limit of the Menam watershed, for on the Mekong slope teak does not appear to grow in any quantity, and what has been observed is small and stunted. The only exception to this is on the Me Ing. It has never been heard of on the left bank of the Mekong.

Nan is a pleasant little town of three or four thousand inhabitants, and is likely to be a busy centre of the teak trade in the near future, as one of the large British teak firms is anxious to extend its operations to that province.

At Pre, which is the next place of importance on the way to Chiangmai, I was delayed a few days by heavy rains and floods. I was very kindly entertained here by Dr. Briggs, a medical missionary, who employed his skill and knowledge in doctoring three of my men who

were prostrated with malarial fever. My cook—a Chinaman—had suffered a great deal during the journey, and I had only kept him alive, on the way from Nan to Pre, by repeated brandy cocktails and spoonfuls of bovril. I had, to my surprise, entirely escaped fever myself, and I attribute this chiefly to the strict precautions I took with water, which I never touched unless both boiled and filtered. Even at native banquets, which it was my fate to attend in ceremony in all parts of the country, I invariably smuggled in, more or less surreptitiously, a bottle or two of my own precious water. The uninterrupted use of a mosquito-net, too, even when there were no mosquitoes, probably assisted greatly in keeping off an attack of malarial fever. I also took five grains of quinine every three or four days, and in particularly malarious regions, two grains night and morning.

At Pre I remember, as one of the many curious experiences of this journey, that I attempted to join in the Lao hymns which the worthy missionary and his household sang at family worship. Dr. Briggs is a Canadian, and his favourite tune was "God save the Queen." To sing Lao hymns to the tune of the National Anthem whilst a bevy of merry brown native girls chimed in with their sweet voices is an experience, I am sure, which is given to few men.

Chiengmai, which I reached on June 20, is the capital of Northern Siam, and a very flourishing, busy, and cheerful town it is. It contains a population, I should think, of twelve thousand, and is prettily situated on the Meping 1000 feet above sea-level, with the lofty and forest-clad peak of Doi Suthep towering up behind to a height of 5500 feet. The European population here numbers about twenty, and they are all missionary or teak-timber men, with the exception of Her Britannic Majesty's Consul.

The latter part of my journey was by boat from Chiengmai to Bangkok, a distance of 537 miles, and that was accomplished with the rising floods in eighteen days, including stoppages for official purposes of four days. The rapids on the Meping, which are not nearly so dangerous or impressive as those on the Mekong, were all passed in a day and a half, and I found it much more exhilarating to shoot swiftly down such watery inclines like an arrow, than slowly fight our way up them. The gorges are quite narrow, lofty, and covered with dense masses of green vegetation, and every sweep of the river brings to view new and exquisite panoramas of rugged landscape. On the way down I called in at Lopburi, one of the ancient capitals of Siam, and there I took a photograph of the ruined palace of Constance Phaulkon, a Greek adventurer, a man apparently of great genius, who attained the post of prime minister in Siam towards the end of the seventeenth century. He was ultimately assassinated in a court intrigue, and his memory is still preserved in Lopburi.

The Menam valley is, comparatively speaking, well-known country, and I shall here only endeavour to draw your attention to one or two significant facts about it, so that you may picture to yourselves the contrast between the Mekong and the Menam valley.

Siam, as I have remarked at the opening of this paper, may be divided into the two valleys of the Menam and the Mekong, and the total average import and export trade for the kingdom of Siam, based on the returns for the past three years, amounts to four and three-quarter millions sterling per annum. As I have estimated the total export and import trade that passes to and from the Mekong region at about a quarter of a million, it follows that the balance of the remaining trade of four and a half millions sterling per annum is carried on with the Menam valley. These statistics show at a glance the relative importance, as far as the outside world is concerned, of these two regions; and, as the great proportion of this trade is carried on by British energy and British capital, you can well understand the satisfaction of the mercantile community to find that this, the important and vital portion of the kingdom of Siam, has, by the recent agreement concluded between England and France, been placed in a position of absolute security and freedom from armed interference on the part of either country.

Nor does four and a half millions sterling represent in any degree the trade that the valley of the Menam is capable of when properly developed, and when its five or six millions of inhabitants are brought within easy reach of British markets. The export of rice, the principal production of the country, which averages nearly two millions sterling per annum, is drawn to a very great extent from the delta of the Menam alone, and not many miles from Bangkok there are extensive tracts of rich alluvial soil which need only canals to bring them within the area of cultivation.

The fertile valleys of Northern Siam, too, require to be brought into closer connection both with Bangkok and Burma, and it is to the object of constructing a Trunk railway up the valley of the Menam, and throwing off branch lines to the Burmese frontier, that the Government of Siam should strenuously devote itself. Nor should the extension and repair of the canals in the Menam delta be forgotten, for in that low alluvial land canals are even a more important factor for development than railways.

In concluding this paper, I might take the opportunity of paying a brief tribute of thanks to the Siamese authorities, and particularly to H.R.H. Prince Damrong, the active and talented Minister of the Interior, by whose special orders my transport throughout the whole of this extensive journey was admirably arranged. It was to his foresight, and to the care and energy displayed by the local officials, that I was nowhere subjected to delay, and that I completed this tour round Siam without any serious mishap.

Before the papers were read, the **PRESIDENT** said: We are honoured this evening by the presence of the Prince of Siam, son of his Majesty the King of Siam. The papers to be read are on kindred subjects. The first by Mr. Clifford,* on some of the Malay States on the eastern side of the peninsula—about which we are almost in complete ignorance, I think, until we shall have heard his paper; and the other will be an account of a very interesting journey round Siam, by Mr. Black, of her Majesty's consular service in Siam. I will now ask Mr. Clifford to read his paper.

After the reading of the papers, the following discussion took place:—

Sir HUGH Low: I am afraid I can add very little to what Mr. Clifford said in his admirable paper. I don't know that part of the country well, having only visited parts of it. Mr. Clifford has travelled through it, and, I suppose, knows it better than any other person who has ever been in it. He came to the country, where I was at the time, about twelve years ago, when quite a young man, and at once showed his great powers of endurance by going into the jungle in all kinds of weather; and he has told us how he forced himself to live upon the native food, which I don't think any other person could have done, and carried out the expedition he undertook with so little difficulty. He is about to go back to these countries, and, although Pahang has not been under the care of British officers long, I have not the least doubt that, when he has been there for a short time, we shall have great improvements by federation with the most prosperous states on the western side of the Peninsula; and federation will enable Pahang to be developed, a policy which has been successful—as all our policy has been lately—so successful that scarcely anything can be compared with it in recent history. It is not for us to talk about the commercial advantages of the place, but the jungles, and the country through which Mr. Clifford travelled, really contain some of the most glorious scenery, the richest botanical products, and the most beautiful zoological productions in the world. Mr. Black mentioned the peacocks. These are far more handsome than those we have in England; it is a most glorious bird. I don't think I can say anything which would add to our knowledge, but I am sure that this Society will wish Mr. Clifford every possible success in this most important post to which he has been appointed, as Resident at Pahang—that country which is said to contain minerals in abundant quantities, which are already profitably produced, though scarcely prospected at all by Europeans. They are crudely worked by the Chinese and Siamese, but could be produced in greater abundance than in any other part of the world; and I have not the least doubt that many other rich productions will soon be developed now that this federation is under the protection of officers who are going to take charge of it.

The **PRESIDENT**: We also, I believe, have to welcome here this evening the presence of Mr. Swettenham, who has been kind enough to bring some interesting curiosities from the Malay Peninsula, and I trust he will address you on some part of the subject Mr. Clifford has brought before us.

Mr. F. A. SWETTENHAM: There are one or two things I should like to say, not so much with reference to Mr. Clifford's paper, because he has said all there is to be said. His journey was very remarkable, and I am specially glad to be here this evening, because I think I may claim some credit for having suggested to this Society that they should ask Mr. Clifford to read this paper. I should like to say, with reference to the geographical portion of the question, that Mr. Clifford has been able to fill up a blank space on the map. Twenty years ago the map showed

* Mr. Clifford's paper will be published in a subsequent number.

only the outline; since that time we have done something to fill up all the western part of it; but until the other day—I speak of last year—the part that is now filled up was quite blank, and this Mr. Clifford and his friends have done. I hope this Society will put it in the way of being seen by the public. If the Royal Geographical Society would aid the efforts that are being made in the East by a sister society, a branch of the Royal Asiatic Society, we might in a short time get a really good map of the Malay Peninsula. As I said, twenty years ago nobody thought it worth while to try and fill in any part of the Malay Peninsula. Sir Hugh Low reminded us that we must not discuss commercial topics here, but I trust that, as we are a nation of shopkeepers, you will forgive me if I allude to matters which are, in a way, commercial. Our interest in the Peninsula has been forced upon us. The British Government for many years absolutely refused to have anything whatever to do with the Malay Peninsula. We were established in a few small places marked in bright red on the map. The British had a colony, and outside that they declined to go, until the state of things in what I may call the Hinterland became so bad that we were compelled to go in against the wishes of the British Government. The result of our going there has been that we have done a great deal of good. The places which yielded a very small revenue indeed ten years ago, \$400,000, now yield \$8,000,000, the colony itself only yielding \$4,000,000. The colony is more than a hundred years old, and we have been in the Malay Peninsula only twenty years. There is not a railway in the colony, and we have 200 miles inside the Malay States. I ask your pardon for mentioning these commercial matters, but they are of some importance. I hope that, by means of the scheme for federation which has lately been sanctioned by the Secretary of State for the Colonies, we shall be able to so extend these railways that by-and-by the Malay Peninsula will become quite an important place, and that Malacca will become the port for the valuable mineral and agricultural products of the Peninsula. All that is due to one great fact which I think we are far too apt to forget, which is, that our presence in the Straits of Malacca is due to the foresight of one man, Sir Stamford Raffles. Everybody who knows anything about his life must recognize that he is one of the greatest Englishmen that ever lived, probably the greatest who ever got as far as he did, and I fear one whose history, character, and career have been the least recognized and least known, although whatever we are and whatever we shall be in the Straits of Malacca is really due to his great foresight and desire to advance the interests of this country.

Mr. F. VERNEY: I have really nothing to add to the very excellent remarks which have been made by those who have had the opportunity of serving in that distant and most interesting country. Perhaps I may be allowed to say a word with regard to the relations which have recently been established between England and France in the country of Siam. I must not trench on the question of politics, but would say this, that we must fervently hope that the arrangement may tend to the advancement and progress of the country, which we have so much at heart. I hope that no one here will think for a moment that commercial rivalry need be co-existent with a kind of commercial hostility. I think there is plenty of room for healthy commercial rivalry in this great country, and we should not in the least deny to France the rights we claim. We hope, by advancing in healthy rivalry, we may, without doing any harm to the king and country of Siam, go ahead in a way advantageous to Siam itself, and not disadvantageous, but of great gain, to the two commercial countries which have their interests so largely developed in Indo-China. We must have been immensely interested by the excellent papers we have heard. It requires splendid health, first-rate temper, a knowledge of the language of the country, and great experience, to produce such

good explorers as we have listened to to-night, and Englishmen, going into these countries, and making nothing of the toil and hardships they go through, giving such excellent representations of the journeys they have made and the countries they have visited, offer us the main chance we have of learning something of, and adding to our interest in, those distant lands. We feel heartily obliged to these two gentlemen who have been exploring these countries, and who have brought back such interesting accounts of them to us.

Mr. J. G. SCOTT: After the two papers which have been read to us, it seems rather invidious to call upon a person like myself, with a superficial acquaintance of the country, to make any remarks at all; but I think I shall be only representing the feeling of this meeting when I say that the little we have heard will make us look forward to the proceedings of the Society with the greatest interest. I should like to make some remarks with regard to Siam. A little earlier than Mr. Black, I travelled in Siam, and crossed his route. A few remarks which Mr. Clifford made about his hardships in Trengganu and Kelantan suggest to me that it would be as well, seeing that Siamese listeners are here to-night, that I should thank the Siamese Government for the facilities they placed at the disposal of myself and Mr. Black in travelling about the country. So far as I am concerned, I can safely say that I never had to test my capacity for putting away the rice which Mr. Clifford spoke of as the diet of which one has to take a great deal before being satisfied. There are a great many British subjects in the north of Siam, a great many Burmans and Shans. It is a curious fact that both Burmans and Shans are agriculturists in their own country. Agriculturists in this country are not in so good a position as they, for in Siam you only have to tickle the ground. Considering the number of British subjects in Siam, it is a matter of great pleasure to us that that country, which was in a dubious position owing to its two neighbours calling each other bad names, is now guaranteed on both sides. In travelling through the country, one sees an extraordinary number of ancient ruined cities, the city walls grown with trees, which shows they must have existed more than a hundred years ago, and from the ruins it would appear that the population must have been very great. We may hope, now that Siam is settled and at ease, that the population will grow to be as great as ever, and it is in this central part of the country that the population will settle. The country to the east, which some people seem to think belongs to France, is much less interesting. Mr. Black's paper, when it is published, will give you an idea of the country, but I think it is waterless, and that the population from there will most probably go to the centre of Siam, and will help to swell the amount of British trade, which is already 97 per cent. of the whole trade of Siam. The Mekong, of which I saw the upper part, and Mr. Black the middle, is a very fine river to look at, but it is not such a fine river as the British river, the Salwen. It never can become a commercial river at all. Lieutenant Simon has taken a gunboat up above the rapids to Luang Prabang, which shows it is feasible for pluck to conduct steamers up the river; but what a brave man will do a commercial man will not do, because it won't pay. Mr. Verney said that we might look upon the French rivalry with friendship. I think that if they intend to use the Mekong river, we may look upon their efforts to take the trade down with indifference.

Mr. R. L. MORANT: I don't wish to keep the meeting; but, if I may, I should like for a moment to add my humble testimony to what has been said about the work done round the Peninsula. I had the honour of going to each centre of government there with H.M. the King of Siam in 1889, on which occasion I was able to look at it, not only as a Britisher, but also, of course, through Siamese spectacles—that is, looking at the methods of the British Government from the point of

view of an Eastern monarch. We went down the west and up the east coast. The contrast was striking as one came up to the more northern ports of the Peninsula, where the suzerainty is not British. I well remember the remarks his Majesty made at the time, that it was quite visible what could be done by good administration. I only wish to ask a question upon two points of some importance. On most maps there is marked a river flowing through Korat down to the Mekong; when I went to Korat in 1894 I did not see anything in the nature of a river which would be of any use. The question is of some importance politically as well as geographically. Perhaps Mr. Black, who was there at a different season, saw something of the kind. As far as I can make out, everything in the nature of commerce must come westwards, that is to say, westwards from Korat. I would also like to know whether it is yet finally decided for the railway to go as far as Korat, or to stop at the point it has now reached. In its present condition it will not largely assist trade, though it has its uses. I shall never forget with what delight we walked along the top of the embankment after toiling over heavy jungle tracks. At the same time, if rails were laid it would be probably somewhat more useful to Siam generally. One would like to know if Mr. Black has any opinion on these points.

Mr. BLACK: As regards Mr. Morant's first question about the river flowing eastwards from Korat to the Mekong, there is such a river called Nam Mun. It flows past Korat, about 13 miles distant. It is a very small stream there, and in the dry season it contains only a few inches of water. Where it enters the Mekong its course is obstructed by rapids, and even the native boats, which at present go down that river, are obliged to have their goods taken out and carried overland; so that in its present condition, for the purposes of commerce it is not what might be called a practicable river. In the rainy season, of course, there is a great deal of water, and launches could, and, in fact, I believe a couple of launches were run for a short time from a place near Korat called Ta Chang down to Ubon, below which the rapids begin. Trade on this river could be fostered and developed, but this would take some time. As regards the railway, I am sorry to say that I have no information to give. If it were continued to Korat, it would develop an entirely new country, and pass over a tract which is now very difficult to traverse. At present this railway has been constructed for a distance of 75 miles, or half way. There still remains a distance of from 80 to 85 miles to Korat to be constructed.

The PRESIDENT: It now only remains for us to thank the authors of these two papers. Mr. Clifford has opened to us countries which, I may say, were almost entirely unexplored. It is true that the coasts of these countries have been known for centuries. I remember well that the great Arctic navigator, John Davis, was becalmed for many days off that coast of Trengganu and Pabang, and in sight of these lands he lost his life through the treachery of some Japanese pirates. But with regard to the interior of these states, we know next to nothing. We must all admire the hardihood and pluck with which Mr. Clifford explored them, and I think we must also applaud the gallantry of those youngsters who, in a dark night, risked their lives down the rapids; for, although it was only to bring their master his dinner, still it was an act of heroism. His account of the country is instructive, and his narrative of the journey most interesting. I am very sorry that Mr. Black was obliged to skip a large portion of a very valuable part of his paper, because he was afraid of boring you, which I am sure he would not have done. What he has told us is certainly most instructive and interesting, and I know you will desire me to return your cordial thanks to Mr. Black and to Mr. Clifford for the papers we have listened to this evening.

A JOURNEY IN THE VALLEY OF THE UPPER EUPHRATES.

By VINCENT W. YORKE.*

Divrik at present contains about 4000 families, of which 800 are said to be Turkish, and the rest Armenian. The town, which is situated on the edge of an extensive plain, is loosely built, with many gardens, and has a fair bazar. Its name and situation would point to its identity with Tephrike, an important fortress of the Paulicians in the ninth century A.D. It was founded by Carbeas, the leader of this powerful sect, in 855, and for nearly twenty years was the cause of much trouble to the Byzantine Empire. It was eventually taken by the Byzantines during the reign of Basil I. in 873.† The place afterwards came into the hands of the Seljuks, who, according to St. Martin,‡ were driven out by the Mongols in 1243.§

After a thorough search for antiquities, we could find no remains which can be with certainty ascribed to any period older than that of the Seljuk occupation. There are two ruined castles at Divrik, the largest of which occupies a strong position on a steep rock overhanging the modern town. Round the top of this rock there exists a circuit of walls, preserved at some points to a considerable height, which may in places be as old as the time of the Paulician occupation. Within these there are also remains of what may once have been a church, though, if this was ever the case, it has been largely modified in the Seljuk style. The other castle is built on a high pinnacle of rock on the further bank of the Chalta Irmak. It is much smaller in extent, and less well preserved. The graveyards of the town did not contain a single inscription, or even any worked stones which can be assigned to the Byzantine age. Remains of the Seljuk period, on the other hand, were abundant; there are numerous small chapels and tombs, for the most part octagonal in shape with pyramidal roofs, which show Seljuk work

* Paper read at the Royal Geographical Society, May 13, 1895. Map, p. 428. Continued from p. 335.

† Other settlements of the Paulicians in this district mentioned by the Byzantine historians are Argaoun and Amara (or Abara), founded by Carbeas, Koptos Spathe, and Tauraa. None of these have as yet been identified.

‡ *Op. cit.*, p. 188.

§ Divrik has been identified with Abrik of the Arab geographers by l'Estrange in his notes to a translation of Ibn Serapion (*Jour. Roy. Asiat. Soc.*, 1895, p. 54), but he has changed his opinion subsequently in deference to Hogarth, who would identify Abrik with the modern Arabkir (*vide J.R.A.S.*, 1895, p. 740). But his original identification is confirmed to a certain extent by the occurrence of the variant Αφρικη for Τεφρικη in two passages of the Byzantine historians (Sym., 8. 455, B.; Leon., 255.16), while the old name of Arabkir, as given in the fiscal archives, appears to have been Nareen (Taylor in *Jour. R.G.S.*, *loc. cit.*, p. 311). Abrik was visited by Ali of Herat in the twelfth century, and was then a place of pilgrimage held in veneration alike by Christians and Moslems. A curious passage from Yakut (i. 87), giving Ali's description of the place, is translated by l'Estrange (*J.R.A.S.*, *loc. cit.*).

in various parts of the town; and on an eminence below the larger of the two castles there stands a magnificent mosque, built, according to an inscription on the north door, for Kai Kosru II. (c. 1240), which must be one of the most splendid monuments of its style and period in existence. As it has attracted very little notice from previous travellers, it will be well briefly to describe it.

The mosque is oblong in shape, lying north and south, and measures 87 yards by 47 yards. It has three great stone portals, two on the west side, and one on the north. The north door is very richly decorated, and, except at the bottom, where it has been in part rebuilt, is in a good state of preservation. The system on which it is designed is that of a pointed arch within a rectangular frame. The sides of the frame are supported by clusters of pillars, and on each side of the arch and above it a line of very elaborate ornament, consisting of rose-medallions, crescents and stars, and lotus-buds, is worked. These are in many cases almost completely detached from the background. The south door of the west side is similar in shape and design to the north door, the chief ornament used being heavy and elaborately carved foliage. The third door is more simple in style, and is ornamented almost entirely with the honeycomb pattern. On each side of it, in panels cut in the projecting buttresses, are representations of the two-headed eagle, the badge of the Seljuk sultans; and against the main wall, close to them, another strange bird, which is probably meant for a hawk. The mosque inside has a stone vaulted roof, ornamented at the keystones with bosses, on which shells and flowers are carved. It was originally supported by sixteen hexagonal piers, which have been roughly built up in recent times. From one of the cupolas hangs a "blue stone," i.e. a ball of Persian porcelain, to which magical properties are ascribed. The whole building is now, unfortunately, in a very bad state of repair, and a large portion of it will probably within a short time fall into ruins.

From Divrik we made our way back to Zimarra by a longer but easier route, which skirts the base of the high mountain which we had climbed in coming. We followed the Sivas road on leaving Divrik for half an hour, and then took a path which goes off to the right and crosses the river by a stone bridge with two arches. We then followed the course of one of its tributaries, the Hornova Chai, until we reached the Armenian village of Hornova, and soon after crossed the watershed between that stream and another which flows into the river of Divrik. Our path then led us down a small and gradually deepening gully to the village of Karageban, which is six and a half hours distant from Divrik. Karageban is a village of sixty houses inhabited by a singularly handsome race of people, who spoke Turkish and claimed to be Turks. Here we spent the night, and the next day proceeded to Zimarra, which we reached in two and a half hours. From Zimarra we took the direct route by Hassan Ova to Kemakh.

At one hour beyond Zimarra we stopped at some ruins on a small stream a short distance below the village of Zinika. These ruins, to which allusion is made in 'Arch. Epigr. Oester.' (1884, p. 239), are those of a small fortress of circular shape, built round a low mound about 50 feet high and 200 yards in circumference. The walls consist of an outer line, within which, at an interval of about 20 yards, is a small enceinte; they are built of large mostly unsquared blocks of limestone laid in uneven courses, the gaps being filled up with small stones and a little mud mortar. It is difficult to determine the period to which these remains belong; the rude style of building would point perhaps to a pre-Roman date for the walls, and the mortar used in them to a Roman



THE EUPHRATES ABOVE CHERMUK (LOOKING SOUTH).

restoration of the same, but without further evidence no definite conclusion can be arrived at with respect to their age.* There is a direct path leading from these ruins to Pingan, not more than 4 or 5 miles distant.

From these ruins we proceeded by an easy path, which led us, after three hours' travelling over bare and undulating country, to the village of Dostal, situated only a short distance from the western Euphrates. The inhabitants of this village, which consists of forty houses, though they described themselves as Kurds, talked nothing but Turkish. At Dostal we were told of the existence of a "written stone" a short distance from the village and close to the road which we were following

* It is quite possible that the remains may be those of the fortress of Hisn-al-Minshar mentioned by Ibn Serapion, as Hogarth suggests (*vide J.R.A.S.*, 1895, p. 746).

to Hassan Ova. This stone we found to be a Latin inscription bearing the name of the Emperor Decius on a panel cut in the living rock on the further or left bank of the Kara Budak, a tributary of the Euphrates at a point situated about 4 miles from Dostal, and about the same distance from the junction of the tributary with the river. On the right bank of the Kara Budak, opposite the inscription, there are remains of an abutment of a bridge, and on the left bank the rock is cut away for a short distance to carry a road.

As is often the case, the name of the river over which the bridge was built is given in the inscription, and, curiously enough, it appears to be the same as that by which the Romans called our own Severn, *i.e.* Sabrina. Its discovery gives certain indication that a Roman road passed the stream at this point.

From the spot where we found the remains Hassan Ova is reached in one and a half hour, and a road to Kuru Chai goes off to the left fifteen minutes after leaving the bridge. At Hassan Ova, which is situated close to the Armidan Chai,* another considerable tributary of the Euphrates, and one which has as yet found no place in Kiepert's maps of Asia Minor, we saw some signs of an ancient site in some columns and capitals, probably of Byzantine date, lying in a ruined hut by the side of our path. Unfortunately, we were prevented from searching the village for further evidence of antiquity by the fear of being detained in quarantine. Hassan Ova lies on the frontier between the vilayets of Sivas and Erzingan, and eleven days' quarantine had been imposed on all travellers coming from the former province. Any delay might have led to our detention in the wretched village, which is notorious in this part of Asia Minor for its bad water, for eleven days, so we hastened on, fortunately without being perceived by the official to whom the supervision of this part of the frontier had been entrusted.

A short distance above Hassan Ova the country through which the western Euphrates flows becomes mountainous on the right bank, and our path struck up into the hills, and, after a long and easy ascent, reached the height of 6458 feet.

We then crossed a well-cultivated upland plain until we came to the valley of the Nezgieb Chai, which we followed down to Nezgieb, a Turkish village of fifty houses, distant three hours forty minutes from Hassan Ova. After leaving Nezgieb, we travelled for rather more than an hour down the bed of the same stream; the path then mounts from the left bank, and crosses the heads of numerous *derés* formed by small tributaries of the Euphrates. In this manner we gradually ascended to the edge of a high cliff, from which we had a view of the

* It is also called the Kuru Chai Su. Its course was followed by Taylor in 1866 (*loc. cit.*, pp. 308 ff.).

Euphrates and Kemakh on the further bank. At this point a severe thunderstorm, which had been brewing all day in the Dersim mountains behind Kemakh, broke over us, with the result that a small stream which lay between us and the town was turned into an almost unfordable torrent. By making a considerable *détour* we succeeded in passing this obstacle, and so reached the Euphrates. The river, which flows at this point through a high and precipitous ravine, is here spanned by a wooden bridge, which we crossed to ride down a ladder-like staircase into the town of Kemakh. We rode the whole distance from Hassan Ova to Kemakh in nine hours twenty minutes, but we travelled very slowly for the last two hours, and the journey could easily be accom-



THE WESTERN EUPHRATES ABOVE AGHIN (LOOKING NORTH).

plished in eight and a half hours. It is quite possible that the road which was so often traversed by Byzantine armies (Sebastea—Tephrike—Kamacha *) may have coincided with the route along which we travelled from Hassan Ova to Kemakh, but we saw no sign of any ancient road along our path.

Kemakh is a small town of about fifteen hundred houses, of which only thirty-five are Armenian. The town is clustered round a precipitous rock, which rises close to the left bank of the river, and on which there are remains of what must once have been an impregnable fortress. It most probably occupies the site of one of the several towns called Theodosiopolis, which existed in this part of the Byzantine Empire.† In

* Ramsay, 'Hist. Geogr.,' p. 56.

† *Vide* Ramsay, *op. cit.*, pp. 282 and 447.

later times it was one of the so-called Mesopotamian fortresses which the Arabs held along the line of the Byzantine frontier.* We stayed two nights in Kemakh, but were unsuccessful in our search for remains of the Byzantine period. Portions of the walls of the castle, which are in places still preserved to a considerable height, may be as old as those times; but it is more probable that the greater part of them are later in date, and the work of the Mohammedan conquerors. Within the walls of the castle there are ruins of many houses which may possibly be the remains of the Byzantine town, but we found no inscriptions or other evidence to support such an hypothesis. The churches which are reported to have been seen by other travellers who have visited Kemakh, do not exist at the present day.† Remains of the Seljuk period, consisting of a number of small chapels or tombs, very similar to those which we saw at Divrik, are plentiful in and about the modern town.

From Kemakh we followed the valley of the river to Erzingan, which is about ten hours distant. We left Kemakh by the bridge which we had crossed on entering the town, and shortly afterwards forded the Kiumur Chai, a considerable tributary of the left bank of the river. We then followed an easy path which keeps closely to the right bank. The river between Erzingan and Kemakh is generally from 80 to 100 yards broad; the stream is yellow in colour, and flows at the rate of about 6 miles an hour. We found the temperature of the water on June 6, at 4.30 p.m., to be 59° Fahr. The Dersim mountains descend abruptly to the left bank all along this part of the course of the river, but for seven hours of our journey the country on the left bank was fairly easy in character; the hills stand back from the river or slope gently down towards the bank. Three and a half hours before reaching Erzingan we came to the carriage-road which is in course of construction along the river-valley. The river, soon after the point at which we got on to this road, is hemmed in on both sides by hills, which continued until we reached the plain of Erzingan, when the road leaves the river. A ride of one and a half hour along the road over the plain then brought us to Erzingan. We met with few human habitations, except *khans*, in the river-valley between Erzingan and Kemakh, and we saw no sign of any old road or other antiquities along our route.

The following table is a list of distances and heights between Egin and Erzingan:—

Miles.		Feet.	Miles.		Feet.
—	Egin	3342	23.	Karageban	4695
14.	Top of ridge	5913	23.	Dostal	—
11.	Pingan	3331	9.	Hassan Ova	—
14.	Kesmé	4874	13.	Nezgieb	5807
8.	Summit	7922	17.	Kemakh	3877
7½.	Divrik	3642	35.	Erzingan	4267

* L'Estrange, 'Palestine under the Moslems,' p. 38.

† Ritter, vol. x. p. 785.

Erzingan is situated in a large plain, which is surrounded on every side by high mountains. It is at the present day the principal military outpost against Russia on this part of the Turkish frontier, and the head-quarters of the 4th Army Corps. The town, which is badly built, is said to contain from 30,000 to 35,000 inhabitants. We could find no ancient buildings or other antiquities in Erzingan, which does not seem to represent any ancient site. The chief monument of the place is a modern mosque built in classical style.

At Erzingan we finally left the Euphrates, and made our way northwards to Sadagh, about ten hours distant on the other side of the high mountain range which bounds the plain of Erzingan to the north, and forms part of the watershed between the Black Sea and the Persian



GORGE OF THE WESTERN EUPHRATES BELOW EGIN.

Gulf. Sadagh, where ruins and antiquities have been reported by several travellers, lies close to the route which is travelled by the postal service between Erzingan and Trebizond. Following this route, an ascent of nearly four hours, by a path which nowhere presents any great difficulties, brought us from the plain of Erzingan to the top of the pass (8805 feet) over the Sipikor Dagh. The carriage-road, which is in course of construction between Erzingan and a point on the Erzerum-Trebizond *chaussée* near Giumush Khané, begins a short distance before the top of the pass is reached, and, though it is not yet metalled in many places, it is probable that before long the whole road will be completed, and it will be possible to drive all the way from Erzingan to Trebizond. After reaching the top of the pass, we rode down a green and pleasant valley to Sipikor, a Turkish village of one hundred houses.

From here we followed the carriage-road, which keeps to the left bank of a small stream flowing into the Kelkid Irmak (Lycus), and in five and a half hours reached Sadagh, which lies a short distance to the left of the road. Sadagh is a Turkish village of about a hundred and fifty houses, built for the most part of old squared stones. It is situated in a depression in the hills on the left bank of one of the main sources of the Kelkid Irmak, and has a fine water-supply which flows from a reservoir, which is artificially banked up above the village. The site lies close to the route up the Kelkid Irmak from Enderes *viâ* Ashkaleh to Erzerum. This route, inasmuch as it formed part of the old route by land from Constantinople to Erzerum,* was of great importance before the half-sea route *viâ* Trebizond to Erzerum was opened up, and in consequence the village has been mentioned in the writings of some of the early travellers to the East.†

In more recent years, it has been visited by Taylor in 1868, who copied a Latin inscription, and reported the existence of some Byzantine inscriptions in the village; ‡ and subsequently by Biliotti, who sent in a description of the site, accompanied by a plan of the ruins, to the British Government. A Latin inscription was also copied on the site by Colonel Everett, and has been published in the Corpus.§ On the strength of the reports Sadagh was identified by Kiepert in his maps with Satala, the camp of Legio XV. Apollinaris.||

There was nothing, however, in these reports and inscriptions to make this identification certain, and we devoted two days to an examination of the site, and a search for further epigraphical evidence. Our efforts were rewarded by the finding of several legionary titles inscribed with the words "Leg. XV. Apol.," the discovery of which must remove all doubt as to the identity of the site with Satala. Considerable remains of an ancient fortified town exist near the modern village. The walls, which consist of a rubble core faced with well-squared stones, seem to have formed a square enclosure, the sides of which faced the four points of the compass. They are best preserved on the north side, where the towers are still standing along the whole line and at the two corners. On the south and along part of the west side the ancient walls have been almost obliterated by the modern village, which is built over the south-west corner of the enclosure. As far as can be judged from the style of construction, the walls would seem to be of Byzantine rather than of Roman date, and are probably in their present form not older than the time of Justinian, who is known ¶ to have restored the fortifications of

* It is described in Ritter, vol. x. p. 751.

† Tournefort, Let. 21; Morier, 'Persia,' p. 331.

‡ Taylor, *loc. cit.*, pp. 287 ff. The inscription which he copied can be partially restored, and is undoubtedly one of the Emperor Aurelian. It has not yet found its way into the Corpus.

§ 'C.I.L.,' vol. iii. Suppl. No. 6744.

|| 'Notit. Dignit. Orient,' cap. xxxv.

¶ Procopius, 'De Æd.,' iii. 4.

the town. A short distance south-east of the site there are remains of an aqueduct, of which five arches are still standing. Above the modern village, near the reservoir, there are remains of earthworks, which possibly represent the site of a small fort which guarded the water-supply. There are also some foundations of a building outside the north wall, but not enough of it is preserved to indicate its character.

In the course of our stay we succeeded in finding, besides the legionary tiles and a considerable number of unimportant Byzantine epitaphs, seven Latin inscriptions. Of these two are mere fragments, and another, a milestone, is so weather-worn as to be wholly illegible.

With regard to the famous bronze head which was found at Sadagh



MOSQUE AT DIVRIK (NORTH DOOR).

and is now in the British Museum, we could obtain but little information. We were shown the place where it was found; the spot is within the walls of the site, and the man who turned it up was at the time of our visit still alive, though at the point of death. From the accounts of the oldest inhabitants, it appears that a thorough search was made at the time when the head and hand were discovered, and they all agreed in saying that nothing else was found, so that the reports which have been in circulation to the effect that the body of the statue is still in possession of the natives of the place, are probably without any foundation. Exactly the same account was given by one of the *bey*s at Kemakh, the government engineer of the district, and our *Khanji* at Erzingan.

From Sadagh we made short excursions along two of the valleys which converge on the village from the west, the valley of the Lycus, No. V.—NOVEMBER, 1896.]

and that of another smaller stream to the south. In the valley of the Lycus, on the road to Kelkid Chifik, at a village one hour distant from Sadagh, there are two columns, which may once have been milestones, though neither is inscribed.

On leaving Sadagh we regained the post-road from Erzingan to Trebizond, and went *viâ* Keusse over a high pass (7389 feet) to strike the Erzerum-Trebizond *chaussée* at a point fifteen minutes short of Tekké. The point where the two roads join is ten hours distant from Sadagh. One hour and a half after leaving Sadagh we saw what may be a Roman fort, 2 miles to the right of our road. We did not have time to visit it, but could make out with a glass that its walls consist of a rubble core faced with squared stones.

From Tekké to Trebizond the road has been described by numberless travellers, and I will only add notes about two places on it. At seven hours twenty-five minutes from Tekké, at Ardasa Khan, there are ruins of a castle, probably Byzantine, above the village on a high rock to the right. From the existence of these remains and the similarity of names, it may be conjectured that Ardasa = *Αραδάση* of the Byzantine lists.* At two and three-quarter hours beyond Ardasa, and ten hours before reaching Trebizond, a small group of *khans* is passed on the south side of the pass, which are called by the collective name of Zigana Khan. The name of one of the stations on the road of the Antonine Itinerary from Trapezus to Satala is preserved in Zigana,† but there is not the faintest trace of antiquity on the spot, and if the distances given in the Itinerary are correct, the station must have been rather further south.

At Trebizond our journey came to an end, and we took ship for Constantinople.

PART II.

THE ROMAN ROADS AND DEFENCES ON THE UPPER EUPHRATES.

Having thus described our journey, I shall now endeavour to show what new light can be thrown by its results on the subject of the Roman roads and defences on this part of the frontier, discussing, firstly, the course taken by the roads, and the position of some of the stations on them; and, secondly, the history of their construction.

The general system of the Roman roads leading to and along the upper Euphrates may be said to be fairly understood, and is well set out in the writings of Professor Ramsay † and Hogarth § on the subject. The system has as its centre Melitene, the *caput viæ* of the great road from Ephesus and Cæsarea, which doubtless followed the same course as the old trade-route to the East, the *κοινή δόδος* of

* Ramsay, p. 319.

† Zigana was also a station for troops ('Notit. Dignit. Orient.,' cap. xxxv.).

‡ *Op. cit.*, p. 55.

§ *Op. cit.*, pp. 69 ff.

Artemidorus. From Melitene a road ran north to Satala, and south in two branches across the Taurus to Samosata, these three points being the *stativa* of the three legions stationed on the upper Euphrates. From Melitene another road led in a north-westerly direction to Sebastea, and from Sebastea another went eastwards to Nicopolis and Satala, from which point it was continued through Armenia Major to Artaxata. From Nicopolis another road ran south to cut into the road Satala—Melitene, according to Kiepert at Analibla, according to Ramsay at Carsagia. From Satala the road from Melitene was prolonged to Trapezus on the Black Sea, which was also a station of Roman troops.

The Roads Melitene—Samosata.

The roads given in the authorities are—

I. Antonine Itinerary: Melitene, XII.; Miasena, XXVIII.; Lacotena, XXVI.; Perre, XXIV.; Samosata.

II. Peutinger Table: Melentenis, VIII.; Corne, XIV.; Metita, XII.; Claudia, XLVI.; Barsalium, VIII.; Heba, XXX.; Charmodara, XII.; Samosata.

Melitene is at Malatia (Eski Shehr), Samosata at Samsat. Of the sites of the other stations on these two roads very little is known, but we have one fixed point in Perre which is near Adiaman (*vide*, p. 322). Corne, Metita, Claudias* (Glaudia), Barzalo† (Barsalium), Cholmadara (Charmodara) of road II. are placed on the river by Ptolemy, and Laudias (Claudias) and Barzalo are mentioned in a passage of Ammianus Marcellinus (XVIII., 7. 11), in which it is implied that they were forts on the Euphrates. A Greek inscription exists at Gerger, and has been published in Humann and Puchstein's book, from which it appears that the place was called Arsameia in the first century B.C. But, unfortunately, this name does not occur either in the roads of the Tables or in Ptolemy. No milestones have as yet been found in the country which lies between Samosata and Melitene, and the only other piece of positive evidence pointing to the course, taken by either of the two roads which joined the camps, is the great bridge of Kiakhtha.

In view of the fact that no one of the stations mentioned in two lists of the Tables is common to both, it seems highly probable that the two roads must have taken wholly divergent routes. Moreover, it appears, from the testimony of Ptolemy and the passage of Ammianus Marcellinus, that road II. kept more or less closely to the river-bank. Hence there is no reason to depart from the arrangement which has been adopted with regard to this road in all the most recent maps of the ancient world, making it follow the course of the river. The precise route taken by the road can only be laid down when further exploration has been carried out along the river above Gerger.

With regard to road I., Ramsay‡ has suggested that it is probably represented by the modern route by Elemenjik, Khan Bunar, Viran Shehr, and Adiaman. But at the time when his work was published, the existence of a Roman bridge at Kiakhtha had only just been made generally known, and if the situation of this bridge, which

* Claudias seems also to be the same as the Claudiopolis of Pliny (V. 24. 85), and Claudiana, a station of the Notitia Dignitatum. It is twice mentioned by Barhebræus ('Hist. Dynast.,' trans. Pococke, pp. 140 and 333). The name seems to have survived into the last century, as Otter ('Voyage en Turquie et Perse,' vol. ii. p. 284) speaks of Arcloudieh as an important fortress near Malatia. However, it is not to be found in the modern maps.

† Barzalo is placed by Atkinson ('Travels in A. M.,' vol. i. p. 263) at Bersel, a village near Tokariz.

‡ 'Hist. Geogr.,' p. 280.

lies in a direct line between Perre (Adiaman) and Melitene, and the easy nature of the country between Perre and Kiakhta, are taken into consideration, the conclusion seems to be inevitable that road I. must have used the bridge. The distance, too, of the route which he selects for the road, seems to be far too great, if the distances are correctly given in the Itinerary.*

If then, as seems fairly certain, the bridge at Kiakhta belongs to road I., the question remains still to be answered: What route did road I. take over the high Taurus between Kiakhta and Malatia? †

The best authority on the roads across this part of the Taurus is undoubtedly Von Moltke. In 1838 he was stationed with the Turkish army at Malatia, and was in great degree responsible for moving the troops across the mountains from Malatia to the plain of Samsat. He crossed the mountains several times, and must naturally have spared no trouble in obtaining information as to the different passes. He says that there are only three routes practicable for troops, ‡ one of these being the waterway of the river, down which he travelled on a raft. The other two are (a) the route by Surghu Erkenek and Pelwera, which he describes as practicable for artillery. This route follows, after leaving Malatia, the Sultan Su, a tributary of the Tokhma Su, and is the same as that thought by Ramsay to represent road I.; (b) a route along another tributary of the Tokhma Su by Abdul Kharab over high mountains, and practicable only for infantry and cavalry. It is improbable, as has been shown above, that route (a) can be the same as the road of the Itinerary, and route (b) keeps a long way to the west of the line which we should expect a road using the bridge of Kiakhta to take. It is possible, however, that the Roman road which crossed the Bolam Su at Kiakhta may have followed that stream to its source, which, according to the maps, is close to Abdul Kharab, and from this point to Malatia may have coincided with route (b). A further possibility remains that it took a line up the basin of the Gerger Chai to the east of the mountain path which we followed from Kiakhta to Malatia. We were told of the existence of such a route at Kiakhta, but were assured that it was considerably longer than the one by which we travelled—in fact, thirty-two hours as compared with eighteen and a half.

Thus, in the present state of our knowledge of the passes through this part of the Taurus, there is but little evidence to show which one was chosen for road I., and it is probable that the old road has not yet been trodden by any European traveller. It seems not unlikely that it may have kept along the valley of the Bolam Su,

* The ruins on this road at Viran Shehr (*vide* 'Ainsworth Travels in A. M.,' vol. i. p. 258) correspond well enough in position to the site of Zibatra, an important fortress in late Byzantine times. Its position is fairly accurately defined in the Arab geographers as lying between Malatia, Samsat, and Hisn Mansur (Adiaman), and close to the source of the Jihan (l'Estrange, 'Palestine under the Moslems,' pp. 554 and 562). l'Estrange, however, in his notes on Ibn Serapion, just published in *J.R.A.S.*, 1895, pp. 739 ff., is inclined to adopt a suggestion by Hogarth, that Zibatra might possibly be Derendeh.

† Very strong arguments have been brought together by Hogarth in Macan's new edition of Herodotus, to prove that the Royal Road of Persian days, and subsequently the *κρωτή δόδοι* of Artemidorus, took a route from Malatia across the Taurus by Kiakhta to Samsat. If this theory holds good, it is highly probable that road I. followed the same route across the mountains.

‡ 'Briefe a. d. Turkei,' p. 316. The value of Moltke's statements, however, is to some slight extent discounted by the fact that in his time Kiakhta and Gerger were occupied by rebellious Kurds. This may have led him to choose routes avoiding these two places.

joining route (*b*) at Abdul Kharab, and thence have followed a tributary* of the Tokhma Su down to Malatia. More than this cannot be said until we are better informed as to the nature of the valley of the Bolam Su.

The Roads north of Melitene.

The whole of the road Melitene—Satala is given in the Antonine Itinerary. It is described as having led *per ripam*.

Ia. Satala, XVII.; Suissa, XVIII.; Arauracos, XXII.; Carsagis, XXVIII.; Sinervas, XXVIII.; Analiba, XVI.; Zimara, XVI.; Teucila, XXVIII.; Sabus, XVI.; Dascusa, XXXII.; Ciaca, XVIII.; Melitene.

A considerable portion of the same road is given in the Peutinger Table, but it starts from Draconis, the second station from Satala on the direct road Nicopolis—Satala (*vide infra*, IIa. and IIb.).

Ib. Draconis, XVI.; Haris, XVII.; Eregarsina, VIII.; Bubalia, XXVII.; Zimara, XVIII.; Zenocopi, XVIII.; Vereuso, XIII.; Saba, XVIII.; Dascusa, XVIII.; Hispa, XVIII.; Arangas, VIII.; Ciaca, XXVII.; Melitene.

A direct road, Nicopolis—Satala, is given both in the Itinerary and the Table.

IIa. In the Antonine Itinerary: Nicopolis, XXIV.; Olotoedariza, XXVI.; Dracontes, XXIV.; Haza, XXVI.; Satala.

IIb. In the Peutinger Table: Nicopoli, XIV.; Caltiorissa—Draconis, XIII.; Cunissa, X.; Hassia, XIII.; Ziziola, XII.; Satala.

Another road, Nicopolis—Satala, which, if Carsagis is taken to be the same as Carsat, joins road Ia. at that point, is given in the Itinerary—

Iic. Nicopoli, XXIV.; Olotoedariza, XXIV.; Carsat, XXIV.; Arauracos, XXIV.; Suissa, XXVI.; Satala.

A road from Nicopolis which cuts into road Ia. at Analiba and road Ib. at Zimara, is given in the Peutinger Table.

III. Nicopoli, XXI.; Ole Oberda, XV.; Caleorsissa, XXIII.; Analiba, XV.; Zimara.

The stations on these roads are evidently much confused; Eregarsina of Ib. is most probably the same as Carsagis and Carsat of Ia. and Iic., and the stations Hispa and Arangas of Ib. are taken from the Melitene—Sebastea road. Probably Hassia of IIb. = Haris of Ib., and Dracontes of IIa. = Draconis of Ib. and IIb. Analiba should be changed, as Ramsay has pointed out, to Analiba, in accordance with Ptolemy and 'Acta Conciliorum.'

Melitene, as has been shown already, is at Malatia (Eski Shehr); Satala, now that we have found the legionary tiles, may with certainty be identified with Sadagh, and Nicopolis is at Purk.† In the country through which the roads must have passed, there are only two places which can confidently be considered to be ancient sites. One of these is the place opposite Pingan, from which three

* There is some evidence pointing to the fact that in late Byzantine times there was a road in use along this tributary. The stream may very probably be identified with the Az Zarnuk of the Arab geographers, as its junction with the Tokhma Su (Kubakib) is accurately defined in a passage of Ibn Serapion (translated by l'Étrange, *J.R.A.S.*, 1895, pp. 63 ff.). The Byzantine historians (Ced., 207. 4; Theoph. Cont., 167 B.) record that Basil, in A.D. 872, marched from Ceramisium on this stream (*ἐπὶ τῷ Ἀρ(δρ)ουκ ποταμῷ*) to the Euphrates along the road to Melitene. I owe the references to de Muralt, 'Chronographie Byzantine,' p. 453.

† *Vide* Ritter, xviii. p. 214; and J.A.R. Munro in 'B.G.S. Suppl. Papers,' vol. iii. pp. 725 ff.

inscriptions have been published, and where we copied another.* The site is identified by Ramsay with Dascusa on the authority of one of the inscriptions found there, in which Ala II. Ulpia Auriana, according to the *Notitia Dignitatum* stationed at Dascusa, is mentioned.† But Ramsay, in his map of Cappadocia, assigns a position to Dascusa 50 miles south of the position given to it in his text, and places Zimara in the map, where, according to the text, Dascusa should be. The position given by Ramsay to Zimara is confirmed by the existence of the modern village with the same name, Zimara, very near to the spot at which the inscriptions were found, and just about in the position in which we should be inclined, if working from the Tables, to look for the site. So that if, following the evidence of the inscription, we place Dascusa on the river-bank opposite Pingan, it will be at a spot only about 6 miles distant from the probable site of Zimara. But the Peutinger Table and Itinerary place Dascusa at a point from 60 to 70 miles south of Zimara, and their testimony is supported by a statement of Pliny,‡ who says that Dascusa was 75 miles lower down the river than Zimara. Hence, if the evidence of the inscription is to hold good, it seems necessary to conclude that the station of Dascusa is wrongly placed by the Table, the Itinerary, and Pliny, and has been shifted by these authorities from its real position, which is where the inscription was found opposite Pingan. A minute examination of the literary evidence bearing on these places makes, however, another explanation open to us, by the adoption of which we should do less violence to the authorities. Ptolemy mentions a *Δασκούσα* in conjunction with Zimara in Armenia Minor on the Euphrates, and another place, *Δάγουσα*, in conjunction with Sinsis and Melitene, also on the river, in the *στρατηγία* of Melitene. A Dagusa is mentioned also by Orosius§ as being situated “in confinio Armeniæ et Cappadociæ,” so that there is some evidence in favour of there having been two places on the Euphrates with very similar names, Dascusa and Dagusa. The position of the first of these, as defined by Ptolemy, would fit in very well with the site opposite Pingan; the name is the same as that of the station of the Ala II. Ulpia Auriana, given in the *Notitia*, and the coincidence of its being joined with Zimara by Ptolemy, and of the preservation of the name Zimara only 6 miles from the spot where the inscription of the Ala was found, is very striking. The position of Dagusa may, then, be found in that of the Dascusa of the Table and Itinerary, and would be, according to the distances which they give and the statement of Pliny, about 70 miles lower down the river. The confusion of two so similar names is so likely to have happened as to require no explanation. On the whole, this theory of there having been two places, Dascusa and Dagusa, on the Euphrates seems to offer the simplest way out of the difficulty, though of course it adds complication to the topography of the district. If it is adopted, the Dascusa, which is placed in Ramsay’s map at a point near the junction of the two branches of the Euphrates, must be changed, on the authority of Ptolemy, into Dagusa, and Dascusa must be placed, in accordance with the evidence of the inscription, on the river-bank opposite Pingan. A point in favour of this arrangement is the fact that Zimara is one of the few stations between Melitene and Satala which has no troops assigned to it in the *Notitia*, and if this

* *Vide* p. 335, note.

† The evidence of the inscription, however, is not conclusive, as it is merely the tombstone of a soldier belonging to this Ala, and it is quite possible that he died while away from his post.

‡ *V.* 24. 84. He says, however, that Zimara is only 12 miles from the source of the Euphrates, so that it is possible that there were two places with this name, as Ritter (vol. x. pp. 822, 823) maintains.

§ *I.* 2. 23.

theory is adopted, the omission can be explained by the proximity of Dascusa, for the troops there stationed would serve to protect the two posts.

The other site is that seen by Boré* near Melik-Sherif, and identified by Kiepert with Arauraca.

With regard to the other stations on these roads, the only suggestions that we can make are that Dascusa of the Table and Itinerary may have been near Korpanik (see p. 330), that the ruins at Zinika (p. 455) may represent the old Zimara, and that Analibla may have been at Hassan Ova, where we saw some signs of a Byzantine site; but none of these identifications can be made with any degree of certainty.

Two fixed points on the main road on the right bank of the Euphrates are given (1) by the bridge at Korpanik (p. 330); (2) by the bridge over the Kara Budak (Sabrina) (p. 456). Between Malatia and Korpanik the country along the river is easy; and, though we saw no certain traces of any Roman road during this part of our journey, it is highly probable that the old road kept close to the earthy bank, and possible that it has been long ago washed away. Above Korpanik, the country through which the river passes soon becomes mountainous, and from Egin to Pingan the path along the right bank is reported to be most difficult by the natives, and all traffic goes by the route which we followed on the left bank. Hence it seems likely that the Roman road between the bridge at Korpanik and the probable site of Zimara took a line to the west of the route by which we travelled. Taylor,† on his way from Zimara to Arabkir, between Gamkeui and Arabkir, high up on the Sarichichek Dag, saw a paved road, which he speaks of as being "solidly and ingeniously constructed," and it is not improbable that this may be a portion of the road for which we searched in vain in the river-valley. Moreover, the further west that we place this portion of the road, the more easy it is to understand how Hispa and Arangas—which belong to the Melitene—Sebastea road—were introduced among the stations of road Ib. in the Peutinger Table.

Beyond the bridge over the Kara Budak, my personal knowledge of the country, through which the road passed in two branches to Nicopolis and Satala, ceases, and I will merely make one criticism of the views advanced by Ramsay as to the course which it took. From the lists of the Table and Itinerary, it appears to be fairly certain that in the district which lies south of Nicopolis and Satala, there was a triangle of roads of which the direct road Nicopolis—Satala was the base. The apex of this triangle is placed by Ramsay at Carsagia, by Kiepert at Analibla. Two sides of the triangle are made by the important roads Nicopolis—Satala and Melitene—Satala, and the third side by the cross-road from Nicopolis to a point in the Melitene—Satala road between Zimara and Satala. Ramsay makes several most ingenious conjectures with regard to the stations Ole-Oberda, Aladaleariza, and Caltiorissa, and makes out what is on paper a very fairly satisfactory restoration of the roads. But in deviating from the view upheld by Kiepert, that road III. struck into the road Melitene—Satala at Analibla, he leaves out of consideration the existence of a natural route which appears to answer very exactly to the requirements of a road from Nicopolis to Zimara. The object in laying out a road from Nicopolis to strike into the Satala—Melitene road would naturally be to make it join the latter at a point in as direct a line as possible between Nicopolis and Melitene; for the road in question cannot have been intended merely to join Satala and Nicopolis, between which points a direct road is given in the Peutinger Table and the Itinerary (IIa. and IIb.) This purpose would be best secured by a road going

* Referred to by Ritter, vol. xviii. p. 215.

† *Loc. cit.*, p. 209.

direct from Nicopolis to the probable site of Zimara, near Pingan, and joining the Satala—Melitene road near the bridge over the Kara Budak, in the neighbourhood of which Ramsay and Kiepert agree in placing Analibia. A possible course for such a road is given us in the route travelled by Taylor * from Purk (Nicopolis) to Zimara. This road, which Taylor implies is practicable for wheels as far as the gorge of the upper Armidan or Kuru Chai Su, passes, soon after leaving Purk, at Ashkhar, a Roman milestone, of which he published a copy, and which has been subsequently seen by Messrs. Hogarth and Munro.† From Purk to this point, an old road was observed by him and by the other travellers. Subsequently Taylor crossed the Kara Budak at or very near the spot where we found the remains of the bridge. The milestone at Ashkhar is assigned by Mr. Munro to the road Nicopolis—Sebastea, but it is equally possible that it may have belonged to the road Nicopolis—Zimara—Melitene, which, if it followed Taylor's route, would have joined the Satala—Melitene road near the bridge over the Kara Budak. It is impossible to prove that this route represents the Roman road from Nicopolis, but it seems to be the most likely course to have been chosen for that road. It hits off the bridge over which the main road certainly passed, and there are remains on it which show that for some part of the way a Roman road once went. There is no epigraphical evidence in favour of Ramsay's restoration of this road, and if the position of the bridge over the Kara Budak as regards the line of Taylor's route and the direct and easy nature of the road from Purk to the bridge are taken into consideration, the conclusion seems to be inevitable that Kiepert's restoration of the road is the more probable.

THE HISTORY OF THE LINES.

We cannot claim to have discovered much which throws new light on the history of the roads and fortifications of the Euphrates. Unfortunately, the evidence of milestones, which is so abundant on the Cæsarea—Melitene road, and from which the history of this section of the great highway to the East can be written with some degree of certainty, vanishes when the valley of the Euphrates is reached. Along the course of the river from Samosata to Satala only five inscriptions which bear the names of Roman emperors have as yet been found. These are at the bridge of Kiakhta,‡ on a milestone near Melitene (p. 328), at the bridge over the Kara Budak (p. 456), on a milestone near Melik Sherif,§ and at Satala (p. 460, *note*).||

On account of this dearth of inscriptions, the history of the roads, which have been briefly discussed above, must be written mainly from the very few literary references to this part of the Roman Empire, and the records which we possess of the legions there stationed.

In the reign of Augustus Cappadocia and Commagene were both client states under native princes, and there is no evidence of any regular Roman troops having been posted then on the Euphrates.¶ Tiberius first made Cappadocia a province, and brought Commagene under direct control; but the latter state was given back

* *Loc. cit.*, pp. 301 ff.

† Munro, *loc. cit.*, p. 727; 'C.I.L.', vol. iii. p. 6057.

‡ 'C.I.L.', vol. iii. Suppl. 6709—6714.

§ 'C.I.L.', vol. iii. p. 306.

|| To these may be added the milestone of Trajan, near Purk (p. 465) ('C.I.L.', vol. iii. 6057), and possibly one of the empress, Julia Domna, which we found at Satala.

¶ Hogarth ('Suppl. Papers of R.G.S.', vol. iii. p. 710) makes a mistake in saying that, according to Dion Cassius (lv. 23), there were two legions stationed in Cappadocia as early as the time of Augustus. Dion Cassius, in this passage, only gives the stations of the legions in his own day.

to its former rulers under Caligula. The northern districts which lie along and above the western Euphrates as far as Trapezus, were first made Roman probably in 63 A.D.* During the wars of Corbulo it seems probable that Melitene was used as one of the bases of operations for the campaigns beyond the river (Tac., 'Ann.,' xv. 26), but whether a camp was established here as early as this is not certain.† In these wars the two legions, XII. Fulminata and XV. Apollinaris, which, at least from Hadrian's time, were both always stationed in Cappadocia, were first employed in Asia Minor; but at this time they were attached to the army of Corbulo for special duty, and did not belong in any way to Cappadocia, the legate of which had no army in times of peace.‡ Under Corbulo we learn that a fort was established at Ziata,§ near Kharput, on the further side of the Euphrates; but for the establishment of other forts on the nearer bank evidence is wanting.

In the Jewish war under Titus both the twelfth and the fifteenth legions took part, and, after the capture of Jerusalem in 70 A.D., the twelfth was sent to Melitene, but the fifteenth was ordered back to its old quarters in Pannonia. ||

Of Vespasian we are told that he "addidit legiones" to Cappadocia, and gave a legate of consular instead of one of equestrian rank to the province. He also brought Commagene again under direct Roman administration, adding it to the province of Syria. In this province he also raised the number of legions from four to seven; one of these being the new legion, XVI. Flavia Firma, of which we found two inscriptions at Samosata (p. 322). Whether this legion was stationed from the first at Samosata—which was certainly afterwards for some time its head-quarters—is not known, but Mommsen inclines to the view that it was.¶ The milestone near Melik Sherif, and most probably on the line of the Melitene—Satala road, to which allusion has already been made, seems to prove that Vespasian laid out a portion of this road. Its date, if Mommsen's restoration of the inscription is right, is 75 A.D., in which year a Roman garrison is known to have been stationed at Harmozica (Tifis).** It is thought probable by Mommsen †† that Satala was a station of troops as early as this reign, but, except for the milestone, there is little evidence to support his view. Legio XV. Apollinaris was sent to Pannonia after the Jewish war, and the monuments of its stay there are so abundant that, even if some of them are to be referred to an earlier period, it is most probable that it remained here for a considerable number of years after the war. ††

Thus, while there are no grounds for supposing any military post or road to

* Armenia Minor rather later, but at any rate by 75 A.D. (*vide* Mommsen, 'Provinces,' vol. i. p. 324).

† It is possible that the *ἔρμα ἐν τετραγώνῳ*, built by the Romans *ἐν τοῖς ἀνω χρόνοις*, may have dated back to this time (Procop., 'De Æd.,' iii. 5).

‡ Tacitus, 'Hist.,' ii. § 1, "Inermes legati regebant nondum additis Cappadocæis legionibus." § 'C.I.L.,' vol. iii. Suppl. 6741-6742.

|| Josephus, 'Bell. Jud.,' vii. 1. 3; vii. 5. 3.

¶ Dion Cassius (Ixviii.) implies that Samosata was not held by the Romans at the time when Trajan arrived there in 109 A.D., so that if the legion was stationed then at Samosata, it must have left its post.

** 'C.I.L.,' vol. iii. 6052.

†† 'Provinces,' vol. i. p. 324, note.

‡‡ Mommsen's view, stated in the *Provinces loc. cit.*, is at variance with the conclusions at which he arrived in discussing the history of the Pannonian legions ('C.I.L.,' vol. iii. p. 550). For the inscriptions of this legion at Carnuntum, *vide* 'Arch. Epigr. Oester.,' vol. v. pp. 208 ff. (Hirschfeld); and for a review of the whole question, 'Arch. Epigr. Oester.,' vol. x. pp. 12 ff. (Domaszewski).

have existed on the right bank of the Euphrates previous to Vespasian's reign, we have one piece of positive evidence that the latter laid out a road in Armenia Minor. Seeing also that he re-made Commagene into a province, and strengthened the defences in Cappadocia and Syria, it is probable that the camps, not only at Melitene but also at Samosata, may be attributed to him. And if so, it is more than probable that he would have laid out a road to connect the two posts. Hence it is fair incidentally to suggest that he may have built the original bridge at Kiakhta, which we know, from the inscriptions found by Humann and Puchstein, to have been restored by Septimius Severus. The fact of the existence of an older bridge* tells against the attribution of the southern lines to Septimius Severus, suggested by Hogarth, and, if they are to be attributed to an earlier emperor, there is no one more likely to have laid them out than Vespasian, who first organized the two districts, which are joined by the bridge, for military purposes.

In the reign of Domitian, according to two inscriptions,† roads were constructed in Cappadocia and Armenia Minor, but the district of Armenia Minor is perhaps only mentioned in order to give the full list of the administrative districts under the governor who made the roads, and no definite inference can be drawn from the inscriptions that Domitian planned any of the roads on the frontier. In Trajan's reign a milestone was placed on some road at a point 7 miles from Nicopolis, and may perhaps, as I have tried to show, belong to a road Nicopolis-Zimara, but the evidence is so slight, as compared with that of the roads laid out by Trajan in Galatia and Pontus,‡ that not much stress can be laid on it. It is possible, however, that this road was made by him as a connection between the main system in that region and the frontier-road along the Euphrates. Trajan is also said to have made Melitene a city (Procopius, 'De Æd.' iii. 5), but this fact does not carry much weight, as a camp most probably existed at this point, according to Procopius's own testimony (*loc. cit.*), before Trajan's time, and Legio XII. was certainly sent here after the Jewish war. Procopius's statement may very likely refer only to some honours conferred on Melitene by Trajan, who must have passed through the place on his march from Samosata to Satala. Whether Legio XV. Apollinaris was stationed at Satala at the time of Trajan's campaign is uncertain. It is supposed by Domaszewski that the legion was not moved from Carnuntum till Hadrian's reign, but no definite evidence as to the date of the change of legions at that camp has as yet come to light. At any rate, by the end of Hadrian's reign this legion had been brought back to the East,§ and seems to have remained till the end of its history at Satala.

Thus it appears that before the middle of the second century the two legions, the twelfth and the fifteenth, were both stationed on the frontier. An Ala Auriana is mentioned by Arrian as having taken part in an expedition against the Alani, and may be the same as the Ala II. Ulpia Auriana of the Notitia, which will thus have been stationed on the Euphrates as early as Hadrian's reign.

With regard to the Legio Prima Pontica, which was stationed at Trapezus,||

* It is confirmed by the erased inscription which we saw on it (*vide* p. 322).

† 'C.I.L.,' vol. iii. pp. 312-318.

‡ Hogarth, *loc. cit.*, p. 711; Bamsay, 'Hist. Geogr.,' p. 258.

§ It is mentioned by Arrian (100 and 103) as taking part in the expedition against the Alani. (The only inscription which can be approximately dated at Satala is that of Aurelian, *vide* p. 460.) Legio XII. also took part in the expedition.

|| 'Notit. Dignit. Orient.,' cap. 32.

nothing seems to be known; it does not occur in any of the early lists of legions, and would seem not to have come into existence till the third century A.D., and to have been one of the lesser auxiliary legions.* In the reign of Septimius Severus, as Hogarth has shown, the great road Cæsarea—Melitene was improved on a magnificent scale, but the only evidence for similar improvements due to this emperor along and to the north of the valley of the Euphrates is given by the inscriptions on the 'great bridge at Kiakhta. Of the later emperors, Decius restored the bridge over the Kara Budak, and there is a milestone, probably the second from Melitene, of the emperors Constans and Constantius, either on the road Melitene—Sebastea or Melitene—Satala. The inscription of Aurelian at Satala need not be any evidence of his having improved that camp, and may be merely an inscription in honour of his great achievements in the East. In still later times, we know that the fortifications at Melitene † and Satala ‡ were repaired by Justinian.

Of the arrangement of the posts and disposition of the troops along the frontier very little is known. Between Samosata and Melitene, Claudiana and Metita are mentioned as posts in the Notitia; Barzalo and Laudias are called *castra præsidaria* by Ammianus Marcellinus, § and may be the same as Barsalium, Claudia and Metita of the Peutinger Table. Between Melitene and Satala, along the road of the Antonine Itinerary, seven of the ten stations (all except Carsagis, Sinibra, and Zimara) are assigned troops by the Notitia. ¶ Between Nicopolis and Satala Aladaleariza of the Notitia may be the same as the Olotoedariza of the Table and Itinerary. North of Satala, on the road to Trapezus, Domana and Zigana were both stations of troops. So that an unbroken line of posts at fairly regular intervals must have existed in later times along the river as far as Satala, and been extended northwards to Trapezus.

With regard to the strategical importance of these posts, Samosata and Melitene, two of the three great legionary camps, guarded two important crossing-places of the Euphrates. Barsalium and Claudia, as may be inferred from the passage of Ammianus Marcellinus (*loc. cit.*), probably were chosen with the same object. If Dascusa was situated opposite Pingan, it doubtless protected another crossing-place. The river is narrow at this point, and a bridge could always have been thrown over it with little trouble similar to the wooden bridge now existing there. It is probable that another station was near the crossing at Keban-Maden, but no troops are assigned to the other Dascusa (*vide*, p. 466), which should be near this point. The importance of Satala seems to lie in its position on the route to the East, which was still much used until the middle of this century, ¶ and in the advantages which it

* The name is confirmed by 'C.I.L.,' vol. iii. 306; *vide* also vol. iii. Suppl. 6746; but I do not know that it is otherwise mentioned. In earlier times, possibly the garrison was furnished by the twelfth and fifteenth legions, as inscriptions of both these have been found at Trapezus (*vide* 'C.I.L.,' vol. iii. Suppl. 6745, 6747).

† Procop., 'De Æd.,' iii. 5.

‡ *Ibid.*, iii. 4.

§ XVIII. 7. 11.

¶ 'Notit. Dignit. Orient.,' cap. 32 and 35.

¶ This route goes from the modern Sadagh to Erzerum, and passes Ilija, usually identified with Elegeia. Trajan went from Satala to Elegeia (Dio. Cass., lxxviii.). Ilija, it must be remembered, however, is a very common Turkish name for a natural hot spring, and is used in many places all over the Ottoman empire. If its identity here with Elegeia could be proved from other evidence, it would afford an interesting example of the common practice of preserving an ancient name, slightly altered so as to bear a meaning in a modern language.

thus offered as a starting-place for expeditions into Armenia from the north. The fact also that it lies on the natural road from Trapezus to the Euphrates, and was thus open to communications with the sea, may have led to the choice of the site for a legionary camp. The legion stationed here seems to have supplied some of the garrisons in Armenia, for we know that in A.D. 185, a *vexillatio* of the Legio XV., Apollinaris was stationed at Valarschapat (Caenepolis).*

Judging from our experience, it seems probable that very slight remains of the Roman defensive posts along the frontier from Samosata to the Black Sea exist at the present day, and, even though further evidence may be forthcoming in the future, it seems certain that the lines on the eastern frontier were not laid out on nearly the same scale as on the other Roman frontiers, on the Rhine and the Danube, in Britain and in Africa. This is more easily to be explained on the more southern reaches of the Euphrates above Samosata, where the great size and swiftness of the stream, and the inaccessible nature of the mountains through which it flows,† render the river, except at certain easily guarded spots, a formidable barrier to the crossing of an army. But north of Melitene, and especially at and above Keban-Maden, near which the two branches of the Euphrates meet, the river is not so serious an obstacle to an invading force,‡ and it is natural to expect to find remains of defensive works on a large scale near the river-bank. Such remains do not appear to exist at the present day, and the inference may with probability, but not with complete certainty, be made that no great defensive works were ever carried out between the camps. In the same way little care seems to have been bestowed on the connecting roads, and, with the exception of the work of Septimius Severus on the Cæsarea—Melitene road and the bridge which he built at Kiakhta, there is no evidence which points to the roads having been constructed differently to the generality of Roman roads in Asia Minor.§

If we are to seek a reason for this apparent neglect, it is doubtless to be found in the different character of this frontier to that of the other frontiers of the empire. This difference lies in the continual change of relations between Armenia and Rome during the first two centuries of our era. During this period Armenia was hardly ever regarded as a hostile country, and was often reduced nearly to the condition of a Roman province with Roman troops quartered in it. Probably, as Hogarth has pointed out, Septimius Severus was the first to depart from the traditional views of the emperors. He is known to have laid out roads to Melitene from the west and from the south; that he intended to extend these roads to the north as well is not improbable, but the regative results of our journey tend to show that, if ever conceived, this project was not carried out.||

Before the reading of the paper, the PRESIDENT said: The paper we are to listen to this evening is an account of an expedition under Mr. Hogarth by the upper waters

* 'C. I. L.,' vol. iii. Suppl. 6052.

† This part of the river is best described by Von Moltke ('Briefe a. d. Turkei,' edit. vi. pp. 808 ff.).

‡ It was easily forded by Taylor in September at a spot near Korpanik (Taylor, *loc. cit.*, p. 315).

§ Ramsay (*op. cit.*, p. 46) describes the usual character of the roads in Asia Minor.

|| Since this paper has been in the printer's hands, a most valuable article on the campaign of Basil I. against the Paulicians has been published by Mr. J. G. C. Anderson in the *Classical Review* (April, 1896), in which he discusses many of the points of historical geography which are dealt with above. It is most satisfactory to me to find that the conclusions at which he has arrived agree most remarkably with the views expressed in this paper.

of the Euphrates and in the Taurus. Unfortunately he is not at present in England, but Mr. Vincent Yorke, a member of the expedition, has kindly prepared a paper, and will read it to us, and exhibit some interesting photographs; and after his paper Mr. Myres will give a short account of his explorations in the Karian country of Asia Minor.*

After the reading of the paper, the following discussion took place:—

Mr. THEODORE BENT: At this late hour of the evening, after dining and hearing two papers, I feel that you will excuse me if my remarks are rather double, but I should like to ask one or two questions especially upon the paper we have last heard from Mr. Myres. At one time I was much interested in the history of the primitive races which migrated from this part of Asia Minor to Greece, probably by means of the islands as stepping-stones. In these islands there are to be found peculiar little marble figures found in the tombs; these are popularly believed to be Karian, and Herodotus, I believe, called them Karian, and I should like to know if Mr. Myres ever saw any of these marble figures of the female goddess in any tombs. When we were on the sister peninsula of Cnidos we heard rumours of several figures found there, and if they are found at Halicarnassus, it would be a considerable point that the peoples who inhabited the islands of Greece before the Greek period came from this part of Asia Minor, and it would make Herodotus right. With regard to Mr. Yorke's paper, I have been somewhat near the country which Mr. Hogarth and Mr. Yorke explored, and which has been so graphically described to us. The point which struck me more particularly was about the Armenians. The Armenians I have seen were at the Patriarchate of Sis, and there I must say they did not seem in a happy frame of mind. In Russian Armenia they are very far advanced in civilization, but in Turkish Armenia they are quite the reverse. I know nothing about the atrocities, and it is many years since we were there; but at the same time it seems to me that if they had the chance they would be better than the Greeks. In Russia they have had the chance, and the result in several places has proved that they are capable of becoming civilized and a credit to the world in general, which I think is more than can be said about the Armenians of Asia Minor. The country of the Euphrates is certainly one of the most interesting parts of the world, and I am sure we are extremely obliged to Mr. Yorke for giving us so much information about an almost unknown part of the world.

The PRESIDENT: I had no idea Mr. Myres was going to give us so full an account as he has done. I think the papers we have heard this evening fully justify us in having assisted the expeditions of Mr. Hogarth and Mr. Myres. They were also assisted by other societies, but for geography they have produced most valuable results. An important tributary of the Euphrates, before unknown, has now been brought to light, and several other interesting points have been brought out in connection with the positions of the legionary stations at the extreme eastern frontier of the Roman Empire, and the Hogarth expedition has actually discovered the site of one previously unknown, one of the four important frontier stations. These discoveries alone fully justify us in having given our aid to these expeditions, and I am sure that the meeting will instruct me to give its very hearty thanks to Mr. Yorke for the trouble he has taken in preparing the paper describing Mr. Hogarth's expedition, and to Mr. Myres for his most interesting account of his discoveries in Karia, especially in the Peninsula of Myndos. We must not forget to thank Lieut. Green, who accompanied Mr. Hogarth's

* The paper by Mr. Myres will appear in a subsequent number.

expedition, for the extremely valuable mapwork he executed. In your names I return thanks to Mr. Yorke, Mr. Myres, and Lieut. Green.

MR. YORKE'S MAP.—The map of the valley of the Upper Euphrates has been constructed by Mr. F. W. Green. The bearings were taken by prismatic compass, distances estimated by time, and the heights above the sea-level obtained by aneroid. Some of the detail has been added from Captain Maunsell's Survey, 1892, and other sources.

DE MORGAN'S "MISSION SCIENTIFIQUE" TO PERSIA.

By Major-Gen. Sir F. GOLDSMID, C.B., K.C.S.I.

WE have now before us the second volume of the 'Études Géographiques,' or results of the scientific mission to Persia, conducted by M. J. de Morgan, of which the first part was noticed in the *Journal* for August, 1895. The large amount of information which it contains, original and compiled, renders it a valuable reference to those who seek a closer acquaintance with the tracts in North-Western and Western Persia; but it can hardly be said to open out any great extent of new country. Notes of available bibliography—almost identical with those to be found in Curzon's 'Persia' *—disclose at once to us how many older travellers have helped to a due appreciation of that portion of Kurdistan which tacitly admits, if it does not openly proclaim, the sovereignty of the Shah; and it is equally evident that a like attention has been given to non-Kurdish districts.

The geographical limits of the country under exploration are shown under nine heads: (1) The Kurdistan of Mukri; (2) the Kurdistan of Sehna; (3) the Kurdistan of Kirmanshaban; (4) the Province of Hamadan; (5) Malayer and Burujird; (6) Northern Luristan; (7) the Pusht-i-Kuh; (8) Susiana; and (9) the Persian Gulf. For each of these there are subdivisions discussing respectively physical geography, climate, flora and fauna, and population; while for the greater number separate treatment is accorded to towns, villages, and monuments, mineral riches, as also commerce, agriculture, and local industries. Under the Pusht-i-Kuh, or "back of the hill," special notice is taken of ruins. On the other hand, there is no mention made of towns or villages for the Persian Gulf.

M. de Morgan's 'Kurdistan de Moukri,' with which his volume opens, is a comprehensive chapter relating to the country traversed by Mr. Walter Harris, some five years later than the French writer, and described by sketch-map and letterpress in our *Journal* for November last. The actual route taken by the two explorers was not always

* Twenty-two out of the twenty-three books of reference on Persian Kurdistan, for instance, are the same, and placed in precisely the same order, as those noted by Mr. Curzon.

identical, for Mr. Harris, on leaving Suj-bulak, abandoned the caravan-road for a straight out across the mountains, so as to visit the Kurds in their summer quarters; but they seem to have been on one and the same track again at Sardasht, Bana (or Bahireh), and Sakiz. Independently of questions of hydrography, orography, and geology, separately grouped, the chapter is rich in illustrative detail, and the author has much to say on the character, language, and customs of the people, which comes under the head of light as well as instructive reading. This description of a marriage at Namashir, in the Balmik district, may be thus rendered in English:

"The bride lived with her parents in a neighbouring village; she had been purchased for the modest sum of twenty *tumáns* (say £8½ to £9½) by an inhabitant of the village in which we were encamped. About five o'clock in the afternoon—when the religious part of the ceremony had been performed—she arrived on horseback, escorted by her own country-folk, and bringing upon a beast of burden two boxes, painted in red, containing her wearing apparel. As soon as the small caravan came in sight, there was a general discharge of firearms; and directly she arrived and had alighted, the bride was conducted to the house of her lord, and the female villagers crowded around her. Much and loud talk ensued among men and women gathered together; then three large coal fires were lighted, and dancing began. The men and women danced in separate groups, holding one another by the waist, whirling round the fires, and adapting their steps to the time of the songs sung by a man placed in the foremost rank of the males, and a woman occupying a like position among the females. The song was slow, with a measured fall, in a monotonous air, often broken in upon by the bursts of laughter of the whole assembly."

Our author endeavoured to obtain some specimens of the words, as strung together for a vocal accompaniment to the dancing on these festal occasions. But, although he was able to collect a certain number, he could not find any that would bear translation. While allowing a high importance to Mukri literature, he regrets that the equivocal taste of its songs and stories is fatal to their publicity in Europe. To the above extract in reference to a wedding, let us add another which relates to a funeral—

"During our stay at the village of Passawa, among the Mamishes, a native of the place, through some unexplained visitation, ceased to show any signs of life. Instantly the air was filled with the lamentations of the whole neighbourhood; the men cried in moderation, but the women and children yelled and shrieked in despair. Although the wretched man thus mourned for was not actually dead, it was not long before he was found to be so in every respect.

"Half an hour after the news of his supposed decease was spread abroad in the village, the male inhabitants took the body to a stream, and, having stripped clothes, were about to wash it, when the corpse revived and began to struggle. 'He is possessed with the devil!' they exclaimed; and, struck by a vigorous blow on the back of the head, the victim fell stiff, now no more to rise again. Arrangements for his burial having been completed, the business of the hour resumed, and the body borne to the cemetery; the whole village followed, weeping and vociferating, as if the practically murdered man had been an object of adora-

to all his fellows. When the grave was closed, the female mourners came and encircled it, continuing their cries and wailings. Then, at a given signal, they suddenly became silent, to resume shortly, in unanimity of cadence, their moan of despair, *wai, wai, wai, wai, wai, wai*, and so on for about an hour. During this time the men, who had accomplished their funeral task, were seated, smoking their *kallians* and discussing their private affairs."

M. de Morgan alludes to the practice of despatching invalids who had grown unconscious as common throughout Kurdistan, and not infrequent in Persia generally. Sometimes, he affirms, the supposed dead man only revives when he has been deposited under the earth. Should his voice at such time be heard, it is said that a great calamity has come upon the country, and every one seeks to escape from the presence, as it were, of an exorcised demon, throwing over the body the largest available stone. Stoning for adultery is mentioned as a national law, but not often put into practice, owing, on the one hand, to the few cases which present themselves, and, on the other, to the difficulty of finding four witnesses to give evidence, a lesser number being insufficient for conviction.

Among the ancient customs of Mukri may also be mentioned the festival of the "sham governor," celebrated at Suj-Bulak in the spring of every year, which is thus described :

"The townspeople appoint a governor (*Amir*), who for three days exercises control, and abandons himself to the eccentricities of the occasion. As soon as this official is installed, he selects his ministers, secretaries, and *Farrash-bashi* (head servant), chooses his body-guard, and proceeds in state, followed by the whole population, to announce to the real governor that he has been deprived of office.

"This festival has often been productive of trouble, for the inhabitants of Suj-Bulak have taken advantage of the occasion to belabour the actual Amir with blows. So that now the sham ruler is always accompanied by soldiers and a government delegate, whose duty it is to prevent the joke being carried too far. For three days the mock rule continues. The governor decides the most absurd cases, and punishes the assumed culprits; but as, in the exaction of penalty inflicted, the dinar ($\frac{1}{100}$ part of a kran) counts for the kran, a fine of one hundred *tumans* (or 10×100 krans) is, in reality, that of one kran only. Thus payment is readily made and amusement afforded. The whole procedure is, practically, the 'Carnival of Mukri.'"

There are some noteworthy observations on the mineral riches of the Kurdistan of Kirmanshahan which may be commended to the attention of present and future explorers. Not only do they possess a general interest for the geographical world, but they indicate the existence of a special field of investigation, to turn which to good account no serious effort seems yet to have been made. We are reminded that marble, such as utilized in the wonderful sculptures at Besitun and Tak-i-Bustan, is still abundant in the locality of these monuments. Moreover, the perfect quality of the plaster procurable from the gypsum—the presence of which in the Zohal district and neighbourhood has been certified by

Loftus and others—is cited to show how natural gifts are suffered to lie profitless by a community, whether the governors or the governed, who prefer conventional dwelling-places of bad brick which entail little labour, to solid and durable houses involving abnormal effort. Above all, the reader is enjoined to give heed to the possibilities of a vast and profitable trade in petroleum, of which the aspect of this part of the country amply warrants the anticipation. Our author is of opinion that what he designates a *bande petrolifère*, stretching out in a south-westerly direction from Kerkuk, in Turkish Arabia, to the Persian "Pusht-i-Kuh," may be found the most important source of wealth throughout the whole region. The proximity of Baghdad and the advantages which it offers as a port of embarkation are pointed out, and it is argued that while the naphthas of Baku must pass through the Suez Canal to reach India, those of Zohab might be despatched thither in a direct line that would be of inestimable value in competition. This question is discussed with much useful and careful detail.

Amid the problems treated in the Kirmanshahan chapter, M. de Morgan discusses the better means of developing traffic between the tablelands of Persia and the Persian Gulf, but he himself supports the ambitious proposal of connecting Tehran by rail with Baghdad. His opinion on the feasibility of this connection is, no doubt, worthy of attention. Moreover, Constantinople to Baghdad, and Baghdad to Tehran, are combinations not only desirable, but likely, as main lines of railway in the future. One stated objection to the fulfilment of his project, in the fact that the city of the khalifs is out of Persia, he considers unimportant, because of the good understanding (*très bonnes relations*) which exists between Shah and Sultan. But we are rather inclined to accept his view on other grounds. Throughout the length of the Turko-Persian frontier, the hostility between the Sunni and Shiah on either side is proverbial; nor is this feeling less marked between Kirmanshah and Baghdad than elsewhere. Some years ago, when the Turkish iron poles of the Indo-European telegraph were about to join the Persian wooden poles across a tract of disputed territory, so great was the international jealousy, and fear of ceding a yard of doubtful land, that proceedings were summarily stopped. Her Majesty's Resident and Consul-General at Baghdad fortunately hit upon the happy expedient of using iron and wooden poles alternately over the whole tract under litigation, or the junction of the wires might have remained a *fait non-accompli* to the present day.

Space will not admit of extracts from other than the two first chapters, but all are worth reading and remembering, in connection with the geographical study of the western side of Persia. Illustrations abound in this handsome volume: these are, for the most part, good and helpful to the due comprehension of the text; some are especially attractive and artistic. Had we to select the more excellent, we might

point to the Lake Gohar, situated in the narrow valley south of Ushtaran Kuh, in Northern Luristan, and three of the many views of the Ushtaran Kuh itself. The Tang-Azna, in the country of the Lurs of Sagwand, is a charming photograph.

SOME BOOKS ON EAST AND SOUTH AFRICA.

THE first book on our list * supplies a welcome exception to the general applicability of the statement, so often made, that the work of British explorers falls far short of that of the Germans in permanent scientific value. In this respect it may rank with the best German publications that have appeared in recent years. Although primarily a geologist, Dr. Gregory has given much attention to other branches of natural science, and his conclusions with regard to the various scientific questions touched upon are the result of long and careful study. The plan of his book is that followed by many German writers, the account of the journey itself being followed by chapters dealing with the various scientific aspects of the country.

The general results of Dr. Gregory's journey were fully given in the series of articles published in the *Journal* in 1894 (vol. iv.). The most striking features of the country dealt with are the Great Rift Valley, which gives the book its name, and Mount Kenya, on which so much new light was thrown by the journey. To non-geologists the term "rift valley" may be apt to suggest an exaggerated idea of depth and narrowness, the height of the walls being after all very slight compared with the width of the floor. It would not be easy, however, to suggest a better. Dr. Gregory followed its eastern side through two degrees of latitude, besides crossing its floor near Lake Baringo. The illustration at p. 94 gives a good idea of the level nature of the floor and the sudden rise of the bounding walls.† It may be remarked that the results of Dr. Donaldson Smith's journey hardly bear out the idea of its prolongation as a marked line of depression north-east of Lake Rudolf, while it is not quite clear, from the allusion to Lake Nyasa as in the *eastern* branch of the valley, whether the author rejects the notion that the western trough is indicated south of Tanganyika by the furrow of the Songwe and Saisi valleys.

The account of Dr. Gregory's adventures in the romantic region of snow-fields and glaciers around the central peak of Kenya is of extreme interest, and will, it is to be hoped, induce others to follow in his steps. Kenya appeals more to the imagination than Kilimanjaro, whose

* 'The Great Rift Valley.' By J. W. Gregory. London: Murray. 1896.

† The illustration (after Giraud) intended to show the steep sides of the narrow type of lakes, is accidentally referred to Tanganyika instead of Nyasa. Another slip is the statement that only one of the lakes has an outlet to the sea.

massive simplicity is more easily taken in; the various peaks and toothed pinnacles of Kenya, separated by upland valleys, show a more complicated general structure. The route followed is not marked on the sketch-map, but the names given to the chief features are an assistance in tracing it. Dr. Gregory does not appear to have named the striking rock-pinnacle, which rises above the moraines of the Lewis glacier, and which might readily be mistaken for the highest summit, though a comparison with the map and the other views shows that it is not. Though lacking the precision of photographs, the views alluded to give a vivid general idea of the features of the great mountain.

An interesting chapter deals with problems connected with the distribution of the flora and fauna, on which new light has been thrown by the discovery of moraines on Kenya at a much lower level than is reached by the present glaciers. In his division of the country into botanic zones, Dr. Gregory has introduced a slight modification since publishing his paper in the *Journal*. He defines a somewhat greater number than Mr. Scott-Elliot, but does not discriminate so minutely as Prof. Engler, whose eight floral zones, laid down for Usambara, do not include the higher mountains. The high mountain forests of Usambara correspond, according to Dr. Gregory, with the mountain forest which clothes the lower slopes of the main peaks.* We cannot do more than refer to the section dealing with the native tribes, which gives, perhaps, the best summary of our present knowledge which exists in English. Special attention is paid to the history of tribal migrations, and the main war-paths of the Masai are shown on one of the accompanying sketch-maps.

Mr Chanler's volume † takes the form of a detailed narrative of the events connected with his expedition to the north-east of Mount Kenya, in conjunction with Lieut. von Höhnel. Although the difficulties encountered caused a partial failure of the original plan, enough new ground was broken to give a considerable value to the results attained, a previously unknown area of over 100 miles in each direction being carefully mapped. The excellence of the former surveys of von Höhnel, on whom this work devolved, is a voucher for the trustworthiness of the map, which is on the large scale of 1:750,000. The colouring, according to contours of altitude—though the data available can hardly admit of great exactitude—no doubt gives a good general idea of the relief of the country. The chief geographical discovery was the tracing of the river Guaso Nyiro through the greater part of its course to the Lorian swamp, the position of which was thus for the first time defined. Much

* In the case of Kenya the forest zone is almost at the base, owing to the height of the plateau on which the mountain is placed; but on Kilimanjaro it begins only at a considerable height.

† 'Through Jungle and Desert.' By William Astor Chanler. London and New York: Macmillan. 1896.

new information was collected regarding the tribes met with, especially the Rendile, a race of doubtful affinity, but probably allied to the Gallas and Somalis, who own large herds of camels. The failure to obtain transport animals from them was largely responsible for the curtailment of the route.

On several occasions fights occurred, and in this respect the expedition compares unfavourably with Dr. Gregory's, which succeeded in maintaining friendly relations with the natives in spite of its small numbers. Mr. Chanler holds that the first intercourse of Europeans with new tribes is bound to involve bloodshed, and was, perhaps, not so determined to avoid it as some travellers have been without ill result. The difficulties encountered were, however, undoubtedly great. He apparently lacks the sympathetic feeling towards the Zanzibaris* which Dr. Gregory displays in spite of a consciousness of their many faults, and this may partly account for, without excusing, the desertion of his men after von Höhnel's departure for the coast, dangerously wounded by a rhinoceros. These animals seem to have been particularly plentiful and troublesome. The numerous and characteristic cuts are from photographs by the author, and, being evidently faithful copies, are a welcome change from the process-reproductions now almost universal in books of travel.

Before proceeding to books on South Africa, we may notice that the second volume of Dr. Paulitschke's 'Ethnographie Nordost Afrikas' has now been published. It deals in a thorough and comprehensive way with the moral culture of the Danakil, Galla, and Somal tribes, the first volume (noticed in the *Journal*, vol. iii. p. 503) having been concerned with their "material culture."

There is, perhaps, no part of the continent about which so many misconceptions prevail as German South-West Africa, the numerous works already published with reference to it having often been too scientific for popular comprehension. The connected account of the colony † which Lieut. H. von François—not to be confounded with his brother, Major C. von François—has prepared in a form suitable for general use, is therefore likely to prove serviceable in giving a clear conception of the present state and capabilities of the country. As the writer has served there for a considerable time, he has had good opportunities of becoming well acquainted with it personally. The book begins with a general description of the physical geography, plant and animal life, etc., followed by a sketch of the native inhabitants. Having thus given an idea of the material to be worked upon in the development of

* The Zanzibaris, Mr. Chanler thinks, are perfectly satisfied with their present condition of serfdom, and he doubts whether they would be benefited by a change.

† 'Nama und Damara, Deutsch-Süd-West-Afrika.' Von H. von François. Magdeburg: Baensch. [1896.]

the country, the author proceeds to relate the chief events connected with the German occupation (some space being devoted to the relations of the government with Hendrik Witbooi), and describes the various industries practised, concluding with a forecast for the future. Of the native population the Hill Damaras and the "Bastards" will probably prove most valuable allies in the work to be done. Political relations with the Hottentots will always be on a somewhat doubtful basis. British merchants and others still form a large proportion of the white population, and Boers are present in some numbers. Although the latter give little trouble, the author sees a danger in the possible preponderance of the Dutch element, and insists on the need of a larger number of German settlers, as well as of improved internal communications and a direct line of steamers to Germany. Want of practical experience at present puts the German immigrants at a disadvantage. The book is well and abundantly illustrated.

Prof. Wallace's book* is a valuable addition to our knowledge of the economic resources of the Cape, and must deeply interest all who are concerned in the welfare of that colony. The information it contains was acquired at first hand during journeys through the length and breadth of the country, carried out in 1895 at the request of the Cape Government, which gave constant opportunities of intercourse with the farmers themselves. Although much of the book naturally deals with more or less technical subjects, it is also most instructive from a geographical point of view, enabling the reader to grasp clearly the general surface features and their effect on the plant and animal life of the colony.

The series of maps by Bartholomew, which are excellent specimens of cartography, is a valuable feature of the work. The orographical features are shown in a two-sheet map of the scale of 1 : 2,500,000, coloured according to contours of altitude at every 1000 feet up to 4000, and at every 2000 feet above that height. Another map shows, under the title "Land surface features," the prevailing forms of vegetation, with the limited areas in which agriculture is practised.† Others give the proportions of the different kinds of stock in different localities, and a useful set of meteorological maps concludes the series. One of the most interesting chapters is that on ostrich-farming. The total number of birds now exceeds a quarter of a million. Fruit-growing, for which the climate is particularly favourable, is unaccountably neglected, and enterprise and skill are much needed to show what might be done in this direction.

* 'Farming Industries of Cape Colony.' By Robert Wallace, F.L.S., etc. London: King. 1896.

† The tints of this map do not in every case agree with those of the reference at the side. Thus the thorn-bush is green in the latter, but a light-brown in the former, apparently owing to the omission of a component tint.

GEOGRAPHY AT THE BRITISH ASSOCIATION, LIVERPOOL, 1896.

THE meeting of the British Association at Liverpool, from September 18 to 23, 1896, was the largest and most successful of recent years. The total number of tickets issued, amounting to 3180, has only twice been exceeded—at Newcastle in 1863, and at Manchester in 1887. If it were possible to distinguish the Liverpool meeting from all others by any one feature, that would be the convenient and even magnificent housing of the Association as a whole and all the sections. Section E certainly fared the best of all, for the “Small Concert Hall,” in the same building with the great St. George’s Hall, which served as the reception-room, was allotted to it. The hall is circular, of large dimensions, seating comfortably about a thousand people; it has just been redecorated, and was effectually darkened to admit of the use of the lantern. The attendance at the meetings of the section was very large, and much more uniform than usual. Very few papers were read to a small audience, and the number of communications sent in was so great (thirty-four) that a meeting had to be held on Saturday forenoon, in addition to the four days which usually suffice.

The Organizing Committee had arranged the papers of which intimation had been given in such a way that similar subjects were kept together; but the failure of some authors to put in an appearance, the changing of dates, which had been fixed to suit themselves, by others, and the presentation of valuable communications at short notice by gentlemen who could only attend on particular days, broke down the prepared order, and made the proceedings of each day too varied to be altogether profitable. It must, however, be recognized that the papers submitted were in themselves of great interest and value, and many of them afforded satisfactory proof of the sound study of geography as a science, and not as the mere record of explorations. But in exploration the story of some splendid successes was told, and an unexampled collection of the finest lantern-slides brought the scenery of many distant parts of the world vividly before most appreciative audiences. The large diagram maps of the Royal Geographical Society were as usual lent to the section.

The constitution of the section was as follows, the names of those nominated as vice-presidents or members of Committee who were disqualified by absence from the meeting or by not becoming *members* of the Association being omitted:—

President:—Major L. Darwin, Hon. Sec. R.G.S.; *Vice-Presidents*:—John Coles, F.R.A.S.; Admiral Sir Erasmus Ommanney, C.B., F.R.S.; Lieut.-Col. Sir Lambert Playfair, K.C.M.G.; P. L. Sclater, F.R.S.; E. G. Ravenstein; Coutts Trotter; Horace Walker. *Secretaries*:—Lieut.-Col. F. Bailey, Sec. R.S.G.S.; H. N. Dickson, F.R.S.E.; H. R. Mill, D.Sc.

(*Recorder*); Commander E. Dubois Phillips, R.N. *Committee*:—J. Bolton; A. Montefiore Brice; G. G. Chisholm, M.A., B.Sc.; Sir W. Martin Conway; Vaughan Cornish, M.Sc.; H. T. Crook; B. V. Darbishire, M.A.; Chas. Gatehouse; E. Heawood, M.A.; A. J. Herbertson; Rev. J. F. Heyes, M.A.; J. Scott Keltie, Sec. R.G.S.; Prof. J. Milne, F.R.S.; Count Pfeil; George Philip, Jun.; Ralph Richardson; Eli Sowerbutts; Major-Gen. Sir Charles Wilson, R.E., K.C.B., F.R.S.

Thursday, September 19.—The address of the President (p. 488) was listened to with close attention by a large audience, and on its conclusion Count Pfeil proposed a vote of thanks, which was seconded by Sir Charles Wilson and heartily carried.

Mr. H. S. Cowper gave a preliminary account of his journey in March, 1896, through Northern Tripoli, a continuation of his work published in the *Geographical Journal*, vol. vii., 1896, p. 150, which it is hoped will shortly be submitted in full to the Society. The Rev. C. J. Robinson gave an account of his travels in the Hausa country.

Mr. John Coles explained the methods of photographic surveying, exhibiting two different types of camera adapted for such work, and expressing his belief that photographic methods in surveying were destined soon to take a very prominent place.

Mr. H. N. Dickson stated the present position of his research on the chemical composition and circulation of the water of the North Atlantic, specimens having been collected for him by the observers of the Meteorological Office and other sea-captains. Prof. Hjort, of Christiania, referred to the admirable oceanographical work being carried on by the Norwegian Government.

Dr. H. R. Mill explained his scheme for a geographical description of the British Islands, based on the 1-inch maps of the Ordnance Survey, and invited discussion on it. Mr. H. T. Crook criticized the Ordnance maps, complaining that they did not give as much information as they should do, and stating that if they were properly constructed no written description would be necessary. Prof. Hull pointed out that the Ordnance maps, with geological colouring superimposed, were as full as any maps could be made; and Mr. Coles paid a high tribute to the great beauty and accuracy of the British maps as compared with the state maps of any country in the world.

Friday, September 18.—The Rev. W. K. R. Bedford described the old tapestry maps of parts of England, woven during the latter part of the sixteenth century, specimens of which are preserved at York and in the Bodleian Library at Oxford. They showed several features of the topography of the counties represented which do not seem to have been shown on any of the published maps of the period.

Dr. Tempest Anderson showed photographs of the Altels avalanche of September, 1895, in which a mass, partly snow, partly glacier ice, swept for 4000 feet down the mountain-side, causing great destruction.

The fracture afforded an interesting glimpse of the internal structure of a glacier far from its termination.

Lieut. G. Vandeleur, of the Scots Guards, gave a preliminary statement of his observations in Uganda and on the Upper Nile, which will shortly be presented in full to the Royal Geographical Society.

Dr. F. P. Gulliver, of Harvard College, discussed the form of the coast-line of Romney Marsh, and described the origin of Dungeness. His paper will probably be published with diagrams in the *Journal*.

Mr. A. Montefiore Brice, secretary to the Jackson-Harmsworth Arctic Expedition, gave an address to a crowded house on the second year's work of the expedition, illustrated by slides, showing the life of the expedition and the scenery of Franz Josef Land. Sir Erasmus Ommanney, Sir Martin Conway, and Mr. Coles, expressed the feeling of the meeting as to the valuable work which had been done. It will be fully recorded in the *Journal*.

Mr. G. F. Scott Elliot communicated a paper on the influence of climate and vegetation on African civilization, an abstract of which appears in the *Monthly Record*. It gave rise to a brief discussion.

Mr. Vaughan Cornish contributed the results of a valuable original investigation on the forms, origin, and distribution of sand-dunes and sand-banks, which we hope to publish in full, with diagrams, at an early date.

Saturday, September 19.—Mr. A. J. Herbertson exhibited a series of monthly mean rainfall maps of the world, which, in conjunction with Dr. A. Buchan, he has prepared for the great physical atlas now being compiled by Mr. Bartholomew, on the basis of Berghaus. These maps are the first of their kind to be made, and are full of interest from the point of view of climatology.

Mr. Ravenstein presented the report of the Committee on the Climatology of Tropical Africa (Secretary, Mr. H. N. Dickson), the text of which is given in the *Monthly Record*.

Mr. J. Howard Reed sent in a paper describing the efforts of the Manchester Geographical Society in the popularization of geographical education.

The feature of the day was an eloquent address on Canada and its gold-resources by Sir James Grant, K.C.M.G., which was warmly received. He said that Canada contained both coal and gold, and within the last few years remarkable discoveries had been made. In Nova Scotia the coal area covered 635 square miles. In New Brunswick it was estimated that there were upwards of 150,000,000 tons of coal; while in the north-west territory Dr. Dawson had arrived, after careful investigation, at the fact that there were over 50,000 square miles of coal-bearing strata. It was a remarkable fact that the Dominion had coal on the Atlantic and Pacific seaboard and in the interior—as if nature had intended to supply it with the requisite material in the

event of an emergency to send its ships to any part of the world, and thus contribute materially to the strengthening of the Empire. With reference to gold, discoveries were made in Nova Scotia in 1860, and since 1885 the mines in the province had become exceedingly lucrative, owing to the utilization of appliances for the recovery of gold from low-grade ores. It was estimated that that province had produced gold to the value of \$11,500,000. In the province of Quebec Prof. Hardman made some investigations. After running a tunnel 600 feet in length, he struck the bed of an old river, and in three weeks removed enough gold to pay the entire expense of his operations. The consequence was that to-day there was feverish excitement in the province, and every acre of land was being taken up. In Ontario the discoveries had been of a remarkable character. At Manatou there were numerous seams in which the gold appeared on the surface, and could be removed with the greatest ease. This district was only 100 miles distant from Winnipeg and 40 miles from the Pacific Railway. In British Columbia 400 miners in one day took from Williams Creek 200 lbs. weight of gold, and he predicted that the future output in this province would surprise not only Canadians, but the whole of the civilized world.

Monday, September 21.—Mr. W. A. L. Fletcher, who accompanied Mr. and Mrs. St. George Littledale on their great journey across Tibet from north to south, gave an account of his journey toward Lhasa; and our readers, who have already had an opportunity of knowing the facts of this journey, will be pleased to learn that Mrs. Littledale has recovered from the results of the hardships she underwent, and was present at the reading of the paper.

Iceland was the subject of two short papers, both illustrated by very fine slides of scenery. Mr. Frederick W. Howell described his journey through the glacier-region of Northern Iceland, and Dr. K. Grossman spoke of the volcanic scenery surrounding Hecla.

Mr. G. G. Chisholm treated of the Relativity of geographical advantages in an able paper, for the adequate discussion of which there was, unfortunately, no time. He considered geographical advantages: (1) as relative to the condition of the surface of a country, *e.g.* the extent of forests, marshes, etc. The former and present relative importance of Liverpool and Bristol might be explained, in part at least, by changes that had taken place under this head. Also the difference in direction by some of the great Roman roads and those of the present day, and the consequent fact that some important Roman roads in Britain were not now represented even by a hamlet. (2) to the political condition of a country and of other countries relative to the state of military science. Under these two differences in the situation of the Roman wall between Tyne and the Anglo-Scottish boundary suggested some considerable

the difference in the situation of some important Roman towns or stations and their modern representatives (Uriconium, Shrewsbury; Sorbiodunum, Salisbury). (4) As relative to the state of applied science—well illustrated in this country, in the history of the iron and textile industries. (5) As relative to the density of population—another important consideration in the industrial history of our own country. (6) As relative to the mental attitude of the people where the geographical advantages existed. Many Chinese travellers and students of China had recognized the excessive reverence for ancestors in that country as one great hindrance in the way of turning the advantages of the country to account.

Mr. Ralph Richardson read a paper on the boundary of British Guiana and Schomburgk's line, which called forth a very lively discussion, but did not reach any definite conclusion.

In the afternoon Sir W. Martin Conway gave a preliminary account of the expedition to Spitzbergen which he, together with Dr. J. W. Gregory, Messrs. Garwood, Trevor-Battye, and H. Conway, made in the summer of 1896. He vividly described the difficulties in the way of land travel presented by soft snow and interminable marshes which he had successfully overcome in crossing the south-western island.

Mr. J. Ferguson, in the absence of Mr. H. W. Cave, exhibited a fine series of photographs of the ancient ruined cities of Ceylon, which were taken by Mr. Cave to serve as illustrations for a forthcoming work on the subject.

Prof. J. Milne, F.R.S., discoursed on earthquakes and sea-waves. During the whole day the audience in the section had been large, and highly appreciative of the papers submitted to them.

Tuesday, September 22.—Mr. A. E. Fitz Gerald gave a short account of his mountaineering journey across the Southern Alps of New Zealand, and announced his intended departure for an expedition of some magnitude to the Chilian Andes, in the course of which it is his intention to attempt the ascent of Aconcagua.

Sir Charles W. Wilson was listened to with the deepest attention while he gave an address on the Egyptian Sudan, a report of which, it is hoped, will appear in the *Journal*, and after he concluded, a number of questions were asked as to the prospects of trade by the different routes proposed to the interior.

Mr. A. W. Andrews read a practical paper on the teaching of geography in relation to history, and his arguments will appear later in the *Journal*.

Mr. E. Odum, of Vancouver, described the border zone between British Columbia and Alaska, referring especially to the region under consideration in the present boundary negotiations. Sir Charles Wilson, as the surveyor responsible for fixing the 49th parallel, the boundary between Western Canada and the United States, and Mr. John Coles as

the first settler in British Columbia, congratulated Mr. Odlum on his paper.

Mr. J. Scott Keltie, who had just returned from Christiania, gave an account of the triumphal reception of Dr. Nansen, and a sketch of the achievements of the great Arctic expedition. He read extracts from an article by Professor Mohn (see the October number of the *Journal*), who expressed the highest possible delight and admiration at the scientific results of the observations, especially those on meteorology and terrestrial magnetism. Sir Erasmus Ommanney and Mr. Coles spoke of the unique value of Nansen's work.

Mr. A. J. Herbertson demonstrated the use of a simple arrangement for explaining the principle of map-projections. It consists of a hemisphere made up of wire meridians and parallels, the shadow of which is thrown on a sheet of paper by means of a candle sliding along a graduated bar. The nature of the projection, of course, varies with the position of the candle.

Mr. B. V. Darbishire showed a new population map of the South Wales coal-district. It gave the position of all detached inhabited houses as well as the villages and towns, and having the contour-lines of elevation, it brought out the relation of population to land-form.

Mr. A. J. Herbertson read the interim-report of the Committee on Geographical Teaching, in which he stated that he had collected a large amount of material; but the Committee, having been unable to obtain access to some important returns, wished to delay the full report until next year, when it could be presented in its entirety.

Mr. Coutts-Trotter proposed, and Mr. Eli Sowerbutts seconded, a vote of thanks to the president (Major Darwin), the vice-presidents who had assisted him in the chair (Messrs. John Coles and Horace Walker), the secretaries of the Section, and the local secretaries for the admirable hall provided.

Papers of geographical interest were as usual read in many sections besides that specially devoted to geography. In Section A (Mathematics and Physics), Dr. L. A. Bauer discussed some problems in terrestrial magnetism, Mr. H. M. Taylor read a paper on great-circle sailing, and reports were submitted by the Committees on seismological observations and on meteorological photographs. In Section C (Geology), Mr. Man's presidential address abounded in allusions to results of physical geography, and much interest was aroused in a series of papers on ocean depth and deposits, introduced by Mr. E. B. Wethered, on the depths of the sea in past epochs. Mr. T. Mellard Reade discussed the oscillations in the level of the land near Liverpool from geological evidence, and Mr. G. H. Morton spoke of the erosion of the sea-coast of Wirral, the tongue-shaped peninsula between the Mersey and the Dee.

In Section D (Zoology), the president, Professor Poulton, reviewed the evidence regarding the age of the Earth from the physical as well

as the biological point of view, and contended for a great extension of its habitable period beyond that usually conceded by physicists. A report was read on the biological investigation of oceanic islands; and in Section H (Anthropology), Prof. Haddon called attention to the need of the immediate study of such islands from the anthropological point of view. In the latter section, the president, Mr. A. Evans, spoke on the pre-historic migrations of people and the origin of European races; and Mr. J. L. Myres read a paper on "Cyprus and the Trade-routes of South-Eastern Europe." Mr. Thiselton Dyer, Director of the Royal Gardens at Kew, gave a lecture in Section K (Botany) on the geographical distribution of plants. Section G (Mechanical Science and Engineering) listened to two communications of much geographical interest, one a "Report on the Effect of Wind and Atmospheric Pressure on Tides;" the other by Mr. G. F. Lyster, on "The Physical and Engineering Features of the River Mersey and the Port of Liverpool." Mr. Lyster's paper was felt to be of such value that it was ordered by the General Committee to be printed in full in the Report.

Prof. W. A. Herdman, in addition to his arduous duties as local secretary, has edited the Association's "Handbook to Liverpool," which, although smaller than some similar books in the past, is admirably compiled, and will serve as a valuable scientific guide to the Liverpool neighbourhood for years to come. It contains the following chapters: History and Antiquity of Liverpool, by W. H. Picton; Geology of the Country around Liverpool, by G. H. Morton, with a geological map specially compiled; The Vertebrate Fauna of the Liverpool District, by Dr. H. O. Forbes; The Marine Fauna of the District, by Prof. Herdman; The Entomology of the Liverpool District, by W. E. Sharp; The Botany of the Liverpool District, by Robert Brown; The Climate of Liverpool, by W. E. Plummer; The River and the Tides, by Prof. Oliver J. Lodge; Docks, and other Engineering Works, by Prof. H. S. Hele-Shaw and H. Percy Boulnois; Trade and Commerce of Liverpool, by Sir William B. Forwood; Chemical Industries, by Dr. C. A. Kohn. An appendix is added giving some similar particulars relating to the Isle of Man, the scene of one of the largest excursions of members after the close of the meeting.

RAILWAYS IN AFRICA.*

By Major DARWIN, Sec. R.G.S.

IN reviewing the record of geographical work during the past year, all other performances pale in comparison with the feat accomplished by Nansen. It is not merely that he has gone considerably nearer the North Pole than any other explorer, it is not only that he has made one of the most courageous expeditions

* Address delivered to the Geographical Section of the British Association at Liverpool, September 17, 1896, by Major Darwin, as President of the Section. Map, p. 540.

ever recorded, but he has established the truth of his theory of Polar currents, and has brought back a mass of valuable scientific information. When Nansen comes to England, I am certain that we shall give him a reception which will prove how much we admire the heroism of this brave Norwegian.

Besides the news of this most remarkable achievement, the results of a considerable amount of useful exploratory work have been published since the British Association met last at Ipswich. With regard to other Arctic expeditions, we have had the account of Lieutenant Peary's third season in Northern Greenland, from which place he came back in September last, and to which he has again returned, though without the intention of passing another winter there. In October the *Windward* brought home more ample information as to the progress of the Jackson-Harmsworth Expedition than that communicated by telegram to the Association at Ipswich, and on her return from her remarkably rapid voyage this summer she brought back the record of another year. As to geographical work in Asia, Mr. and Mrs. Littledale returned safely from their explorations of the little-known parts of Tibet; the Pamir Boundary Commission, under Colonel Holdich, has collected a great deal of accurate topographical information in the course of its labours; Dr. Sven Hedin continues his important researches in Turkestan; and the Royal Geographical Society was glad to welcome Prince Henry of Orleans when he came to tell us about his journey near the sources of the Irrawaddy. As to Africa, the most important additions to our knowledge of that continent are due to the French surveyors, who have accurately mapped the recently discovered series of lakes in the neighbourhood of Timbuktu, Lake Faguibine, the largest, being found to be 68 miles in length; Dr. Donaldson Smith has filled up some large blanks in the map of Somaliland; and Mr. and Mrs. Theodore Bent have investigated some interesting remains of ancient gold workings inland of the Red Sea. In other parts of the world less has been done, because there is less to do. Mr. Fitz Gerald has proved for the first time the practicable character of a pass across the Southern Alps, thus supplementing the excellent work of Mr. Harper and other pioneers of the New Zealand Alpine Club; and Sir W. M. Conway has commenced a systematic exploration of the interior of Spitzbergen, a region to which the attention of several other geographers is also directed.

It is impossible in such a brief sketch to enumerate even the leading events of the geographical year, but what I have said is enough to remind us of the great amount of valuable and useful work which is being done in many quarters of the world. It is true that if we compare this record with the record of years gone by, we find a marked difference. Then, there was always some great geographical problem to be attacked; the sources of the Nile had to be discovered; the course of the Niger had to be traced; and the great white patches on our maps stimulated the imagination of explorers with the thought of all sorts of possibilities. Now, though there is much to be learned, yet, with the exception of the Poles, the work will consist in filling in the details of the picture, the general outlines being all drawn for us already. Personally I cannot help feeling a completely unreasoning regret that we have almost passed out of the heroic period of geography. Whatever the future may have in store for us, it can never give us another Columbus, another Magellan, or another Livingstone. The geographical discoverers of the future will win their fame in a more prosaic fashion, though their work may in reality be of even greater service to mankind. There are now few places in the world where the outline of the main topographical features is unknown; but, on the other hand, there are vast districts not yet thoroughly examined. And, in examining these more or less known localities, geographers must take a far wider view than heretofore of their methods of study in order to accommodate themselves to modern conditions.

But even if we confine our attention to the older and more narrow field of geography, it will be seen that there is still an immense amount of work to be done. We have been filling in the map of Africa during recent years with extraordinary rapidity, but yet that map is likely to remain in a very unsatisfactory condition for a long time to come. Englishmen and other Europeans have always shown themselves to be ready to risk their lives in exploring unknown regions, but we have yet to see how readily they will undertake the plodding work of recording topographical details when little renown is to be won by their efforts. It should be one of the objects of geographical societies to educate the public to recognize the importance of this work, and General Chapman deserves great credit for bringing the matter before the International Congress last year in such a prominent manner. He confined himself to four main recommendations. (1) The extension of accurate topographical surveys in regions likely to be settled by Europeans. (2) The encouragement of travellers to sketch areas rather than routes. (3) The study of astronomical observations already taken in the unsurveyed parts of Africa in a systematic manner, and the publication of the results. (4) The accurate determination of the latitude and longitude of many important places in unsurveyed Africa. I am certain that all geographers are in hearty accord with General Chapman in his views, and it is, perhaps, by continually bringing this matter before the public that we shall best help this movement forward.

Not only do we want a more accurate filling in of the picture, but we have yet to learn to read its lessons aright. The past cannot be understood, and still less can the future be predicted, without a wider conception of geographical facts. Look, for example, at the European colonies on the West Coast of Africa. Here we find that there have been Portuguese settlements on the Gold Coast since the year 1471, the French possibly having been established there at an even earlier date; whilst we English, who pride ourselves on our go-ahead character, have had trading factories on the coast since 1667. I have here a map showing the state of our geographical knowledge in 1815. Why was it that Europeans have never, broadly speaking, pushed into the interior from their base on the coast, which they had occupied for so many centuries? That they had not done so, at least to any purpose, is proved by this map. Why had four centuries of contact with Europeans done so little even for geographical knowledge at that time? The answer to this question may be said to be mainly historical; but the history of our African colonies can never be understood without a study of the distribution of the dense belt of unhealthy forest along the shore; of the distribution of the different types of native inhabitants; and of the courses of the navigable rivers, all strictly geographical considerations.

Geography is the study of distribution, and early in that study we must be struck with the correlation of these different distributions. If we take a map of Africa, and mark on it all the areas within the tropics covered with dense forest or scrub, we shall find we have drawn a map showing accurately the distribution of the worst types of malarial fever; and that we have also indicated with some approach to accuracy—with, however, notable exceptions—the habitat of the lowest types of mankind. These are the facts which give the key to understanding why the progress of European colonization on the West Coast has been so slow.

Along the coast of the Gulf of Guinea we find settlements of Europeans at more or less distant intervals. All along, or nearly all along this same coast, we find a wide belt of fever-stricken forest, fairly thickly inhabited by uncivilized negro and Bantu tribes. Inside this belt of forest the country rises in altitude, and becomes more open, whilst at the same time there is a distinct improvement in the type of native; and the more we proceed inland, the more marked does this improvement

become. There appears, in fact, to have been a number of waves of advancing civilization, each one pressing the one in front of it towards these inhospitable forest belts. Near the coast the lowest type of negro is, generally speaking, to be found; then, as the more open country is reached, higher types of negroes are encountered—for example, the Mandingoes of the Senegal region are distinctly higher than the Jolas inhabiting the mouths of the Gambia; and the Hausas of the Sokoto empire are vastly superior to the cannibals of the Oil rivers. In both these cases the higher types are probably not pure negroes, but have Fulah, Berber, or Arab blood in their veins; for we see, in the case of the Fulahs, how they become absorbed into the race they are conquering. Near the Senegal river they are comparatively light in colour, but in Adamawa they are hardly to be distinguished by their features from the negroes they despise. Thus the process appears to have been a double one; the higher race driving some of the lower aboriginal tribes before them out of the better lands, and, at the same time, raising other tribes by means of an admixture of better blood. These waves of advancing civilization seem to have advanced from the north and east, for the more we penetrate in these directions, the higher is the type of inhabitant met with, until at last we reach the pure Berbers and the pure Arabs. Thus there are two civilizing influences visible in this part of Africa; one coming from the north and east—a Mohammedan advance—which keeps beating up against this forest belt and occasionally breaking into it; the other, a Christian movement, which, until the middle of this century, was brought to a dead halt by this same obstacle. The map of Africa, showing the state of geographical knowledge in 1815, makes it clear that, except in a few cases where rivers helped travellers through these malarial regions, nothing was known about the interior. No doubt much has been done since those days, but this barrier still remains the great impediment to progress from the West Coast; and those who desire our influence to spread more effectively into the interior must wish to see some means of overcoming this obstacle. On the East Coast of Africa the conditions are somewhat different, as there is comparatively little dense forest there; but the districts near that coast are also usually unhealthy, and how to cross those malarial regions quickly into the healthy or less unhealthy interior is the most important problem connected with the development of tropical Africa.

Other influences have been at work, no doubt, in checking our progress from the West Coast. In old days, the European possessions in these districts were mere depôts for the export of slaves. As the white residents could not hope to compete with the natives in the actual work of catching these unfortunate creatures, and as the lower the type the more easily were they caught, as a rule, there was no reason whatever for attempting to penetrate into the interior, where the higher types are met with. But, though this export trade in human beings is now no longer an impediment to progress, the slave trade in the interior still helps to bar the way. When the forest belt is passed, we now come, generally speaking, to the line of demarcation between the Mohammedan and the pagan tribes, and here slave-catching is generally rife; when it is so, the constant raids of the Mohammedan chiefs keep these border districts in a state of unrest, which in every way tends to impede progress. Thus a mere advance to the higher inland regions will not by any means solve all our difficulties, but it will greatly lessen them; and it is universally admitted that the more communication with the interior is facilitated, the more easy will it be to suppress this terrible traffic in human beings. By the General Act of the Brussels Anti-Slavery Conference of 1890-91, it was agreed by the assembled delegates that the construction of roads, and, in particular, of railways, connecting the advanced stations with the coast, and permitting easy access

to the inland waters, and to the upper courses of rivers, was one of the most effective means of counteracting the slave trade in the interior. Here, then, we have the most formal admission which could be given of the necessity of opening up main trunk lines of communication into the interior.

But not only does geographical knowledge help to demonstrate the necessity of improving the means of communication between the coast and the interior, but it helps us to decide where it is wise to make our first efforts in this direction. In the first place, it is essential to note that if the continent of Africa is compared with other continents, its general poverty is clearly seen. Mr. Keltie, in his excellent work on the Partition of Africa, tells us that "at present (1895) it is estimated that the total exports of the whole of Central Africa by the east and west coast do not amount to more than 20,000,000*l.* sterling annually." For the purposes of comparison, it may be mentioned that the export trade of India is between sixty and seventy million sterling annually, and that India is only about one-seventh or one-eighth of the area of the whole of Africa. On the other hand, the trade of India has been increasing by leaps and bounds, largely in consequence of the country being opened out by railways, and there is every reason to hope that somewhat similar results would occur in Africa under similar circumstances, though the lower civilization of the people would prevent the harvest being so quickly reaped. But, however it may be as to the future, the present poverty of Africa is enough to demonstrate the necessity of pushing ahead cautiously and steadily, and of doing so in the most economical manner possible.

M. Declé, in an interesting paper, read before the International Geographical Congress in London last year, strongly advocated the construction of cheap roads for use by the natives, taking precautions to prevent any traffic in slaves along them. His suggestions are well worthy of consideration; but the cost of transport along any road would, I should have thought, soon have eaten up any profits on the import or export trade to or from Africa. What must be done in the first instance is to utilize to the utmost all the natural lines of communication which require little or no expenditure to render them serviceable; in fact, to turn our attention at first to the rivers and to the lakes. I have already pointed out that the early maps of Africa prove that the rivers have almost invariably been the first means of communication with the interior, and until this continent is rich enough to support an extensive railway system, we must rely largely on the waterways as means of transport.

It may be as well here to remark that geographical knowledge is often required in order to control the imagination. I do not know why it is, but almost every one will admit that, if he sees a lake of considerable size depicted on a map, he immediately feels a desire to visit or possess that locality in preference to others. A lake may be of far less commercial value than an equal length of thoroughly navigable river, and yet it will always appear more attractive. Look at the way in which the English, the French, and the Germans are all pressing forward to Lake Chad; and yet Lake Chad is in reality not much more than a huge swamp, and, in all probability, it is excessively unhealthy. Again, it is probable that the Albert Nyanza will prove to be of comparatively small value, because the mountains come down so close to its shores. Of course, the great lakes form an immensely important feature in African geography, but we must judge their commercial value rationally, and without the bias of imagination.

To develop the traffic along the rivers and on the lakes is the first stage in the commercial evolution of a continent like Africa. But it cannot carry us very far. Africa is badly supplied with navigable rivers, chiefly as a natural result of the general formation of the land. The continent consists, broadly speaking,

of a huge plateau, and the rivers flowing off this plateau are obstructed by cataracts in exactly the places where we most want to use them—that is, when approaching the coasts. The second stage in the commercial evolution will therefore be the construction of railways with the view of supplementing this river traffic. Finally, no doubt, a further stage will be reached, when railways will cut out the rivers altogether; for few of the navigable rivers are really well suited to serve as lines of communication. This last stage is, however, so far off that we may neglect it for the present; though it must be noted that there are some parts of Africa where there are no navigable rivers, and where, if anything is to be done, it must be entirely by means of railways.

Thus, as far as the immediate future is concerned, the points to which our attention should be mainly directed are (1) the courses of the navigable parts of the rivers, and (2) the routes most suitable for the construction of railways in order to connect the navigable rivers and lakes with the coast. As to the navigable rivers, little more remains to be discovered with regard to them, and we can indicate the state of our geographical knowledge on this point with sufficient accuracy for our purposes by means of a map. Of course the commercial value of a waterway depends greatly on the kind of boats which can be used, and that point cannot well be indicated cartographically.

As to the railways, we must study the physical features of the country through which the proposed lines of communication would pass. All the obstacles on rival routes should be most carefully surveyed when considering the construction of railways in an economical manner. Great mountain chains are seldom met with in Africa, and from that point of view the continent is as a whole remarkably free from difficulties. But drifting sand is often a serious trouble, and that is met with commonly enough in many parts. Wide tracts of rocky country also form serious impediments, both because of the cost of construction, and also because the supply of water for the engines becomes a problem not to be neglected. Such arid and sandy districts are, of course, thinly inhabited, and we may, therefore, generally conclude that where the population is scanty, there railway engineers will have special difficulties to face. On the other hand, dense forests are also very unsuitable. We have not much experience to guide us, but it would appear probable that the initial expense of clearing the forest, and the cost of maintenance, in perpetually battling against the tropical vegetable growth, will be very heavy; for it will not do to allow the line to be in constant danger of being blocked. The dampness of the forest, which will cause all woodwork and wooden sleepers to rot, will be no small source of trouble, and the virulent malarial fevers, always met with where the vegetation is very rank, will add immensely to the difficulty, both of construction and of maintenance. The health of the European *employés* will be a most serious question in considering the construction of railways in all parts of tropical Africa, for the turning up of the soil is the most certain of all methods of causing an outbreak of malarial fever; and the evil results would be most severely felt in constructing ordinary railways in dense forests. In making the short Senegal railway, where the climate is healthier than in many of the districts further south, the mortality was very great. Perhaps we shall have to modify our usual methods of construction so as to mitigate this danger, and, in connection with this subject, I may perhaps mention that the Lartigue system seems to be specially worthy of consideration—a system by which the train is carried on a single elevated rail. This is perhaps travelling rather wide of the mark of ordinary geographical studies, but it illustrates the necessity of a thorough examination of the environment before we try to transplant our own methods to other climates.

We may, however, safely conclude that we must as far as possible avoid both dense forests and sandy and rocky wastes in the construction of our first railways.

Then, as to the lines of communication, considered as a whole, rail and river combined, we must obviously, if any capital is to be expended, make them in the directions most likely to secure a profitable traffic. In considering this part of the question, it will be seen that there are several different problems to be discussed: (1) trade with the existing population in their present condition; (2) trade with the native inhabitants when their countries have been further developed with the aid of European supervision; and (3) trade with actual colonies of European settlers. To many minds the last of these problems will appear to be the most important, and in the end it may prove to be so. But the time at my disposal compels me to limit myself to the consideration of trade with the existing native races within the tropics, with only an occasional reference to the influence of white residents. We must, no doubt, carefully consider which are the localities most likely to attract those Europeans who go to Africa with the view of establishing commercial intercourse and commercial methods in the interior; and there can be no doubt that considerations of health will play a prominent part in deciding this point. Moreover, as the lowest types of natives have few wants, the more primitive the inhabitants of the district opened up, the less will be the probability of a profitable trade being established. For both these reasons the coast districts are not likely in the end to be as good a field for commercial enterprise as the higher lands in the interior; for the more we recede from the coast, the less unhealthy the country becomes, and the more often do we find traces of native civilization. To put it simply, we must consider both the density of the population and the class of inhabitant in the districts proposed to be opened up. Of course, the exact nature of the products likely to be exported, and the probability of demands for European goods arising amongst the natives of different districts, are vitally important considerations in estimating the profits of any proposed line of railway; but to discuss such problems in commercial geography at length would open up too wide a field on an occasion like this.

If the importance of considering the density of the population in the different districts in such a preliminary survey is admitted, we may then simplify our inquiry by declining to discuss any lines of communication intended to open up regions where the population falls below some fixed minimum—whatever we may like to decide on. Of course, the question of the greater or less probability of a locality attracting white temporary residents is very important, but unless there is a native population ready to work on, there will be little done for many years to come. Politically, it may or may not be right to open up new districts by railways for the sake of finding outlets for our home or our Indian population; but here I am considering the best lines for the development of commerce, taking things as they are. What, then, shall be this minimum of population? The population of Bengal is 470 per square mile; of India, as a whole, about 180; and of the United States, about 21 or 22. If it is remembered that the inhabitants of the United States are, per head, vastly more trade-producing than the natives of Africa, it will be admitted that we may for the present exclude from our survey all districts in which the population does not reach a minimum of 8 per square mile; it might be right to put the minimum much higher than this. On the map now before you, the uncoloured parts show where the density of population does not come up to this minimum, and we can see at a glance how enormously this reduces the area to be considered. The light grey indicates a population of from 8 to 32 per square mile, and the darker grey a denser population than that. Of course, such a map, in the very imperfect state of our knowledge, must be very inaccurate, as I am

sure the compiler would be the first to admit. On the same map are marked the navigable parts of rivers. I should like to have shown the dense forests also, but the difficulty of giving them with any approach to correctness is at present insuperable.

Here, then, is the kind of map we want in order to consider the broad outline of the questions connected with the advisability of attempting to push lines of communication into the interior. The problem is how to connect the inland parts of Africa, which are coloured grey on this map, with the coast, by practicable lines of communications, at the least cost, with the least amount of dense forest to be traversed, and, in the case of railways, whilst avoiding as far as possible all thinly populated districts.

It is, of course, quite impossible here to discuss all the great routes into the interior, and I should like to devote the remaining time at my disposal to the consideration of this problem as far as a few of the most important districts are concerned, confining myself, as I have said, to trade with existing native races within the tropics. Taking the East Coast first, and beginning at the north, the first region sufficiently populous to attract our attention is the Valley of the Nile, and parts of the Central Sudan. Wadai, Darfur, and Kordofan are but scantily inhabited, according to our map, and this is probably the case now that the Khalifa has so devastated these districts; but, without doubt, much of this country could support a teeming population, and is capable of great commercial development. The Bahr-el-Ghazal districts are especially attractive, being fertile and better watered than the somewhat arid regions further north. These remarks remind me how difficult it is at this moment to touch on this subject without trenching on politics. Few will deny that the sooner this region is connected with the civilized world the better, and it is only as to the method of opening it up, and as to who is to undertake the work, that burning political questions will arise. The geographical problems connected with the lines of communication to the interior can be considered whilst leaving these two points quite on one side.

A glance at the map reminds us of the well-known fact that below Berber the Nile is interrupted by cataracts for several hundred miles, whilst above that town there is a navigable waterway at high Nile until the Fola rapids are reached, a distance of about 1400 miles, not to mention the 400 to 500 miles of the Blue Nile and the Bahr-el-Ghazal, which are also navigable. The importance of a railway from Suakin to Berber is thus at once evident, and there is perhaps only one other place in Africa where an equal expenditure would open up such a large tract of country to European trade. This route, however, is not free from difficulties. Suakin is hot and unhealthy. Then the railway, about 200 miles in length, passes over uninhabited or thinly inhabited districts the whole way. Though the hills over which it would pass are of no great height, the highest part of the track being under 3000 feet above the sea, it is often said that the desert to be traversed would add greatly to the difficulty of construction. According to Colonel Watson, *v.c.*, however, these difficulties have been greatly exaggerated, for the water-supply would give no great trouble. The sixth cataract, between Merouah and Kartum, would, it is said, make navigation for commercial purposes impossible when the waters are low: if this is so, it is probable that this impediment would be overcome by erecting locks, but it is impossible to estimate the cost of such works. Then again, the Nile above Kartum is much obstructed by floating grass or silt, making navigation at times almost impossible; but it was Gordon's opinion that a line of weirs on the river, even if running at great intervals, would keep the course of the stream clear; this, however, remains to be proved.

If the construction of the Nile railway should prove to be a necessity, but too

costly an undertaking, then it would be most advisable to carry on the railway beyond that obstacle. This might be done by prolonging the line along the banks of the Nile, or by adopting an entirely different route from Suakin through Kassala. I hope we shall hear something from Sir Charles Wilson as to the relative merits of these proposals during the course of our proceedings. Proposals have also been made for connecting the Nile with other ports on the Red Sea, and all of these suggestions should be carefully examined before a decision is made as to the exact route to be adopted. But in any case, considering the matter merely from a geographical standpoint, and putting politics on one side—a very large omission in the case of the Sudan—it would appear that one or other of these routes should be one of the very first to be constructed in all Africa.

Passing further south, it is obvious from the configuration of the shore, and from the distribution of the population, that the lines of communication next to be considered are those leading to the Victoria Nyanza, and on to the regions lying north and west of the lake.

Two routes for railways from the coast to the Victoria Nyanza have been proposed, one running through the British and the other through the German sphere of influence. Looking at the matter from a strictly geographical point of view, there is perhaps hardly sufficient information to enable us to judge of the relative merits of the two proposals. Both run through an unhealthy coast zone, and both traverse thinly inhabited districts until the lake is reached. The German route, as originally proposed, would be the shorter of the two; but there is some reason to think that the British line will open up more country east of the lake, which will be suitable for prolonged residence by white men. Sir John Kirk, in discussing the question of the possible colonization of tropical Africa by Europeans, said, "These uplands vary from 5000 to 7000 feet in height, the climate is cool, and, as far as known, very healthy for Europeans. The district is separated from the coast by the usual unhealthy zone, which, however, is narrower than elsewhere on the African littoral. Between the coast zone and the highlands stretches a barren belt of country, which attains a maximum width of nearly 200 miles. The rise is gradual, and throughout the whole area to be crossed the climate is drier and the malarial diseases are certainly much less frequent and less severe than in the regions further south." These very advantages, however, may have to be paid for by the greater difficulty of railway construction. Putting aside future prospects, the map shows that the populous region to the west of the lake makes either of these proposed lines well worthy of consideration, though it would perhaps be rash to predict how soon the commerce along them would pay for the interest on the capital expended. What will be the fate of the German project I do not know, but we may prophesy with some confidence that the British line, the construction of which has been commenced, will be completed sooner or later.

The two lines of communication we have discussed—the Suakin and the Victoria Nyanza routes—are intended to supply the wants of widely separated districts; but, looking to a more distant future, they must sooner or later—probably later—come into competition, one with the other, in attracting trade from the Central Sudan. Before this can occur, communication by steamboat and by railway must be opened up between the coast and the navigable Nile by both routes. This will necessitate a railway being constructed, not only to the Victoria Nyanza, but also from that lake, or round it, to the Albert Nyanza; and, as the Nile is rendered unnavigable by cataracts about Dufle, and as the navigation is difficult between Dufle and Lado, here also a railway might be necessary in order to complete the chain of steam communication with the coast. If goods were brought across the Victoria Nyanza by steamer, and taken down the Nile in the same manner from the Albert

Nyanza to Dufle, this route would necessitate bulk being broken six times before the merchandise was under way on the Nile; by the Suakin route, on the other hand, bulk would only have to be broken twice, provided the sixth cataract were navigable. Thus, if this latter difficulty does not exist, or can be overcome, and if the sudd on the Nile is not found to impede navigation very much, this Nyanza route will certainly not compete with the Suakin route for any trade on the banks of the navigable Nile until a railway is made from the coast to Lado, a distance of over 800 miles as the crow flies, and certainly over 1000 miles by rail. It must be remembered, also, that the Nyanza route passes over mountains 8700 feet above the sea; that the train will have to mount, in all, nearly 13,000 feet in the course of its journey from the coast; and that a difficult gorge has to be crossed to the eastward of the Victoria Nyanza. From these facts we may conclude that it will be a very long time before the Nyanza route will draw any trade from the Central Sudan; so long, that the idea may be neglected for the present.

The line through the British sphere of influence runs to the northern end of Victoria Nyanza, but from Mr. Vandaleur's recent expedition into these regions we learn that a shorter route, striking the eastern shore of the lake, is under consideration. To lessen the expense of construction would be a great boon, but if we look to the more ambitious schemes for the future, something may be said in favour of the original proposal as being better adapted to form part of a line of railway reaching the navigable Nile.

With regard to the comparison between the German and British routes to the Victoria Nyanza, the latest accounts seem to imply that the Germans have practically decided on a line from the coast to Ujiji, with a branch from Tabora to the Victoria Nyanza. This would be a most valuable line of communication; but it seems a pity that capital should be expended in competitive routes when there are so many other directions in which it is desirable to open up the continent. If the Germans wish to launch out on great railway projects in Africa, let them make a line from the south end of Lake Tanganyika to the northern end of Lake Nyasa, and thence on to the coast; they would thus open up a vast extent of territory, and Baron von Schele tells us that a particularly easy route can be found from Kilva to the lake. Such a line of communication, especially if eventually connected with the Victoria Nyanza to the north, would be more valuable than any other line in Africa in putting an end to the slave trade, as it would make it possible to erect a great barrier, as it were, running north and south across the roads traversed by the slave-traders.

A line through German territory connecting Lake Nyasa with the sea would, no doubt, come into competition with the route connecting the southern end of that lake with the Zambesi, and thus with the coast. The mouths of the Zambesi, though they are passable, will always present some impediment to commerce. But after entering the river navigation is not obstructed until the Murchison Rapids on the Shiré river are reached. Here there are at present 60 miles of portage to be traversed, and this transit must be facilitated by the construction of a railway, if this route is to be properly developed; Mr. Scott Elliot tells us that 120 miles of railway, from Chiromo to Matope, would be necessary for this purpose. Beyond this latter point there is a good waterway to Lake Nyasa. Thus a comparatively short line of railway would open up this lake to European commerce, and this route is likely to be developed at a much earlier stage of the commercial evolution of Africa than the one through German territory above suggested. It will be seen that these routes connect fairly populous districts with the coast, and it must also be recollected that the high plateau between Lake Nyasa and the Kafue river is one of the very few regions in tropical Africa likely to attract white men as more or less permanent residents.

Further south we come to the Zambesi river, which should, of course, be utilized as far as possible. But this line of communication to the interior has many faults. The difficulties to be met with at the mouths of the Zambesi have already been alluded to. Then the whole valley is unhealthy, and white travellers would prefer any route which would bring them on to high land more quickly. Moreover, the Kebrabasa rapids cause a serious break in the waterway, and, as the river above that point is only navigable for canoes, it is doubtful if it would ever be worth making a railway for the sole purpose of connecting these two portions of the river.

As the population of the upper Zambesi valley is considerable, and as the country further from its banks is said to be likely to be attractive to white men, there can be no doubt of the advisability of connecting it with the coast. This naturally leads us to consider the Beira route, as a possible competitor with the Zambesi. A 60-centimetre railway is now open from Fontevilla to Chimoio (190 kilometres), and it is probable that during the course of the next two years the construction of the railway will be completed from the port of Beira itself as far as the territory of the Chartered Company. This will form the first step in the construction of a much better line of communication to the upper Zambesi regions than that afforded by the river itself. It is true that the gauge is very narrow, and that the first part of the line passes through very unhealthy districts; but this line will nevertheless be a most valuable addition to the existing means of penetrating into the interior of the continent. It is needless to say that the object of this railway is to open up communications with Mashonaland, not for the purposes now suggested.

South of the Zambesi the map shows us that there are no regions in tropical Africa where the density of the native population reaches the minimum of eight per square mile. Here, however, we come to the gold-fields, where there is attractive force enough to draw white men in great numbers within the tropics, and where, no doubt, some of the most important problems connected with railway communications will have to be solved in the immediate future. But, for reasons of time and space, I have limited myself to the discussion of districts within the tropics, where trade with the existing native races is the object in view. The Beira railway does not in reality come within the limits I have imposed on myself, except as to its future development. Had time permitted, I should like to have discussed the route leading directly from the Cape to Mashonaland, its relative merits in comparison with the Beira railway, and as to where the two will come into competition one with the other. But I must pass on at once to consider the main trunk routes from the West Coast leading into the interior of Africa.

Passing over those regions on the West Coast where railways would only be commenced because of the probable settlement, temporary or permanent, of white men—passing over, that is, the whole of the German sphere of influence—we first come to more dense native populations near the coast towns of Benguela and St. Paul de Loanda. The latter locality is the more hopeful of the two, according to our map, and here we find that the Portuguese have already constructed a railway leading inland for 191 miles to close to Ambaca. The intention of connecting this railway with Delagoa Bay was originally announced, and I am not aware to what extent this vast project has now been cut down, so as to bring it within the region of practical proposals. A further length of 35 miles is, at all events, being constructed, and 87 more miles have been surveyed. The Portuguese appear to be very active at present in this district, as there are several other railways already under consideration; one from Benguela to Bihe, of which 16 miles is in operation, another from Mossamedes to Huilla Plateau, and a third from the Congo to the

Zambesi. It is difficult to foretell what will be the outcome of these schemes, but our population map is not very encouraging.

Next we come to the Congo, and here there is a grand opportunity of opening up the interior of the continent. In going up this great stream from the coast we first traverse about 150 miles of navigable waterway, and afterwards we come to some 200 miles of cataracts, through which steamers cannot pass. Round this impediment a railway is now being pushed, 188 kilometres of rails (117 miles) being already laid. Then we enter Stanley Pool, and from this point we have open before us—if Belgian estimates are to be accepted—7000 miles of navigable waterway. If this fact is correct, and if the population is accurately marked on our map, then there is no place in all Africa where 200 miles of railway may be expected to produce such marked results. The districts traversed are unhealthy, and the natives are, generally speaking, of a low type; but in spite of these drawbacks, which no doubt will delay progress considerably, we may confidently predict a grand future for this great natural route into the interior.

To the north of the Congo, the next great navigable waterway met with is the Niger. Again, granting the correctness of the population map, it can be seen at a glance that there is no area of equal size in all Africa so densely inhabited, and no district where trade with the existing native population appears to offer greater inducement to open up a commercial route into the interior. Luckily, little has to be done in this respect, for the Niger is navigable for light-draft steamers in the full season as far as Rabba, about 550 miles from the sea; here the navigation soon becomes obstructed by rocks; and at Wuru, about 70 miles further up the river, the rapids are so unnavigable that even the light native canoes have to be emptied before attempting a passage, and there are frequent upsets. From Wuru the rapids extend to Wara, after which a stretch of clear and slow-running river is met with. Above this, again, the Altona rapids extend for a distance of 15 miles, then 15 miles of navigable waterway, and then 20 miles more of rapids are encountered. Yelo, the capital of Yauri, is situated on these latter cataracts, above which the Middle Niger is navigable for a considerable length. The Binue is also navigable in the floods for many miles, the limits being at present unknown; part of the year, however, it is quite impassable except for canoes. The trade with the Western Sudan, which has been made possible by the opening up of this river, is still only in its infancy, and to get the full benefit of this waterway a line of railway ought to be carried on from Lokoja to Kano, the great commercial centre of Hausaland; Mr. Robinson's recent journeys over this country, which we hope to hear about at a later period of our proceedings, have served to confirm the impression that no great physical difficulties would be encountered. The political condition of the country may, however, make the construction of this railway quite impossible for the present; for here we are on the borderland between Mohammedanism and Paganism, where the slave trade always puts great impediments in the path of progress, but where the same circumstances make it so eminently desirable to introduce a higher condition of civilization. The only drawback to the Niger as a line of communication to the Western Sudan is the terribly unhealthy nature of the coast districts which have to be traversed. Any man, who finds a means of combating the deadly diseases here met with, will be the greatest benefactor that Africa has ever had; but of such a discovery there are but few signs at present.

It is perhaps too soon to speculate as to the best means of opening a trade route to Wadi, and the more central parts of the Western Sudan; for we may be sure that little will be done in this direction for years to come. Several competing routes are possible. From the British sphere, we may try to extend our

communications eastward from the navigable parts of the Binue. The French, on the other hand, may push northwards from Ubangi; whilst, in a later stage of commercial evolution, the best route of all may be found through German territory, by pushing a railway from the shore in a direct line towards Bagirmi and Wadai. To compare the relative merits of these trunk lines is perhaps looking too far into the future, and traversing too much unknown country, to make the discussion at all profitable.

Proceeding northwards, or rather westwards, along the coast we find ourselves skirting the belt of dense forest already described as being the great obstacle to advance in this part of Africa. It is to be hoped that this barrier will be pierced in several places before long. Naturally we turn our attention to the different spheres of British influence, and here we are glad to learn that there are several railways being constructed or being considered, with a view to opening up the interior.

At Lagos a careful survey of a railway running in the direction of Rabba has been made, and the first section is to be commenced at once. To connect the Niger with the coast in this way would require 240 miles of railway, but the immediate objectives are the towns of Abeokuta and Ibadan, which are said to contain more than a third of a million inhabitants between them. No doubt the populous coast region makes such a line most desirable; but whether it would be wise to push on at all quickly to the Niger, and thus to come into competition with the steamboat traffic on that river, is a very different question.

Surveys have also been made for a railway to connect either Kormantain or Apan on the Gold Coast with Insuaim, a town situated on a branch of the Prah. It is believed that the local traffic will be sufficiently remunerative to justify the construction of this line. But, looking to the further prolongation of this railway into the interior, it appears possible that those who selected this route were too much influenced by the desire to reach Kumasi, which is a political rather than a commercial centre. According to the views I have been advocating to-day, the main object of a railway in this quarter should be the crossing of the forest belt, and if, as there is some reason to believe, that belt is exceptionally wide and dense in this locality, the choice of Kumasi as a main point on the route will have been an unfortunate selection. A little further south, nearer the banks of the Volta, it is probable that more open land would be met with, and, moreover, that river itself, which is navigable for steam launches from Ada to Akusi, would be of use as a preliminary means of transport. It is to be hoped that the merits of a line from Accra through Odumase will be considered before it is too late.

I am now approaching the end of my brief survey of tropical Africa, for the best method of opening communication between the upper Niger and the coast is the last subject I shall touch on. With this object in view, the French have constructed a railway from Kayes, the head of steam navigation during high water, on the Senegal to Bafulabe, with the intention of ultimately continuing the line to Bamaku on the Niger. Unexpected difficulties have been met with in the construction of this railway, and, as the Senegal river between Kayes and St. Louis is only navigable for about a quarter of the year, it would hardly appear as if the selection of this route had been based on sound geographical information. No doubt the French will find some other practicable way of connecting the upper Niger with the coast, and surveys are already in progress with that object in view. It may be worth mentioning that the Gambia is navigable as far as Yabutenda, and that it affords on the whole a better waterway than the Senegal; it is possible, therefore, that a railway from Yabutenda to Bamaku might form a better means of connecting the Niger with the coast than the route the French have selected.

At Sierra Leone a railway is now being constructed in a south-easterly direction with a view of tapping the country at the back of Liberia. But here, as in the case of the Gambia route, political considerations are of paramount importance; for no doubt the best commercial route, geographically speaking, would have been a line run in a north-easterly direction to some convenient point on the navigable part of the upper Niger. If such a railway were ever constructed, it would connect the longest stretch of navigable waterway in this region with the best harbour on the coast. But the fact that it would cross the Anglo-French boundary is a complete bar to this project at present.

Proposals for connecting Algeria with the upper Niger by rail have often been discussed in the French press, the idea being to unite the somewhat divided parts of the French sphere of influence by this means. If the views here sketched forth as to the necessity of selecting more or less populous districts for the first opening up of lines of communication into the interior are at all correct, these projects would be simple madness. For many a year to come Algeria and the Niger will be connected by sea far more efficiently than by any overland route, and I feel sure that when the details of these plans are properly worked out we shall not find the French wasting their money on such purely sentimental schemes.

I must now conclude, and must give place to the other geographers who have kindly undertaken to read papers to us on many interesting subjects. All I have attempted to do is briefly to sketch out some of the main geographical problems connected with the opening of Central Africa in the immediate future. Such a review is necessarily imperfect, but its very imperfections illustrate the need of more accurate geographical information as to many of the districts in question. Many blunders may have been made by me in consequence of our inaccurate knowledge, and, from the same cause, many blunders will certainly be made in future by those who have to lay out these routes into the interior. In fact, my desire has been to prove that, notwithstanding the vast strides that geography has made in past years in Africa, there is yet an immense amount of valuable work ready for any one who will undertake it.

Possibly, in considering this subject, I have been tempted to deviate from the strictly geographical aspect of the case. Where geography begins and where it ends is a question which has been the subject of much dispute. Whether geography should be classed as a separate science or not has been much debated. No doubt it is right to classify scientific work as far as possible; but it is a fatal mistake to attach too much importance to any such classification. Geography is now going through a somewhat critical period in its development, in consequence of the solution of nearly all the great geographical problems that used to stir the imagination of nations; and for this reason such discussions are now specially to the fore. My own humble advice to geographers would be to spend less time in considering what geography is and what it is not; to attack every useful and interesting problem that presents itself for solution; to take every help we can get from every quarter in arriving at our conclusions; and to let the name that our work goes by take care of itself.

FROM TEHERAN TOWARDS THE CASPIAN.

By Lieut.-Colonel HENRY L. WELLS, R.E.

TEHERAN, the capital of Persia, occupies a depression on the lowest slopes of the Elburz range of mountains which, running east and west, separates the entirely dry province of Irak from Gilan and Mazanderan, provinces situated on the

southern shores of the Caspian, and consequently deriving abundance of moisture from the fogs and rain produced by the sun's action on that inland sea. In the latter region the forests recall those of the Indian Terai, and, like them, are infested by tigers and intersected by ricefields. The fogs that roll almost perpetually southwards from the Caspian would, if unchecked by the Elburz, impart their refreshing influence to the arid plains of Persia; but they are vigorously met by the hot, dry air of the central desert, and the mountain-tops of the intervening watershed become, as it were, a battle-field for the ceaseless contests of the two great genii of damp and drought. In summer the climate of the upper mountain slopes is most enjoyable. The sides facing north have a fauna and flora like those of Central and Northern Europe; facing south, they remind one rather of Italy and Spain. All who can, quit the city of Teheran during June, July, and August, to take up their abode in the picturesque villages of the southern slopes of the Elburz range. The most frequented summer resorts are situated at a distance of 7 or 8 miles from the city, and at an altitude varying from 1000 to 1600 feet above it. There are in all some 400 Europeans in Teheran, including members of the various legations, *employés* of the Indo-European Telegraph Department, the English and Russian banks, and the tramway, sugar and glass manufactories, as also hotel-keepers and owners of shops. The head-quarters of the English for the summer months is the village of Gulahek, which was presented to them by Fath 'Ali Shah at the commencement of the present century. It is situated at a distance of 6½ miles from the city and 920 feet above it—that is, at an altitude of 4800 feet above the sea.

A German capitalist has lately obtained a concession for a light electric tramway or railway to connect the various summer resorts with the city, and the enterprise promises to be lucrative. There is already a railway, 4½ or 5 miles in length, from the south-eastern gate of Teheran to a favourite shrine; and a road fit for wheeled vehicles is in course of construction to the Caspian, so that ere long the capital will be reached from the seashore with comparatively little difficulty.

On June 18, 1895, at 7 a.m., three of us left Gulahek for Mazanderan. The lofty Tupal mountain—a branch of the Elburz—which lies north of Teheran, is so covered with snow in the early summer that the track across its summit, the most direct route to the north, cannot be used before August. Therefore we had to skirt the mountain range in an easterly direction along its base till a suitable pass was reached. Such we found in the Jager Rud, or river, which, rising near the Elburz watershed, flows south until lost in the great desert. The *détour* was picturesque. On our left were rocky heights still crested with snow; in the far distance, behind many intervening ranges, peeped the cone of Demavend, the crater-lip of which has an altitude of 19,400 feet above the sea; in the mid-distance, the morning sun threw lovely tints upon the barren hills; in the foreground, the ripening crops of barley, with patches of luxuriant lucerne and sweet-scented beans, showed the extent of the fertilizing streams. Blue jays and brilliant bee-eaters sat in the trees along the roadside, whilst quails and buntings made a merry noise in the adjoining crops.

About 2 miles east of Gulahek is Sultanetabad, one of the Shah's summer resorts. Another one, Niaveran, is situated a mile further up the slope. These palaces are surrounded by groves of mulberry, poplars, and willows; here, too, thickets of cherry and apricot afford good harbour for woodcock in winter. We followed an avenue of prim *navend* trees, a kind of witch elm, common in Persia, in shape, for all the world, like trees from a toy-box, but very bright and pleasing in colour. Their matted branches give absolute protection to small birds, and must account for the numbers which escape from the hawks infesting the country.

Save for the existence of a few isolated gardens east of Sultanetabad, the limits of cultivation were now attained. On the border waste lands flourish the flowered chickory, and pale yellow and pale pink hollyhocks, through whose wan petals the sunshine has a pretty effect. There is also a picturesque thistle, with flowers varying in hue from ultramarine ash to French grey, which take the form of perfect spheres. In contrast with ripe corn these produce a wonderful effect. Another greyish-blue plant, very common on the edges of the cornfields, has a blue foliage, and the younger sprouts of spiky leaves are of a bright metallic colour. Once beyond the limit of water-supply, all is barren except in spring-time. The remainder of our two hours' ride over the spur which forms the watershed between the Teheran drainage-area and valley of the Jager had, consequently, but little interest.

We commenced ascending the right bank of the river through a deep gorge. The way led over a very rough though well-cared-for mule-track. After four hours in the saddle we reached the picturesque village of Uchan, situated at the junction of two branches of the river, at an altitude of 5800 feet. The valley opens out to a quarter of a mile in width at this place; and the stream, beside which our camp was pitched, has a stony and rocky bed, over which the waters roll in a deafening torrent. Behind us was a narrow strip of cultivation, bordered by poplars, walnuts, and willows, while above were seen the mountains, rising to some 11,000 feet, along the base of which we had travelled from Lashkerak. The air at Uchan was perceptibly cooler than that at Gulahek; between the two places there is a short out by a steep and difficult pass known as the "Talhouse." On June 19 we started, on mules with a muleteer guide, up the left branch of the Jager river, for general purposes of exploration, as well as to visit a coal-mine belonging to the Teheran gas company. The track, well preserved hitherto, practically disappeared beyond Uchan, but reappeared after two miles at the village of Pachemp. By a bridge in course of construction and other signs, we became aware that the Shah was expected to pass shortly in this direction, *en route* to Lar and Kujur, favourite camping-grounds of his Majesty. The scene was very beautiful. In this upper part of the river's course, the banks lend themselves to cultivation better than below Uchan, and the peasants, like hill-men in all countries, have taken advantage of every available square inch of ground. The crops were all fresh-looking; the wheat was hardly yet in ear; the lucerne, in flower, stood quite 2½ feet high, and men clad in picturesque rags were cutting it. In the patched garments of these peasants was displayed every shade of blue, from indigo to ultramarine ash, the shades being somehow all harmonized by wear and tear. Occasionally a man might be seen wearing a tunic of old crimson plush, which at threadbare points had a plum-coloured sheen.

At the borders of the tiny fields and beside the roaring torrents were clumps of luxuriant stuff, with handsome leaves and large white flowers of the umbellifera class, the size of a saucer. This plant emits a noisome odour when touched. There were plenty of pretty flowers, and quantities of barberry, briars, and dog-roses in full bloom. Above the cultivation the valley was bounded by frowning cliffs of conglomerate and ironstone, in the crevasses of which were patches of frozen snow, whence rushing streams issued across our path.

At Saigon, a small village, we left the king's highway, a track 7 feet broad, but we could trace it for many miles, till it was lost behind a spur surmounted by a white dome, known as the shrine of Aborek. The track we now had to follow was only just passable for laden mules. However, after moving for two miles up the side valley, we arrived at the large village of Lalan. Making for certain black patches which marked the entrance to the coal workings, visible in the distance,

and almost at the summit of a range of mountains fronting us, we managed, after a hard and hot climb, to reach the door of the manager's hut, a grimy one-roomed abode, having on one side of its walls prints of a religious character, and on another guns, rifles, and game-bags. Zakhary, the owner, we found a remarkable man in his way. He is a Chaldean Roman Catholic from the neighbourhood of Urumia (or Urmi), and thus a subject of the Shah, and he spoke in raptures of his native country. Grizzled hair, a calm handsome face, and beautiful teeth made up a countenance not soon forgotten. Above all, his cheerfulness and contentment with his lot most favourably impressed us. He has one fellow-Catholic with him, whose children welcomed us in Chaldean. Zakhary himself, whose own belongings were shortly to join him, spoke excellent French. He has twenty Turks, from the neighbourhood of Tabriz, employed on the works, the Persians refusing to labour underground. The miners are paid 5 *krans* for 650 lbs. (a Persian measure known as *kharwar*),* and can earn up to that sum (or about two shillings) a day. Zakhary has to procure rice, dried fruit, with bread stuff for their consumption, and sells them these articles at cost price, plus carriage. Three mules, to fetch provisions, are provided by the gas company, and these carry broken tools to the city for repairs, making up their loads with coal.

There is a forge at the mine, and hutting for the miners; also an iron-roofed store to protect the coal "got" in the winter from the action of snow and rain. From Zakhary's account, the climate at the mines, which are situated on the southern slope of a range running east and west, is most salubrious. It is only in March and April that rain and mists are annoying. In summer it is not hot, and in winter the snow does not lie for any length of time. Our informant only quits his home twice a year, to attend the festivals of Christmas and Easter respectively in Teheran.

South of the manager's hut is seen a rocky ridge, said to harbour leopards. On the mountains behind the mines are pastures for moufflon, and wild rhubarb abounds. To the east there is a glorious view of Demavend towering into the sky.

The quality of the coal did not impress us much, for it "comes out" as dust; but for the production of gas, in which it is said to be very rich, this does not greatly matter. It is found in sandstone, and it seems likely that it only exists in pockets, *i.e.* is the remains of lacustrine deposits. The seams are vertical, *i.e.* have a "dip" of 90°. They vary from 1 foot to 5 feet in thickness. The "strike" seems to be east and west. One working into which we went was pronounced unsafe, and nothing was going on there, pending the arrival of timbering from Mazanderan. This gallery ran horizontally in from the face of the hill, and wound about, following the seam or pocket. The whole of the roof was coal, and in one place a shaft had been sunk to get at the coal below; this was now full of water.

Zakhary had ingeniously arranged a syphon for the emptying of this shaft. One of our servants nearly fell into it, having followed us along the working without a light; in fact, but for our timely return, to find him on the brink of the shaft, he must have been lost. Two men lost their lives owing to the falling of the roof at the mouth of a working last year—otherwise there have been no accidents. There is said to be no fire-damp, but as no working has yet been pushed more than a hundred yards into the hill, it is possible it may yet be met with.

Zakhary went to Europe to learn printing, and then took to brewing—not a

* Wollaston gives this at 725 lbs; perhaps 625 to 675 lbs., of which 650 is the mean, is more strictly correct.

useful education for a miner. His statement that the whole mountain near his mine is full of coal is not to be relied on. We bade him adieu after promising to revisit him in the shooting season, and started homewards, making the 14 miles to be covered one long race. In camp we were joined by two friends, who had delayed their departure from Gulahek a day later than ourselves, and also by a personage who announced that he was the Shikarchi Bashi to the Shah. The last, a spare wiry man, with small bright eyes and somewhat sly expression, withal an incessant talker, introduced himself by saying that he had been sent to see that we got good sport, and received due honour and hospitality at the hands of the population. It was only by feigning inability to comprehend his egotistical chatter that we contrived to rid ourselves of this intrusive *attaché*; so that, after the first day's proceedings, he changed his tactics, and favoured us but little with his company, except at the hour of starting in the morning. At such time he would appear accompanied by his henchman, both decently mounted. His occupation, apparently self-imposed, was to go ahead and turn out the greybeards of every village through which we passed, all of whom appeared, bringing a lamb as an offering. Had we accepted these lambs, we should have been possessed of a large flock before reaching Mazenderan. What the Shikarchi Bashi made out of the transaction, it was difficult to gather. He probably told each headman that he had persuaded the *sahibs* not to take the lambs, and therefore merited a small sum for his good offices. As regards any service to ourselves, he never came near our camp when we reached the ibex-ground at Sheristanek; and the same thing happened on our entering the bear country in Mazenderan.

From Uchan our road led up the Egil river, a tributary of the Jager, and followed the actual bed of the stream for some distance. The valley is rugged and less picturesque than that of the main stream. We passed Egil village, which has an evil reputation, as it is said to harbour the much-dreaded "stranger-biter" (*gharib gez*), or poisonous bug.

We breakfasted in a lovely spot beyond a village named Ahah (altitude 6700 feet), beneath the shade of walnuts, with a roaring torrent in front. From Ahah the watershed which divides the sources of the Jagerud and Sheristanek rivers has to be crossed by those who wish to get into the valley of the latter. This takes two and a half hours of mountain roads. The summit of the watershed has an altitude of 8700 feet. Except for the first 600 feet, the road presented no serious difficulty, and our muleteer, who lost an animal by falling over the mountain-side, was himself to blame for the mishap.

From the watershed there is a wonderful view of bare mountains; not a tree is to be seen anywhere. The contorted and variegated strata of the mountains to the north-east, in which direction we were going, are suggestive of an enormous slate quarry, about the size of an English county, with altitudes varying from 4000 to 10,000 feet. To the south, and close by, lie the northern slopes of the Touchal range, the southern side of which forms so conspicuous a feature in the Teheran landscape. The track, rising to nearly 12,000 feet, by which the distance from Gulahek to Sheristanek may be traversed in eight hours in the late summer, was visible, with large patches of snow lying across it.

From the watershed down to the Sheristanek valley was a comparatively dull march, though relieved by an occasional peep at the terraced fields and the sight of the Shah's red-roofed *chateaux*, situated at the head of the valley. The river appeared a perfectly white roaring torrent. The *chateaux* looked prim enough, but badly placed in what must be a stifling hole.

On reaching the valley, we found the crops all green and luxuriant, the foliage of the poplars and walnuts in perfection, and the roaring river even more

picturesque than when seen from a distance. Four miles down the valley we reached our camp at the extremity of the cultivation, altitude 6300 feet. Here the torrent enters a wild rocky gorge, foaming and boiling with a deafening noise, and yet in the swirls behind the stones trout are harboured, as we proved when whipping these eddies with a fly. How trout come to be in this river, or why they should exist in this and not in the Jager, or any other river which has a similar course, viz. from the Elburz range into the great central desert, is an unexplained mystery. On the 21st we halted, one of our party going after ibex, the others fishing. Another animal of our caravan met its death here by falling down a precipice when turned out to graze. A tall coarse sword-grass, poisonous to horses, mules, and asses, grows on the watershed between the Jager and Sheristanek rivers. The animals, unconscious of its dangerous properties, eat of it with deadly effect, unless happily prevented from doing so.

On the 22nd our road lay for half a mile down the Sheristanek river, to where it joins the Laura, a stream three times the size of, and, if possible, more rapid and turbulent than, the first-named. Its ochre-coloured waters dashed onwards, swollen with melted snow. The Doab, or junction of the two streams, is at a wild romantic gorge, in which they are lost to sight amid precipitous crags of red rocks. When united, they bear the name of the Kerij river. There is no road out of this Kerij, nor indeed out of the Sheristanek valley, more practicable than that by which we entered, *viâ* Uchan. We now followed the left bank of the Laura, passing northwards through gap and gorge, in red sandstone and conglomerate, standing rugged and bold with vertical "dip." Further up-stream, where the river-banks are edged by a few trees, the views are very picturesque. Where the strata are less hard, they have weathered into slopes of fine *detritus*; and down them the peasants come at a great rate, almost as if they were snow-slides. Eight miles up the Laura we encamped at *Gachisar*, literally, "head or source of gypsum," where the geological character of the country changes, and the mountains have rounded contours, with some grass, but still not the vestige of a tree. Here, at an altitude of 6700 feet, we passed a very cold night. On the 23rd, when we started across the Kendevan pass, ominous white clouds were overhanging the mountains to the north.

At *Gachisar*, the main stream of the Laura is crossed by a one-arch bridge, and its right bank is followed for about three-quarters of a mile. Then its valley is abandoned, for it turns sharp east. The gorge, down which a small tributary flows, is followed for another $1\frac{1}{2}$ mile. This gorge had still snow lying in it where the road takes huge zigzags up the rounded slope of the mountain to the north. In an hour and three-quarters from *Gachisar*, the summit of the watershed between the Caspian and the central plateau of Persia is reached. At an altitude of 10,000 feet, the sandy loam on the south slope of the watershed is covered with flowers; many of the vetch tribe and wild fennel grow here in large clumps. The wind at the top of the pass was bitterly cold; the driving mist was freezing on the posts placed at intervals to keep the traveller from losing the track. There is a small refuge near the summit built in brick; in fact, the whole road shows that an amount of care is bestowed on it such as is observable on no other track in Persia. The zigzags for the descent on the Caspian side are required for a shorter distance than for the ascent from the south. In three-quarters of an hour from the summit we were following the course of one of the branches of the Touchal river, in a country clearly under the influence of the refreshing rain-clouds from the Caspian. Grass, yellow irises, ferns, and succulent water-plants fringed the streams. Further up the mountain-sides, clumps of magnificent columbines, of bluish-purple with white centres, and scarlet poppies, with blooms the size of breakfast-cups and

buds the size of walnuts, formed lovely masses of colour. Lavender, and many varieties of a sort of white campion, of the most delicate form, with the flowers arranged with curious regularity, were to be recognized amongst many other beautiful plants which it would require a botanist to classify and describe.

A wetting mist hid all distant features. We descended rapidly, and found the slopes further down clothed with scrub of oak, hornbeam, and sycamore, interspersed with wild pear and apple, buckthorn, and brambles. Here and there more open patches showed hawthorns and other flowering shrubs. The ground between them was literally carpeted with flowers. The presence of the tall yellow spikes of a flowering plant, similar in character to those observed in the hedgerows and brakes in the west of England, prepared us to find cowslips, periwinkles, crowsfoot, wild strawberries, and a crowd of other flowers that fringe the woods at home, besides quantities that were new to us. Wild roses and sweetbriars with blooms of every hue, from darkest pink to white, scented the air. The impression that we were following the drive to some domain on the coast of Devon constantly recurred. We saw also a beautiful shrub of handsomer growth, but with a flower resembling in shape that of the laburnum, only a richer chrome in tint. Another was quite beautiful, like honeysuckle both in leaf and flower, only growing as a rounded bush of graceful form. There were quantities of everlasting pea with dark crimson flowers, and here and there the giant poppy, already described, blazed in deep scarlet grandeur. The roar of a torrent replaced that of waves. We could fancy ourselves at Mount Edgcombe and that, when the mist lifted, Plymouth breakwater or the "Mewstone" would appear in the distance. The mist did eventually lift, to disclose the Chel-haus river boiling below, with precipitous cliffs of ruddy rock clothed in forest wherever trees could hold. These formed the foreground to a magnificent view of gorge, rock, and wood, leading the eye to distant spurs, overtopped in the far distance by a snow-capped range of great altitude and rugged outline. The moisture in the atmosphere gave the soft cobalt tint to the distant mountains so grateful to eyes long used to the glare and the crisp outlines of dry inland Persia. Our camp was pitched on the right bank, about 300 feet above the river, so we were spared the deafening din of its surging torrent, and able to hear the familiar notes of a blackbird which rang out in the stillness of the evening. About a mile south of our camp was the village of Valiabad. The younger brother of the Nasru's-Saltaneh, who came to visit us, thoughtfully brought with him his two *shikaris*, as well as presents of rice and sheep. Talking on the prospects of sport, we were told of bear and stag in the neighbouring forests, and of ibex and moufflon on the hilltops; moreover, that salmon was to be found one day's march further down-stream. The *shikaris*, father and son, were accompanied by a *mirza*, to represent the governor himself, and see that the villages sold us good provisions. These men were of a distinctly Mazanderani type, somewhat darker in complexion than the ordinary Persians. Their jet-black hair was curled in ringlets; moreover, they had brighter eyes and expressions, and were of handsomer face, than the inhabitants of the plateau. They informed us that a certain part of the country was the Shah's preserve, the remainder that of their own immediate master; but that we, having the royal permission to shoot, were privileged to avail ourselves of the whole. We tried for trout that evening, but, after reaching the river with great difficulty, we found it unfishable. On the 24th, owing to the report of three of our party who made a reconnaissance, we decided that the road towards the Caspian was too steep and dangerous for horses, and proceeded to negotiate it on our baggage mules.

Looked at from our camp, the road was found to rise gently as it wound northwards along the face of steep slopes and overhanging precipices. From it no fence

or wall prevents your seeing the abyss, some 1000 or 1500 feet in depth. We looked to our surcingle. Perched on the top of a pack-saddle as high as if riding a 16-hand horse, but with no command over your quadruped, you soon come to the conclusion that such a position is far more dangerous than it would be if one were riding one's own horse, even if he were somewhat fresh, for, at all events, he would not insist on always keeping along the outer edge of the track, as pack-mules obstinately do. When we had once started, the road proved to be less risky than it looked, as it had a width of 7 or 8 feet, and was in good repair. The view from it into the abyss beneath is superb. Numerous cascades, hundreds of feet in height, fall over the bare rock faces of the lower precipices. Issuing from glades hundreds of feet below the road, these cascades form a picture of great magnificence. From where they commence the mountains are more or less clothed in forest to their summits. Nothing can be seen or heard of the torrent that is eating its way into the strata far, far below.

Forty minutes' trotting on our mules brought us to a point whence the road, rounding a spur, dives zigzagging down the crumpled side of the gorge in the Hazar champ, or 1000 twists. From hence is obtained the loveliest of the many lovely views of the Chel-haus chasun. Thence it can be seen for some 20 or 25 miles of its length, viz. from the snow-clad watershed which marks the source of the river to the south, to beyond the Takht-i-Shah (which is hereafter to be described) on the north. Nothing in Kashmir, the Himalayas, or Switzerland resembles it. Maybe it may find a parallel in the rifts in California. Here, close to the road, a rough kind of pagoda has been erected to shelter the Shah when he comes this way, and entice him to stop and admire the loveliest scene in his dominions. Was this building the outcome of his Majesty's own wish, or the result of an inspiration on the part of the Austrian engineer who constructed the road some twenty-six years ago? The zigzags below the pagoda are so steep as to make riding impossible, and the excuse to dismount may be appropriately made, notwithstanding that a stout fence of stonework pillars, with wooden beams, now precludes all danger of falling into space. Towering isolated rocks, which here overhang the track, would each, in a more frequented country, have its distinctive name, and be recognized as the "Eagle's nest," the "Cathedral rocks," or the "Cheddar cliff," respectively. About half a mile below the pagoda a boring or tunnel, 15 feet in length, has been made in the live rock. Gasteiger Khan, the Austrian who built the road, apparently made the most of this, to the Persian mind, 'extraordinary feat in engineering. On the south side of the tunnel are two inscriptions; and a bas-relief in alabaster has been let into the eastern side. This slab represents his Majesty, Nasiru'd-din Shah, shooting from horseback at a leopard or lion, whilst hounds and hawks pursue other game both in the foreground and on the horizon. In the rear of his Majesty is seen an escort drawn up with military precision. On the north side and over the centre of the arch of the tunnel, Gasteiger has immortalized himself in a Latin inscription, setting forth his distinctions and titles. The strings of mules that bring charcoal, dried fish, and the main rice supply from Mazanderan and the shores of the Caspian to Teheran pass this way.

We soon got into less rocky ground, where the slopes are covered with forest of sycamore, oak, and hornbeam, with underwood of medlar and crab-apple. Butterflies flit about; a lovely large one with black wings is very remarkable. From far below is heard the chop, chop, chop, of the charcoal-burner, while a thin wreath of smoke marks the spot where his devastation is going on. In two places small rills of water cross the track, and here and there rude limekilns show where the stone had been burnt to make mortar for the pillars of the protecting parapet.

One hour and twenty minutes from the pagoda, and we are at the end of the next great spur, and 400 feet below the former. Here the zigzags begin again with a vengeance, and we decide to stop for breakfast. Gasteiger Khan has chosen this point as another suitable halting-place for royalty, and an elevated platform with a rude stone seat gives an excellent place to spread our carpet. The view from this platform (named the "Takht-i-Shah," or King's throne) is in its way as fine as that from the "pagoda." Looking up-stream, you seem to be absolutely in the centre of the valley or causeway. One thousand feet below, still invisible in its tortuous chasm, runs the course of the river. Picturesque precipices, fringed with forest, scored with cascades, and rich with verdure wherever grass can grow, lead the eye up to gentler slopes and park-like clumps accidentally spared by the charcoal-burner, whose fire is ever at work, but is unable to more than temporarily unclothe these verdant mountains. Such fairy glades and cool grotts did we look into across the chasm! What a place for *shikar*! But what a chance of breaking your neck and of losing your quarry if you killed it! Whilst we were thus soliloquizing, the sound of three shots rang out from across the chasm, and the sense of distance and the vastness of the scene was brought home to us by the fact that our three pairs of eyes could not see the smoke of the shots, much less the game or the hunter. A passing peasant informed us that the sportsman was one Hidáyat by name, and that he was after ibex, of which he had killed two on the previous day. How this man had got news from such a distance, for there was no way nearer than round by Valiabad, was a puzzle to us. He looked too much a man *ingenui vultus* to have invented his facts for our benefit; yet, in spite of his manner and appearance, we very much doubted them. Looking down-stream, the rift is observed through which the Ogham river comes to meet the Chel-hauz, and the latter shows itself, a foaming white streak, for a few short twists of its madding course. There is no sign of a definite opening through which the river can escape to the sea; ridge interlocks ridge, and snow-capped mountains rise into the distant sky, apparently leaving no means of exit. After breakfast, our baskets were filled with hart's-tongue, spleenwort, *Adiantum nigrum*, and polypodium ferns. Many varieties of seedum were seen in bloom, one species being almost as large as a house-leek. Roman laurel and grass-fern were plentiful.

The morning of the 25th broke cloudless and bright. Two of our party were preparing to make an exploration seaward, to trace the egress of the waters to which our attention had been drawn, when the two shikaris of the Nasru's-Saltaneh arrived in camp with the news that they had marked two bears up-stream in the Shah's preserves, and that they were sleeping amid brushwood and tall grass in one of the mountain valleys, only a few miles from our recently traversed road. The information seemed so authentic, and the men who brought it gave such straightforward replies to our cross-questions, that all other arrangements were put aside in favour of a proposed bear-hunt. Accordingly, we filed out of camp, and took the road to the Keravend pass, revisiting the hill which had attracted us by its luxuriant flowers, but on the summit of which the main object was now a bevy of tawny-coloured vultures awaiting an opportune moment to assail the carcase of a horse. We were soon joined by the *Shikarchi-Bashi* and four beaters, or keepers of the royal preserves; but they professed ignorance as to the presence of the bears, and the first-named functionary took upon himself to deny the truth of the report about them. His action did not, however, shake our confidence in the veracity of the Nasru's-Saltaneh's men.

Having come out of the scrub on to the grass of the upper mountain slopes, we were sitting at luncheon by a stream, when our informants were seen to conduct the *Shikarchi Bashi* over a neighbouring crest; and ere we had completed

our repast by partaking of the conventional cup of coffee, one of them returned to announce that the bears were still in their old place. Our first impulse then was to toss for places and shots. We were four in number. Two, who had previously shot big game in India as "strokes," merely tossed who should accompany them. It was settled that "stroke" No. 1, with his "bow," should remain beside the ravine at the head of which the bears lay, and that "stroke" No. 2 and "bow" No. 2 should accompany the beaters, and, making a *détour*, head the game down the ravine. This was all very well to talk about, but when it came to going up the side of the mountain at anything like the pace the beaters set, "bow" and "stroke" Nos. 2 found it a most difficult proceeding. The young *shikari* Ali was leading at a prodigious pace, and had to be spoken to very roughly, even threatened with punishment, ere he would slacken it. At length it was evident that, if the ravine head was reached, "bow" and "stroke" Nos. 2 would be so blown that it would be hopeless for them to try and shoot; so they took up a position behind rocks commanding the brushwood clump where the bears were said to be lying, as well as the opposite slopes—in fact, similar to that occupied by "stroke" and "bow" Nos. 1, only some 250 yards higher up. Between the two positions, on the opposite slope, were other clumps of brushwood, and the bears were as likely as not to be in them. The energetic beaters were soon seen throwing stones into the brushwood, and for some moments without result. Then suddenly out dashed a lovely fluffy brown bear, and made for the waterway down the ravine. She was followed by a youngster of a year's growth, about the size of a large sheep-dog. In colour the young one was dark brown. The beaters caught sight of the youngster, though they had not seen the old one, and set up frantic yells. Immediately after breaking cover they were lost to view, but the old one soon reappeared, making straight for No. 2. "Stroke" No. 2, having won the toss for the first shot, waited till she was within 70 yards, where she paused and turned half round, apparently to look for the youngster. The beast was then hit hard in the shoulder, and eventually fell plugged with four more bullets than were necessary for her destruction. The youngster now appeared running across the stony side of the mountain to the left front. It was a difficult shot, as he was going a good pace and rather uphill. The result was he was missed clean, and by the time the guns were reloaded there was nothing to be seen but the ears of the beast as it crossed the ridge within easy range. The youngster pegged away gaily over the mountain, and was lost to view. The behaviour of the natives around us, when the dead bear was hauled out of the thicket, supplied a good illustration of the excitability of the Persian character. One youth completely lost his head, and it was only when our own servants arrived that we could get the carcass slung on a stick and carried to a mule for transport to camp.

The Persians had no idea of the meat or skin of a bear being of the slightest value, and it seems that when the Shah shoots one he throws the body, skin and all, into the nearest river, after having shown it to his wives and his other women. There was great difficulty in getting the beast skinned, but liberal *bakhshish* eventually prevailed. The *Shikarchi Bashi*, meanwhile, was taking the credit of the whole affair, and pointing out how well he had arranged the beat, and how that all presents that were to be made should be made through him. This meant that no one else would get a *sou*. Eventually by plain speaking he was subdued, and retired, not to appear again for the next three days, *i.e.* till there was a further chance of extorting lambs from villagers.

On June 26 two of our party started for our projected trip to Lower Mazanderan, past the pagoda, and down the Takht-i-Shah, a road already described beyond

the latter point. The face of the mountain is again rock, and the road twists round the contortions of the strata in a very ingenious way. About 3 miles from Takht-i-Shah, Gasteiger Khan seems to have run out of patience, or, more likely, of funds, for he makes a dash for the bottom of the gorge by zigzags such as no laden beast but a mule could get over. Just at the end of these a beautifully clear tributary joins the Chel-hauz on its right bank, and here we watered our tired animals. The river itself was disappointing; rushing and plunging as madly as ever, its turbid waters gave no prospect of fly-fishing, and it seemed doubtful whether even salmon could be hoped for. We had reached a new flora of fig-trees, alders, and elms, with thorny shrubs for undergrowth. Beside the river, patches of corn, ripe for the sickle, were being cut by men and women. The latter made no pretence of covering their faces, and their crimson or scarlet bodices and petticoats, though generally ragged, were extremely picturesque. As a rule handsome, they had, like most women condemned to hard work out-of-doors, a sad expression. Here the small fields were more or less fenced; and the mountains, less precipitous than at Hazar Champ, were clothed with forest to their summits, except where patches of cultivation occupied moderately level spurs. Now and again the encampments of the reapers, hard by the boiling river, showed where they ate, drank, and slept in the open, a tree felled by fire forming a bridge of ingress and egress with some otherwise isolated field. At the foot of the Hazar Champ, the Ogham Rud falls into the Chel-hauz. Up the rocky valley of the former river there is a road to the mountainous district of Hazar Be-ar.

Three miles below the aforesaid confluence of the Ogham Rud, the Maka Rud, with its gentle current, falls in on the left bank of the main river. The Maka Rud valley is most picturesque, more cultivated and less rugged than any we have yet seen. Half a mile below the bridge that crosses this tributary, a green sward hard by the river, with a lovely view in front and picturesque rocks behind, lured us to encamp. Here two alder trees, the one from the right bank having fallen over, as it were, into the arms of the one on our side of the river, formed the piers to a rustic bridge, leading to a small farmer's homestead or huts.

Whilst our tents were being pitched, we crossed over to eat our lunch under the shade of these trees, and were soon joined by a ragged but picturesque individual, who gave us a *salâm* of welcome, and showed great interest in our proceedings. He, like all Mazanderanis, was of more civil and gentlemanly instincts than the ordinary Persian. Being one of the landed proprietors of the district, we dubbed him the Laird of Rudbarek, from the name of his domain. He was one, he said, of three brothers who had inherited the freehold of the mountains on either side, and of the cultivated ground on both sides of the river below the confluence of the Maka Rud, and that they paid taxes to the Nasru's-Saltaneh. The Laird was now threshing and winnowing his crop of barley, and anxious to sell us forage, milk, and butter-milk. If only he had been better clad and cleaner, our friend would have been quite an enviable personage. Accompanying us as he did during the remainder of that day and the greater part of the following, we got to know him very well. Indeed, from the first he seemed to have no reserve with us, and we treated him accordingly; moreover, as he was a keen sportsman, we had many subjects of conversation in common. He had shot bears close by his domain, and followed the Mazanderan stags every winter, when they were driven down from the upper ranges. Looking at the lovely glades high up on the mountain-side, he pointed out spots where he had killed extra fine animals, with antlers of twelve points, and more. Strange to say, he knew nothing about preserving skins, and the fact that they could be utilized as a warm covering for himself and children seemed to him quite a revelation. Stags' horns, he said, were in demand, and

hucksters came round regularly to buy them, as well as salted salmon. He was much interested in our rods, flies, minnows, and tackle, and quite expected to see us haul out lots of fish, though August, he admitted, was the time when the rivers get clear and the pools yield their supplies, whether to the spear at night or to line by day. No hooks on lines are used on these occasions. The Laird said that he got on an average sixty salmon a season, varying from fourteen to twenty-five pounds each. We started whipping the milky waters of the river as soon as the sun got behind the mountains, our native friend showing us the pools where the salmon lay, and the spots where the brushwood and trees along the bank would allow of a fly being thrown. These two requirements for success did not often coincide, and the Laird looked quite crestfallen when told that some deep swirl was unapproachable with a fly. At length, as a fly would not entice, a minnow was put on, and the ground gone over again. Just as it was beginning to get dusk, at a lovely spot where the river, passing a huge rock, formed a magnificent run, a fish was hooked. The Laird, though delighted that this proof of his veracity had at length been vouchsafed, was not a bit over-excited, managed the landing-net like an old hand, and eventually brought a salmon trout to bank, weight about fifteen ounces. The fish was free when landed; probably it was accidentally hooked, and had not seen the minnow in the turbid water. In any case, it was the first salmon trout that had been killed with a rod in a Persian river flowing into the Caspian.

The next day, the 27th, we made an expedition northwards, down the river for a two hours' sharp ride. The scenery was magnificent. The river, ever headlong, had a more open valley, allowing of groves of stately alders here and there. The cultivation climbed higher up the slopes. Villagers in all directions were gathering the harvest, and stacking the corn on platforms raised to such a height that the cattle could find shelter underneath, whilst the straw could not be stolen. Wild grape-vine, figs, and pomegranates were in all the nooks, from which rills of water in many places crossed the road. Thick hedges of thorny stuff guarded the way on either side, and gave an impression of there being some sense of care and industry in the tillers of the soil, though this was dissipated by the sight of clumps of thorns dotted about amidst the crops. This charming foreground was even surpassed by the more distant views. We could now see far above the mountains that shut in the river. On its right bank forests clothed them as far up as the snow and cold of winter permitted. Above the forests grassy rounded slopes, fit pastures for deer, ibex, and moufflon, carried the eye to summits where snow still clung even in the mouth of June.

On the left bank the country was less steep, so clusters of mud huts could be seen here and there. Veritable snowy ranges formed the background far away to the south.

Further north, as the valley opened out the vegetation became more sparse, as though we had reached a belt where the rain-clouds seldom touched, but passed over to break on the higher ground. Further still away to the north, thick forest was again visible, clothing all the mountains, which rose to a considerable altitude. We lunched in a grove of ancient alders on an island in the river near to the mosque of Bandi, with its roof of picturesque shingle, showing we were near a forest land, and one where the ordinary mud roof of Persia was unable to cope with the rainfall.

Reluctantly we returned northwards; time would not permit of our pushing down to the sea. That evening a try was again made for fish, but without success. The 28th found us climbing up the Hezar Champ, and a terrible climb it proved. The black butterflies were gay as ever, and a Bohemian wax-wing visited us at lunch, which we ate in the shade of Gasteiger Khan's tunnel.

That night we pitched our tents near our former camping-ground of Valiabed, and the next day pushed over the Kendevan pass and down the Laura valley to-

where the Sheristanek falls into it at Doab. The next morning the *Shikarchi Bashi* appeared, but not till one of our party had started over the mountains by the short cut for home, hoping to get a shot at ibex on the way. The rest of us were honoured with a full parade of lambs at every village through which we passed, and on July 1 we reached our homes at Gulahek.*

THE MONTHLY RECORD.

THE SOCIETY.

The New Session.—The first meeting of the New Session will take place on Tuesday, November 10. It was hoped that Dr. Nansen might have been able to come to England and open the session with an account of his remarkable expedition. Unfortunately, he will not be able to leave Norway till towards the end of January, when it is expected that he will address the Society. The first paper of the session will be an account of the expedition under Mr. Jackson, which is pushing its way and carrying out scientific observations in Franz Josef Land; the paper will be by Mr. Arthur Montefiore Brice, as will be seen from the programme inserted in the present number. This will be followed before Christmas by papers on Uganda and Unyoro, by Lieutenant S. Vandeleur, and on the Sources of the Niger by Colonel J. K. Trotter. Other interesting papers, as will be seen, are in preparation for the meetings after Christmas. During the session special meetings will probably be held in connection with the 400th anniversary of the voyage to America by Cabot and of the route to India by Vasco da Gama. For other special features reference is made to the Programme.

Special Medal to Dr. Nansen.—At a recent meeting of the Council, it was decided to award a special gold medal to Dr. Fridtjof Nansen, in recognition of the value of the geographical and other scientific work which has been accomplished by his North Polar Expedition. Dr. Nansen has already received a Royal Medal from the Society.

EUROPE.

Geographical Work in Finland.—The Finnish Geographical Society at Helsingfors has recently sent us their publications for the years 1894, 1895, and 1896, which show a record of solid geographical work of a very satisfactory character. There appears to be an awakening to the value of geographical study in Finland, which is accompanied, not only by the production of such memoirs as the volumes under notice contain, but by an earnest effort to adopt whatever is good in the geographical teaching of other countries in the schools of Finland. The papers in the *Vetenskapliga Meddelanden af Geografiska Föreningen i Finland* are

* For a general illustration of the country traversed by Colonel Wells, the reader is referred to map of a Route along the Alburz Mountains, between Tehran, Astrabad, and Shahrud, by Lieut.-Colonel Beresford Lovett, R.E., to be found at page 120, vol. v., *Proceedings* (New Series) of the Royal Geographical Society. The section of country now treated may be identified by the names Gatchasir and Wallabad on that map, and is between long. 51° and 51° 40'.

about which hardly anything has been known hitherto, is peopled by a mixture of Chinese from Yunnan, Kutsongs, Mosos, and Sifana. North of this town the explorer traversed the Tibetan kingdom of Meli, into which the Chinese even have never penetrated. It is entirely in the hands of the yellow lamas, to whom the king himself belongs, and is known to the Chinese on this account as Huang-Lama ("yellow lamas"). The lamasery (placed on the side of a mountain) was composed of three-storied houses with white walls, balconies, verandas, etc., which recalled a town of South Europe. From Meli M. Bonin crossed the Yalung, and made his way over several very high passes to Ta-tsien-lu.

AFRICA.

Captain Böttego's Expedition.—Letters describing the progress of Captain Böttego's Expedition to Somaliland down to March last have been published in the *Memorie* of the Italian Geographical Society (vol. vi., 1896, p. 149). The leader himself writes, first from Lugh, the important Somali town on the middle course of the Jub, and afterwards from a point a little south of the Daua river, in about 40° 40' E. long. Captain Ferrandi also writes from Lugh, where he has remained as chief of the newly founded Italian station. From Brava the route (shown on two sketch-maps accompanying the letter) led first westwards to the Webi Shabeli; then northwards to the district of Baidoa, where the population is said to be more dense than in the most thickly peopled parts of the valley of the Po (apart from the large cities); and thence again west to the Jub, or Ganana, at Lugh. Baidoa forms a perfectly level plain, about 1650 feet above the sea, with a soil devoid of pebbles, producing abundance of durra and cotton. Lugh had been attacked by a band of marauding Amharas (who had come from Imi by way of the Web) shortly before the arrival of the expedition, and the inhabitants had abandoned the place. They returned after Captain Böttego's arrival, but the prevailing feeling of insecurity had prevented the arrival of the usual caravans from the Benadir coast for the interior. The country between the coast and Lugh is partly composed of red sandy clay, rich in magnetite, and occasionally mixed with fragments of crystalline rock, and partly of grey or yellowish strata. The former is covered with trees and thorny scrub, with little grass, while vegetation, and especially grass, is much more abundant in the grey soil. Beyond Lugh the expedition followed the south bank of the Daua for some distance, afterwards diverging from the stream and ascending the plateau to the south. Along the Daua the strata were generally horizontal, and seemed to represent an old sea or lake bottom. Salt is found over the whole district, especially east of the Web river, where is a mine, near which ruins of an ancient city were reported. Captain Böttego heard frequently of a river named Sagan, in the direction in which he was marching. This river is said to flow into a lake (not Abbaia), and to be distinct from the Omo. The Amhara Burgi dwell on its banks. Meteorological observations have been made throughout by Captain Böttego, who gives the broad results in his letters.

French Expedition across Equatorial Africa.—The two French travellers, M. Versepuy and Baron de Romans, have accomplished a journey across Africa from east to west by way of Lake Albert Edward and the equatorial forest (*Revue Française*, September, 1896). Their original intention had been to reach Mount Kenya and Lake Rudolf, but, the road in this direction being closed by hostilities with the Masai, they were obliged to change their plans. After leaving Katue, on Lake Albert Edward, they came into collision with hostile natives. Through the forest—in which they suffered severely from fever—they appear to have, on the whole, kept to Stanley's route, though in the reverse direction. We regret to state that M. Versepuy succumbed at Chantilly, soon after his return to

France, to dysentery, contracted during the journey (*Mouvement Géographique*, No. 36).

French Steamer for the Shari.—M. Gentil, who is proceeding to the Shari basin by way of the Ubangi, taking with him a small steamer in sections to place upon the former river, has, according to the September number of the *Bulletin du Comité de l'Afrique Française* (p. 275), been delayed for some months at the station of Krebeje, founded by him in 5° 46' N. lat., on the banks of the Tomi, an affluent of the Kemo, itself a northern tributary of the Ubangi. M. Gentil proposes to make for the Nana (a southern tributary of the Gribingi, explored by Maistre), on which he hopes to launch his steamer (see also *Revue Française*, 1896, p. 492).

The French in the Niger Basin.—The *Bulletin du Comité de l'Afrique Française* (1896, No. 8) contains the account of a journey in the west of Borgu by M. Deville, who, early in 1895, was commissioned to visit the district of Buay, which had not been reached by the French expeditions of 1894-95 to the region north of Dahomé. According to M. Deville, Borgu is composed of several independent kingdoms, of which Buay is one. The chief town is placed by him about 50 miles north-west of Niki (visited by Captain Lugard), and the kingdom is said to extend from 10° to 12° N. lat., and from 2° 20' to 4° 20' E. long. It lies on the watershed between the basins of the Weme and Niger, the line of partition nowhere attaining a greater altitude than from 1300 to 1650 feet. There are some forests on the side towards the Niger, but elsewhere the surface is covered with tall grass, interspersed with *karité* trees, and supplies pasturage for the flocks of the Fulah herdsmen. It is furrowed by many streams, which mostly dry up during the hot season, but enough moisture remains in the soil (which is very fertile) to admit of cultivation. The natives possess a small but active breed of horses. M. Deville thinks that the name Adafudia, given by Duncan as that of the chief town of this region, may be composed of two words used in the country as an expression of contempt, the meaning of which was misunderstood by the English traveller.

AMERICA.

Mr. Fitzgerald's Expedition to the Chilian Andes.—Mr. E. A. Fitzgerald, who recently returned to England from his expedition in the New Zealand Alps, has started on a fresh journey, the main object of which is the ascent of Aconcagua the highest summit of the Andes. The expedition consists of ten persons in all—Mr. Vine, geologist; Mr. de Trafford, surveyor; Mr. Philip Gosse, naturalist; and Mr. Fitzgerald, with guides and servants. From Buenos Aires, the party will proceed by railway to Mendoza. Here they will commence the ascent of the mountains, making direct for Aconcagua, and afterwards for the side valleys of the Andes. The objects of the expedition are scientific, and the ascent of the mountain will be made in a leisurely manner. Mr. Fitzgerald's object is to watch the effect of the various altitudes on the system, and from this to see whether it is possible to climb higher peaks in the Himalayas.

Project for a Route from the Amazons to Cuzco by way of the Purus.—The distance from the headwaters of the Purus to the left bank of the Amaramayu, or Madre de Dios, is about 90 miles. The advantage of such a route would be that there are no rapids on the Purus, as is the case on the Madeira. It is proposed by M. A. Pimenta Bueno that the mixed Commission which is to fix the Peru-Brazilian boundary-line between Madeira and Yavari, should also be instructed to explore the country between the headwaters of the Purus and Aquiry, and the left bank of the river Madre de Dios.

Explorations in the Argentine Republic.—On May 15, 1896, Dr. F. P. Moreno, director of the Museo de La Plata, returned to Buenos Aires from his great journey of exploration begun in January. In December last year Dr. Moreno had sent out from Mendoza several expeditions composed of twenty-six engineers, geologists, botanists, and cartographers for the exploration of the districts bordering on the Andes lying to the south. He himself followed in the middle of January, and traversed the country between Mendoza and 47° S. The route followed was across the Rio Grande and the Colorado to Chos-Malal, the capital of Neuquen, thence to Codihue, to the Rio Bio-Bio, across the Collon Curá to Junin de los Andes and the lakes of Nahuel Huapi, Lacar, Caleufú and Miaten. These explorations complete a series begun about the end of 1894 on the Bolivian frontier, in the course of which 25,000 miles have been travelled over by the various expeditions. The collections, of the most various kinds, fill 400 chests, and 2000 photographs have been taken. The territories of Neuquen, Rio Negro, and Chubut have been explored and surveyed with special care. Dr. Moreno is convinced that the much-talked-of but still unidentified Bariloche pass lies on the Lago de Gutierrez. North of Lago Nahuel Huapi eight new lakes have been discovered, and fifteen south of it. The mysterious Rio Tetelefu is now accurately known from its source. In many places it has a depth of more than 25 feet. The beauty and fertility of the neighbourhood of Nahuel Huapi are much praised, and it is stated that a brilliant future awaits this tract as soon as it is connected with the east coast by a railway.—Dr. Polakowsky in *Petermanns Mitteilungen*, 1896, No. 9.

POLAR REGIONS.

Mr. S. A. Andrée's Polar Expedition.—In the last issue of *Ymer* (1896, Häft 3), Mr. S. A. Andrée publishes a report on his balloon expedition to Spitzbergen. It is known that the *Virgo*, which had on board, besides the balloon expedition, a party of geologists and zoologists, left Tromsø on June 14. After the steamer had called at Isfjord, and next at the Norway islands, a suitable place for building the balloon-house was found, on June 23, on Danes' island. It took nearly one month to land the balloon and to build a house for filling it. It was ready on July 20; the filling of the balloon began on July 23, and in the evening of July 27 the balloon was filled and ready to start. But the expected winds from a southern quarter did not come, and on August 17 the expedition had to pack up the balloon (the ship was freighted till August 20 only), and it started on its return journey on August 20, reaching Göteborg nine days later. From a table of the directions and force of the wind, from July 27 to August 16, which is given by Andrée, it appears that during these three weeks the wind blew chiefly from northern quarters, or was very feeble and changing. Only on July 29 and 30, and next on August 2 and 3, was there for a few hours a feeble southern wind, which, however, changed in the afternoon to a wind from the north or north-east. It appears, moreover, from the journal of Captain H. C. Johannessen, who cruised north of Spitzbergen during the same time, that, with the exception of August 9, when a fresh wind blew for a few hours from east-south-east, and the next day when a feeble south-east, with snow, was felt, the wind was always from northern quarters. Andrée explains at length why he did not take advantage of these short hours, the chief reason being that these winds were too feeble to carry the balloon, with its guide-rope, any distance northwards. The idea of taking advantage of any wind for a polar balloon-journey evidently was also discussed, but was abandoned because it offered relatively little interest, and because all probabilities were in favour of the balloon being lost, if landing took place, as it probably would, in some uninhabited spot. The loss of the balloon would have raised the costs of a

new expedition to 106,000 kroner, while now, the balloon being in working order, the costs of a new expedition would not exceed 53,000 kroner, provided that the next year's expedition is taken to Spitzbergen on board a ship of the Swedish navy. Mr. Andrée fully believes in the possibility of such an expedition, if only the balloon-house is ready earlier in the summer. There was no lack of southern winds in the earlier part of the stay at Danes' Islands. This year's expedition is not quite fruitless. It has proved the possibility of a balloon being filled in Spitzbergen, and of a pigeon-post being established between Spitzbergen and the Continent, while astronomical, magnetic, and meteorological observations were made, as well as geological explorations under Prof. De Geers, and hydro-geographical measurements under Prof. Arrhenius. At the same time Mr. Grönberg has made good natural history collections.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Vertical Distribution of Snow Plants and Habitations.—Two papers on vertical distribution, by pupils of Prof. Ratzel, appear in the second volume of the *Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig*. Dr. Magnus Fritsch gives the following figures (English feet) as the results of his survey of the Ortler Alps:—

Exposure.	N.W.	W.	S.W.	S.	S.E.	E.	N.E.	N.	Mean.
Snow-line, climatic...	9510	9840	10,070	10,130	9780	9750	9370	<i>9360</i>	9720
" orographic	8330	8620	9000	9040	8940	8630	8420	<i>8310</i>	8630
Trees	7630	7420	7600	7350	7410	7340	<i>7110</i>	7280	7390
Woods	7000	7070	7080	6990	6960	6960	<i>6640</i>	6890	6950
Shepherds' huts ...	—	<i>6675</i>	7680	7150	7410	7070	7310	6880	7180
Cattle-tenders' huts...	—	6540	7070	6670	6290	6290	<i>5760</i>	6040	6400
Meadow hay	5290	5700	6220	6510	5840	5630	5670	<i>4840</i>	5800
Cereals	<i>3960</i>	4660	5380	5340	5120	4460	4020	4080	4560
Permanent habitations	3890	4930	5460	5200	4920	4120	3860	<i>2760</i>	4520

The south-western and western slopes of the mountains are the most favourably situated, as is indicated by the bolder figures, which show the maximum height of each line; while the figures in italics, denoting the lowest position of each line, are found for the north-eastern and northern slopes. The orographic snow-line is "the line which joins the wreaths of snow protected by their position and the nature of the surrounding ground." It is interesting to compare these figures with those obtained by Dr. Hupfer for Etna. In summer some wreaths of snow lie on the mountain, as they do on Ben Nevis in our own country, although its summit is below the climatic snow-line. On Etna, in 1893, there were five small snow-wreaths on the north-west, north, and north-east of the summit plateau, between 9000 and 9900 feet. Dr. Hupfer gives the vertical zones of the mountain as follows:—

- III. Waste region { (b) Snow-wreath region.
(a) Pasture region (8850 feet).
- II. Forest region { (b) Summer-green or birch region (6560 feet).
(a) Ever-green or pine region (6070 feet).
- I. Cultivated region { (b) Summer-green cultivated plants, and upper limits of agricultural region (5080 feet).
(a) Ever-green cultivated plants, and upper limits of the olive (2620 feet).

It would appear that the forest limit is somewhat lower on Etna than on the Ortler Alps, while agricultural operations are carried on only about 500 feet

higher on the slopes of the volcano, despite its more southerly and insular position, which may be partly explained by the dryness of Sicily during the warm months. The beautiful map which accompanies Dr. Hupfer's paper shows that the distribution of trees is neither so high nor so extensive as it was seventy years ago.

GENERAL.

Population Maps.—In the second volume of the scientific publications of the *Leipzig Verein für Erdkunde* there are two papers on the distribution of population, one on the kingdom of Saxony, by Dr. Richard Buschick, and the other on West Central Africa, by Dr. Vierkandt. The former is of especial interest from the map, which shows the distribution of the people by using various symbols for small settlements, and various combinations of thin and thick lines which follow the boundaries of the settlements, whose areas are large enough to be traced. The map is fairly effective, and gives more precise information than that constructed on the usual plan of colouring the chosen political region according to the average number of inhabitants per unit area. In the case of a large-scaled map, such as that given for the Zwickau district, the white space is actually uninhabited. The value of these maps would be enhanced if the space inside the lines bounding an area of settlement were shaded or coloured to show the average density of the population per unit area, as well as the approximate number of inhabitants within these lines. The large number of villages with between twenty and two hundred inhabitants, and their regular distribution on the lower lands, is in marked contrast to the relatively much greater number of single settlements and larger villages in the mountains. It is interesting to compare these maps with that constructed by Mr. Bosse for the Royal Scottish Geographical Society's beautiful *Atlas of Scotland*, recently prepared and published by Mr. Bartholomew. In this map the country without any permanent inhabitants has been outlined and left white, and the density of population below this line calculated for each parish and indicated in the usual way. In addition, the number of inhabitants in each town has been indicated by special signs. This makes the map exceptionally graphic and precise in the way it presents population statistics. On comparing this with a contour map, it is seen that comparatively few inhabitants live permanently above 500 feet in Scotland. Dr. Vierkandt's population maps of West Central Africa are constructed in the usual way. The data, however, are very defective, and the author has usually to rely on the qualitative estimates of travellers. These differ according to the ideas of their authors, which are usually affected by the nature of the country previously traversed. The explorer coming from the desert is likely to term a region thickly inhabited that another, after passing through the populous parts round the lower Niger, would call thinly settled. The result of a critical discussion of the available information leads Dr. Vierkandt to conclude that ordinary estimates of the population of West Central Africa are too high, and he reduced Prof. Supan's total of nearly 37 millions to nearly 24 millions. With this alteration he points out that the total number of inhabitants in Africa, as estimated by Prof. Supan, is about 150 millions.

Place-Names.*—Besides a glossary of 266 pages, containing compact and interesting explanations of a number of well-selected names from all parts of the world, this new work by Canon Taylor contains a prologue of 35 pages, discussing and expounding many points of interest with reference to place-names, and an appendix

* 'Names and their Histories, alphabetically arranged as a Handbook of Historical Geography and Topographical Nomenclature.' By Isaac Taylor, M.A., etc., Canon of York. London: Rivington, Percival & Co. 1896.

of 88 pages, in which the elements most commonly met with in Indian, Turkish, Magyar, Slavonic, French, German, and English names are treated of. The last section is naturally the fullest. It extends to 46 pages, and is divided into five sections—on names containing survivals of grammatical inflection; on personal names; on names indicating occupations and status; on names of hundreds, shires, and parishes; and on those of towns and townships. This plan of relegating much of the matter to an appendix has many recommendations. It not only saves space, but it makes the subject dealt with more interesting and instructive. It ought, however, to be supplemented by an index containing references, both to the elements of names treated of and to the names explained or given as examples. In the prologue, curiosity is roused again and again about names about which no explanation is given in the glossary, at least under the names in question, and which cannot be found in the appendix (if they are there at all) without a long search. It is also to be regretted that there is no section in the appendix dealing with Celtic names in general, or Scotch and Irish names of Celtic origin in particular.

Geological Survey Report.—The Annual Report of the Geological Survey and Museum of Practical Geology for 1895 is a record of steady progress and much useful work. It contains the usual summary of work accomplished during the past year, to which every geographer studying a special region should refer. Perhaps the most interesting item in the report is the announcement that the half-crown machine-coloured geological map of the London district, on a scale of 4 miles to the inch, has sold well enough to justify "the expectation that the same system may be continued and extended." The issuing of geological maps at a reasonable and not prohibitive price will help geographers in every district, and we hope that the department will soon issue fresh sheets at a similar cost.

Popular Geography in Manchester.—At the Liverpool meeting of the British Association, a paper by Mr. J. Howard Reed was submitted, describing the work of the "Victorians," a number of members of the Manchester Geographical Society who deliver popular lectures free of charge. During the past five years over three hundred lectures have been delivered in Manchester and the surrounding districts, and over ninety thousand hearers have been reached. The audiences are principally of the working class, but also include the members of many well-known literary and scientific clubs, and students of continuation schools. The lectures given include such titles as: "Shaping of the Earth's Surface by Water-action," "Map Projection," "India," "China, Korea, and Japan," "Polar Exploration," "Across the Rocky Mountains," "Canada," "Across Africa with Stanley," "Uganda," etc. Applications for lectures are made to an honorary secretary, who conducts all correspondence and makes arrangements with the local societies and the lecturers. The engagement of the halls, printing, and similar matters are carried out on the spot by the local people. This system has proved so satisfactory, and the enthusiasm of the voluntary workers has been so well maintained, that no hitch has ever occurred. The terms on which the lectures are given are very simple. Any member of the Manchester Geographical Society or any affiliated society is entitled to apply for lectures. Lantern apparatus and volunteer operator are supplied when required. A nominal fee is charged for each lecture, travelling and lantern expenses being added when incurred. Any balance in hand at the end of each season is applied to the upkeep of lantern plant and the making and purchase of new slides. Another important branch of voluntary work consists in the analysis of some two hundred British and foreign scientific journals. This is most useful for scholars and students. It enables them to follow up, with ease, the literature on any special subject.

OBITUARY.

Baron Sir Ferdinand von Mueller.

WE learn with much regret of the death of Baron Sir Ferdinand von Mueller, K.C.M.G., F.R.S., the eminent Government Botanist of Victoria, Australia. For nearly half a century Von Mueller's name has been intimately associated with the progress of science and exploration in Australia, and especially with the development of its vegetable resources. He was born at Rostock, in Germany, in June, 1825, losing his parents at an early age. He obtained a training in pharmacy, and in his leisure time devoted himself to the study of botany and chemistry. In 1846-47 he studied at the University of Kiel, where he took the degree of Ph.D. For several years he investigated the botany of Schleswig and Holstein. In 1847, in order to counteract a hereditary tendency to phthisis, he emigrated to Adelaide, in South Australia, where he commenced his career as assistant to a chemist, and during the following four years devoted himself to the investigation of the flora of the colony. From 1848 to 1852 he travelled over 4000 miles, mainly for botanical purposes. In 1852 he was appointed Government botanist to the colony of Victoria by Mr. Latrobe, the first Governor, and here he at once entered upon the labours for the exploration of the continent and development of its vegetable resources and capabilities that only ceased with his death. From this year dates also his series of publications on the botany of Australia, which in extent and value represent no small proportion of an Australian bibliography. In 1855-56 he accompanied as botanist the expedition under the command of A. C. Gregory for the exploration of North and Central Australia, and was one of the four to reach Termination Lake in Central Australia. Some 6000 miles of previously unknown land was traversed, and abundant collections made of the various forms of vegetation. On Mueller's return to Melbourne he was appointed Director of the Botanical Garden of that city. Whilst rendering immense services, not only to Australia, but to many other countries, he failed to satisfy the wishes of the colonists for a garden which should, like Kew, be as ornamental as useful. Mueller was neither a practical horticulturalist nor a landscape gardener, and the Victorians, seeing with envy in the capital of a sister colony (Adelaide) the erection of a garden as æsthetic as scientific, relieved him of the directorship of the garden, at the same time, with rare liberality, retaining him in the position of Government botanist, with undiminished salary, library allowances, and appliances for pursuing his labour in scientific and economic botany.

Though mortified almost beyond endurance by this action of his fellow-colonists, Mueller, with undiminished zest and liberality, continued his exertions as their benefactor to the day of his death. He was the introducer into Australia of many useful plants from other regions, in exchange sending abroad plants native to Australia of more or less economic value. He had a leading hand in introducing that most useful of Australian trees, the eucalyptus, into Algeria, India, the Riviera, and other countries, in some of which it is of essential service as timber and fuel, and in others as an aid in draining marshy land. He was the first to raise the great *Victoria Regia* water-lily. Indeed, his immense knowledge as a botanist had almost always a practical end in view, and not a few Australian industries are largely indebted to him for their development. It was also partly due to his suggestion that the camel was introduced into Australia and first used for exploring purposes in 1860. His own travels in Australia for botanical purposes, on foot and on horseback, covered some 25,000 miles. After he himself had ceased, owing to

his official duties, to be able to travel, he had a directing hand in many of the important expeditions that went out from Victoria as well as other colonies.

In recent years Baron von Mueller was actively interested in the promotion of Antarctic exploration, and was greatly disappointed that the efforts made, both in this country and in Australia, proved futile. He was a voluminous author, but his writings are mostly of a strictly scientific character. The titles of over a hundred papers by Mueller are given in the Royal Society's catalogue of scientific papers. This is exclusive of independent works on descriptive and economic botany, and of which his 'Fragmenta Phytographiæ Australiæ' covers about a dozen volumes. Almost from the date of his arrival in his adopted continent, he had entertained the ambition of producing a 'Flora Australiensis,' and when the several governments of the Australian Colonies appointed one of the most distinguished botanists in England, Mr. G. Benthon, F.R.S., to undertake the work, Mueller, at once recognizing the wisdom of the selection, and that an access to the Australian collections contained in European Herbaria was essential to the perfection of the work, generously offered the use of his own unrivalled Herbarium, notes, and observations, in aid of the undertaking. During the whole sixteen years occupied in the publication of this gigantic undertaking, which extended to seven volumes, Mueller was unceasing in his efforts to contribute to its success, working in unbroken harmony with its author throughout. Of his own numerous works three especially are of permanent value, the 'Eucalyptographia,' a history with excellent drawings of the Eucalypti of the continent; the 'Select Extratropical Plants eligible for Industrial Culture in Australia,' a work unique of its kind, and overflowing with valuable suggestions of a thoroughly practical nature; and his 'Introduction to Botanic Teaching in the schools of Victoria.'

Few men have received so many honours as the late baron. He was one of the first three in Australia to receive the Order of St. Michael and St. George; he was promoted to Knighthood in the Order in 1879. In 1871 he was made a hereditary baron by the King of Würtemberg. From Portugal and from Spain he received high orders. He was made a Fellow of the Royal Society in 1861, and in 1888 the society awarded him one of its Royal medals. He was a corresponding member of some 150 scientific societies. He had been a Fellow of the Royal Geographical Society since 1858.

Personally Baron von Mueller was a man of a warm heart and great kindness of nature. Though a botanist by choice and profession, he was in other respects a man of great culture, interested in many branches of knowledge, and a lover of music, the practice of which art he zealously advocated amongst the young and old of the colony. He was a voluminous correspondent, ever ready to help his friends; somewhat vain, perhaps, but of a vanity that was never offensive. He has rendered services of a high order to Australia, in the history of the advancement of which his name will always be held in high honour.

Professor Josiah Dwight Whitney.

Professor Josiah Dwight Whitney, who died last August 24 at the age of seventy-seven, commenced the long series of geological labours which have made his name famous in 1840, when he was at work on the survey of New Hampshire. After spending two years of study in Europe, supplementary to his university training at Yale, he worked out the geology of the Lake Superior region in conjunction with Mr. J. W. Foster, the results being published in 1849, 1850, and 1851. These surveys involved a large amount of topographical mapping as a necessary preliminary to the geological delineation; and in most of his subsequent

work Mr. Whitney had occasion to lay the foundations by means of a pioneer geographical survey. In 1854, after several years' travelling in the west of the United States, he produced a work on the 'Metallic Wealth' of that country, including a comparison with the rest of the world. A similar volume, 'The Mineral Resources of the United States,' has since been made an official annual publication of the national geological survey, and is a document of the utmost value to students of economic geography. Mr. Whitney was engaged in succession on the geological surveys of Iowa, Wisconsin, Illinois, and California, devoting ten years' work to the scientific study of the last-named state. He was for a time Professor of Chemistry in Iowa University, and from 1865 until his death he has occupied the chair of geology at Harvard. It is impossible, in a brief note, to enumerate his published contributions to geological and geographical science. The name of Mount Whitney, the highest summit of the Rocky mountains in the United States, perpetuates his memory and records the esteem in which he was held by his contemporaries. Professor Whitney had been an Honorary Corresponding Member of the Royal Geographical Society for many years.

Dr. J. A. Moloney.

Dr. Moloney's death, at the early age of thirty-eight years, adds another name to the long list of victims to the hardships of African exploration, for to these must, no doubt, be attributed the aortic aneurism from which he suffered, and which ended fatally on October 5 last. Dr. Moloney was the son of the late Captain Moloney, of the 60th Rifles. He was born at Newry, in Ireland, and graduated at Dublin University, after previously studying medicine at St. Thomas' Hospital. His name first came into prominence as an African traveller through the part which he took in Captain Stairs' expedition to Katanga on behalf of the Congo Free State, which resulted in the extension of the state's authority over that part of the Congo basin. The death of Captain Bodson (the second in command) at Bunkeia, King Msidi's capital, and the dangerous illness of Captain Stairs, threw the task of bringing the expedition back to the coast on Dr. Moloney, who succeeded in so doing after countless difficulties and hardships. In 1893 he published an account of the expedition under the title 'With Captain Stairs to Katanga.' In 1895 Dr. Moloney was entrusted with a mission to the country west of Lake Nyasa, and succeeded in inducing several of the native chiefs to place themselves under British protection. He had been a Fellow of the Royal Geographical Society since 1892.

CORRESPONDENCE.

Makran.

Davos Platz, October, 1896.

If it will not be thought to be unduly prolonging the correspondence on this subject I should like to make a few remarks with reference to Colonel Holdich's letter in the *Journal* for the current month, and, in the first place, to express my regret for having misread him in the way he points out.

Colonel Holdich will, I dare say, be amused to learn that after putting Fahraj near Bampur "out of the question" I now find myself under the necessity of reinstating it as the starting point of Ibnu Khurdadbeh's extremely puzzling route "from Fahraj to Sind." I am led to this by a further and more careful comparison of what is to be gathered on the point from the above-mentioned geographer with what is stated by Yakubi and Istakhri. After my previous and

unfairly long communication I cannot ask for the space that would be requisite if I were to state the grounds of my new conclusion, which must await some other time and some different channel of publication, but I shall be happy to submit them privately to Colonel Holdich if he would care to know them. He would, I feel sure, be satisfied with them.

To put the result summarily, Fahraj near Bampur is the place locally called *Fahra* in the middle ages. Then the *Basurjan* of Ibnu Khurdadbeh, the *Masurjan* of Idrisi, and the *Masakan* of Istakhri, are one and the same place. This, in all probability, occupied the site of the present Sarbaz. It is stated to have been 24 farsakhs from Fahra, while Sarbaz (according to Sir F. Goldsmid's route) is 73 miles distant from that place. In Ibnu Khurdadbeh's time it was the chief town of "the Schismatics" (for his *Medinetu 'l Kharun* read *Medinetu 'l Khuru*), and these people, we know from the later Arab writers, were settled along the course of the Sarbaz river. Subsequently *Rask* became their capital. This place, lower down the river and 40 miles from Sarbaz, is not mentioned by Ibnu Khurdadbeh, but I would identify it with his "village of *Yahya bin Amr*," 10 farsakhs from Basurjan (*Sarbaz*), and would suppose that Yahya was then the headman of the place, or that he was, perhaps, its founder. From Rask onwards to Panjgur, I must confess I can make nothing of the route, nor can I identify a single one of the ten intervening stations. According to the later Arab geographers, there was a route from Rask through the present Bampusht district to Dizak, and thence to Panjgur, the entire distance from the first place to the last being 6 stages, while modern itineraries and maps would make it about 230 miles. How, then, can we account for Ibnu Khurdadbeh's 93 farsakhs, or say 336 miles—perhaps 370 miles? The route cannot have proceeded from Rask through the Kej valley, otherwise Kej, the capital and probably the most ancient place in the valley, would surely have appeared among the stations; but it does not, nor does any other place east or west of Kej shown in published maps. There I must leave the difficulty. Perhaps Colonel Holdich, with the far greater advantages he possesses, can solve it. Allowing it its full weight, it does not, in my opinion, counterbalance the evidence in favour of the identifications above stated, though in present circumstances I can only offer these for provisional acceptance.

M. R. HAIG.

The Discovery of the very Important Lundai Sin, or Swat River.

October 12, 1896.

In the *Geographical Journal* for this present month there is a letter on the subject of "Makran," by Lieut.-Colonel Holdich, R.E., on which subject I have nothing to say at present; but, in the last paragraph of the letter, referring to the serious mistakes made with respect to that part of the Kafirstan, which has caused some trouble, and more discussion, he says, "We found that the river flowing through Kafirstan from the west into the Chitral or Kumar [*sic*] river, and correctly called Arnawai, . . . was also called 'Bashgol' and 'Lundai Sin;' and that he has "discovered one other very important Lundai Sin, which is also called the Swat river."

It is to this last "discovery" I have more particularly to refer. Any small or minor river may be, and is, called Landaey Sin—not "Lundai"—by the Afghan people and others dwelling near them. *Land* is the Pushto adjective for "small," "little," "short," etc., and the diminutive form of that adjective is *landaey* for the masculine singular, *landa'i* for the feminine, and *landi* for the plural, both masculine and feminine. Sin, or Sind, a corruption of Sanskrit *sindhu*, means a

The calculations are given in full, fixing Bogenhausen as 18m. 55'123s. west of Vienna; 9m. 40'125s. east of Milan; 15m. 21'422s. east of Strasburg; 46m. 26'226s. east of Groenwich; and 7m. 8'793s. east of Berlin.

- Germany—Moors.** *Globus* 70 (1896): 73-78. **Krause.**
Die Existenzbedingungen der nordwestdeutschen Heidefelder. Von Dr. med. Ernst H. L. Krause. II.
- Germany—Prussia.** *Petermanns M.* 42 (1896): 173-187. **Halbfass.**
Der Arendsee in der Altmark. Von Dr. Wilh. Halbfass. *With Map.*
- Germany—Prussia.** *Globus* 70 (1896): 229-236, 281-285. **Tetzner.**
Die Kaschuben am Lebasee. Von Dr. F. Tetzner. *With Map and Illustrations.*
- Germany—Saxony.**
Kalender und Statistisches Jahrbuch für das Königreich Sachsen nebst Marktverzeichnissen für Sachsen und die Nachbarstaaten auf das Jahr 1897. Dresden: C. Heinrich, 1896. Size 8 x 5½, pp. 90, viii., and 250.
- Germany—Schleswig-Holstein.** **Schüick.**
Magnetische Beobachtungen auf den West-Inseln und einigen Punkten der Westund Südküste Schleswig-Holsteins, übertragen auf 1895, von Kapitain A. Schüick, Hamburg. Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein. Band xi., Heft 1, 1896. Pp. 36-38. Size 9½ x 6½. *Presented by the Author.*
- Germany—Sunshine.** *Ann. Hydrographie* 24 (1896): 313-325. **König.**
Dauer des Sonnenscheins im deutschen Küstengebiete. Von Helmuth König.
- Italy—Lake Maggiore.** *Le Globe, Mém. S.G. Genève* 35 (1896): 47-54. **Ritter.**
Morphométrie du lac Majeur, suivie d'une note sur les Tables de glacier en glace. Par Etienne Ritter. *With Plate.*
- Netherlands—Bibliography.** **Nijhoff.**
Bibliotheca Historico-Geographica Neerlandica. Catalogue de Livres, Anciens et Modernes, Cartes, Plans, etc., concernant l'histoire locale et la topographie des Pays-Bas. En vente aux prix marqués chez Martimes Nijhoff à la Haye, Nobelstraat 18, 1896. Size 9 x 6, pp. 50, 144, and 168.
- Norway.** *Rev. Scientifique* (4) 6 (1896): 399-401. **Antonjadi.**
Voyage en Laponie. Par M. Antonjadi.
- Norway.** *B.S. Normande G.* 17, 1895 (1896): 351-369. **Le Roux.**
Voyage à travers la Norvège. Par M. Hughes Le Roux.
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The Rhine from Rotterdam to Constance. Handbook for Travellers by Karl Baedeker. With 44 Maps and 24 Plans. Thirteenth Revised Edition. Leipzig: Karl Baedeker, 1896. Size 6½ x 4½, pp. xxxiv. and 422. *Price 7 marks. Presented by Messrs. Dulau & Co.*
For a new edition of a guide-book to contain no reference to touring cyclists and their requirements, is an omission which Mr. Baedeker might find it to his advantage to fill.
- Russia—Novorossiisk.** *B.S.G. Commerc. Havre* 13 (1896): 70-92. **Fauvel.**
Le nouveau port russe de Novorossiisk. Par A. A. Fauvel.
- Spitzbergen.** *Nature* 64 (1896): 437-438. **Gregory.**
The Conway Expedition to Spitzbergen. By Dr. J. W. Gregory.
- Sweden—Water-Temperature.** **Hamburg.**
Bihang K. Svensk. Vetenskaps- A. Handlingar 21 (1896): 26.
Temperaturobservationer i Mälaren och Saltsjön vid Stockholm. Af Axel Hamburg. *With Plate.*
- Switzerland.** **Messerschmitt.**
Relative Schweremessungen in der Schweiz. Von Johann Baptist Messerschmitt. Festschrift der Naturforschenden Gesellschaft in Zürich, 1746-1896. II. pp. 92-99. Zürich: Zürcher & Furrer, 1896. Size 9½ x 6½.

Switzerland.

Régime des eaux en Suisse. Bassin du Rhin depuis ses sources jusqu'à l'embouchure de la Tamina. Première partie. Surfaces des Bassins de réception, des zones de 300 en 300 m. au-dessus de la mer, des rochers, des forêts, des glaciers et des lacs. Deuxième partie. Stations limnimétriques au point de vue de leur emplacement et de leur repérage avec profils en travers pour chaque station et pentes relatives de l'eau à la surface. Travail exécuté par la Section hydrométrique de l'Inspectorat fédéral des travaux publics, 1893. Size $15\frac{1}{2} \times 10\frac{1}{2}$, pp. 56 and 8. *Map and Plates.* Presented by Professor Paul Chaux.

United Kingdom—England.**Norris.**

Catalogue of the Huntingdonshire Books collected by Herbert E. Norris. Written with Notes by Himself. Cirencester, for Private Circulation, 1895. Size $8 \times 5\frac{1}{2}$, pp. 52. Presented by the Author.

This bibliography of Huntingdonshire comprises about five hundred entries dating from 1610 to 1895, relating to the county and to the constituent parishes. The references are not only to books, maps, or other publications referring to the locality, but include works written by natives or residents of the county.

United Kingdom—England.**Ward.**

Thorough Guide Series. North Devon [including West Somerset] and North Cornwall from Exmoor to the Scilly Isles, with a description of the various approaches. By C. S. Ward. Twenty Maps and Plans by J. Bartholomew. Seventh Edition. Revised. London: Dulau & Co., 1896. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xvi. and 160. Price 3s. 6d. Presented by the Publisher.

Excellent maps on the scale of half an inch to a mile are included.

United Kingdom—Geological Survey.

List F. Memoirs, Maps, etc., issued by the Geological Survey of the United Kingdom and the Museum of Practical Geology. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 68. *Index Maps.* Presented by the Director-General of the Geological Survey.

United Kingdom—Ireland—Donegal. *Blackwood's Mag.* 160 (1896): 467-480.

In Dark Donegal: The Tourist on the Celtic Fringe.

ASIA.**Central Asia—Bokhara.***Globus* 70 (1896): 138-142.**Vambéry.**

Bilder aus Bochara. Von H. Vambéry. *With Illustrations.*

Dutch East Indies.*Petermanns M.* 43 (1896): 187-192.**Zondervan.**

Die Entwicklung der Kartographie von, Niederländisch-Ostindien. Von H. Zondervan.

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Botany of Formosa.

India—Bengal.**Sunder.**

Final Report on the Land Revenue Settlement of the Western Duars, Bengal. By D. H. E. Sunder. Calcutta: Bengal Secretarial Press, 1895. Size $12\frac{1}{2} \times 8$, pp. xiv., 164, and xxvi. *Index Map.* Presented by the Author.

India—Economic Products.**Watt.**

A Dictionary of the Economic Products of India. By George Watt (assisted by numerous contributors). Index. Prepared by Edgar Thurston. Calcutta, 1896. Size $10 \times 6\frac{1}{2}$, pp. 166. Presented by the Government of India.

This very useful index to a most valuable work could have been made much more convenient for reference by adopting bolder type for the leading words, and by repeating at the head of each column the word to which the entries apply.

India—Madras.*Mis. Catholiques* 23 (1896): 285-287, 296-298.**Bonaventure.**

Dans les forêts Khondes de Ganjam. Par le R. P. Bonaventure.

India—Madras.**Thurston.**

Madras Government Museum. Bulletin No. 4. Anthropology of the Todas and Kotas of the Nilgiri Hills; and of the Bráhmans, Kammáians, Pallis, and Pariahs of Madras City. By Edgar Thurston. Madras, 1896. Size $9 \times 5\frac{1}{2}$, pp. [96]. *Illustrations.*

- Indo-China.** *Ann. G. 5* (1896): 429-436. **Roux.**
 Note sur les longitudes et altitudes observées et calculées par M. E. Roux (Expédition du prince Henri d'Orléans, de MM. Roux et Briffaut, du Tonkin aux Indes, 1895).
- Persia.** *B.S. Normande G. 18* (1896): 1-28. **Dieulafoy.**
 A travers la Perse (conférence). Par Mme. Dieulafoy. *With Portrait.*
- Siberia.** **Schrenck.**
 Reisen und Forschungen im Amur-Lande in den Jahren 1854-1856 im Auftrage der Kaiserl. Akademie der Wissenschaften zu St. Petersburg, ausgeführt und in Verbindung mit mehreren Gelehrten herausgegeben von Dr. Leopold v. Schrenck. Band iii. Dritte Lieferung. *Vie Völker des Amur-Landes. Ethnographischer Theil. Zweite Hälfte.* St. Petersburg, 1895. Size 13½ × 9½, pp. xvi. and [144]. *Plates.*
 The bear-feasts and funeral ceremonials of the Amur Gilyaks are described and illustrated, the proceedings being similar to those of the Ainu.
- Southern Asia.** **Lapicque.**
Tour du Monde, 1 (n.s.) (1895): 409, 421, 433, 445, 589, 601, 619;
2 (n.s.) (1896): 37, 49, 61, 73.
 A la Recherche des Négritos (voyage du yacht *Sémiramis*). Première Partie: Les Andaman; Deuxième Partie: Les îles Mergoui; Troisième Partie: La Péninsule Malaise; Quatrième Partie: La Sonde Orientale. *With Maps and Illustrations.*
- Tibet.** *S.G. Paris, C.R.* (1896): 234-241; 250-252. **Bonin.**
 Voyage de M. Bonin. [De Tali à Tatsienlou à travers le Tibet.]
 Sur le voyage de Bonin. *With Map.*

AFRICA.

- Abyssinia.** *B.S.G. Paris (7) 17* (1896): 212-232. **Caillaud.**
 Les tentatives des Franciscains au moyen age pour pénétrer dans la Haute-Éthiopie. Par F. Romanet du Caillaud.
- Africa.** **Leo Africanus.**
 The History and Description of Africa and of the notable things therein contained, written by Al-Hassan Ibn-Mahommed Al-Wezaz Al-Fasi, a Moor, baptised as Giovanni Leone, but better known as Leo Africanus. Done into English in the year 1600 by John Pory, and now edited, with an Introduction and Notes, by Dr. Robert Brown. 3 vols. London: Printed for the Hakluyt Society, 1896. Size 9 × 6, pp. viii., cxli., and 1120. *Maps. Presented by the Hakluyt Society.*
 The death of Dr. Robert Brown left his work on these volumes unfinished, but so near completion that it was judged advisable to issue it without further addition. The sheets were revised in passing through the press by Dr. E. Denison Ross, and a valuable series of maps with notes, which are the result of his independent study, was contributed by Mr. Ravenstein. The main body of the work is an exact reprint of Pory's translation, the editor's care having been devoted to a biographical and critical introduction and to explanatory notes.
- Algeria.** *B.S.G. Paris (7) 17* (1896): 145-153. **Vuillot.**
 Note sur un voyage de Nefta à Ghadamès (mars-avril 1893) exécuté par MM. Cazemajou, capitaine du génie, et Dumas, lieutenant au 4^e spahis. Par Paul Vuillot. *With Map and Illustrations.*
- Algeria and Tunis.** *B.S.G. d'Alger. 1* (1896): 32-34. **Péris.**
 Projet de Carte de l'Algérie et de la Tunisie. Par M. A. Péris.
- Algeria and Tunisia.** *P. American Philosoph. S. 35* (1896): 39-56. **Pepper.**
 Eucalyptus in Algeria and Tunisia, from an hygienic and climatological point of view. By Dr. Edward Pepper.
- British Central Africa.** **Johnston.**
Africa, No. 5 (1896). Report by Commissioner Sir Harry Johnston, K.C.B., on the Trade and General Condition of the British Central Africa Protectorate. April 1, 1895, to March 31, 1896. London: Eyre & Spottiswoode, 1896. Size 13½ × 8½, pp. 28. *Map. Price 9d.*
- Central Africa.** *B.S.G. d'Alger 1* (1896): 24-31. **Rivière.**
 Les Bambous aux Grands Lacs de l'Afrique Centrale. Par M. Ch. Rivière.

- Congo.** *Missions en Chine et au Congo* (1896): 291-299. **Cambier.**
Congo: Lettre du P. Cambier: les troubles de Luluabourg.
- Congo State—Coffee.** *Mouvement G.* 13 (1896): 376-278. **Laurent.**
La Culture du Caféier au Congo. Par Em. Laurent.
- East Africa.** *B.S.G. Italiana* (3) 9 (1896): 272-273. **Millosevich.**
Seconda spedizione Bottego: Coordinate astronomiche di alcuni punti. Del prof. E. Millosevich.
- East Africa—Somaliland.** *Mem. S.G. Italiana* 6 (1896): 149-170. **Böttogo.**
La seconda spedizione Böttogo nella Somalia Australe. *With Maps and Illustrations.*
This will be referred to in the Monthly Record.
- Egypt—Red Sea Coast.** *Nineteenth Century* 40 (1896): 580-595. **Bent.**
On the Dervish Frontier. By J. Theodore Bent.
- French Congo.** *B.S.G. Paris* (7) 17 (1896): 154-187. **Barrat.**
Ogôoué et Como (Congo Français). Par Maurice Barrat. *With Map.*
- French Congo.** *B.S.G. Paris* (7) 17 (1896): 188-211. **Cholet.**
La Haute Sangha (Congo Français). Par Ed. Cholet.
- French Congo.** *B.S. Normande G.* 17, 1895 (1896): 329-350. **Decazes.**
Le Haut-Oubangui. Par M. le Commandant E. Decazes. *With Map.*
- French West Africa.** *La Géographie* 9 (1896): 465-467. **Béhagle.**
Voyage Commercial au Bassin du Tohad (Afrique Centr.le). Par Ferdinand de Béhagle.
- French West Africa.** *La Géographie* 9 (1896): 459-461. **Paroisse.**
Contribution à l'Étude du Climat de la Guinée Française. Par Georges Paroisse.
- German East Africa—Mafia.** **Baumann.**
Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig.
Dritter Band, Erstes Heft. Die Insel Mafia. Von Dr. Oskar Baumann. Leipzig:
Duncker and Humblot, 1896. Size 10 × 6½, pp. 38. *Map.*
- German South-West Africa.** *Globus* 70 (1896): 79-80. **Brincker.**
Bemerkungen zu Bernsmanns Karte des Ovambolandes. Von P. H. Brincker.
Stellenbosch. *With Map.*
- German West Africa—Togo.** **Flehn, Gruner, Baumann, and Sprigade.**
M. Deutsch. Schutzgeb. 9 (1896): 117-147.
Bericht über den Verlauf meiner Reise nach Atakpame, Akposso und Kebu. Vom
4 März bis zum 17 April, 1896. Von Lieutenant R. Flehn.
Siedepunktbestimmungen. Von Dr. Gruner und E. Baumann in Togo.
Begleitworte zu der Karte des südlichen Theiles von Togo. Von P. Sprigade.
With Map.
- Madagascar.** **Grandidier.**
Congrès des Sociétés Savantes. Discours [sur Madagascar] prononcé à la Séance
Générale du Congrès le samedi 11 Avril 1896. Par M. Grandidier. Paris: Imp.
Nationale, 1896. Size 11½ × 7½, pp. 16. *Presented by the Author.*
- Madagascar.** *Rev. Scientifique* (4) 6 (1896): 75-81. **Vincent and Burot.**
Le paludisme à Madagascar. Par MM. Vincent et Burot.
On malaria in Madagascar.
- Madagascar—Sainte-Marie.** *Rev. Maritime* 130 (1896): 419-445. **Landrieu.**
A Madagascar. L'île de Sainte-Marie. Par M. G. Landrieu.
A careful account of the island from personal knowledge and the study of local
archives. The description deals with the island, inhabitants, productions, trade, and
in his concluding remarks the author warns emigrants of the small farmer class
from attempting to settle in a place where only native labour is possible.
- North Africa.** *B.S.G. d'Alger.* 1 (1896): 39-45. **Jenoudet.**
Monographie de la Tribu des Righas. Par M. Jenoudet.
- South Africa.** **Gill.**
Cape of Good Hope. Report on the Geodetic Survey of South Africa executed by
Lieutenant-Colonel Morris, R.E., etc., in the years 1883-92, under the direction of
David Gill, Her Majesty's Astronomer at the Cape, together with a Rediscussion

of the Survey executed by Sir Thomas Maclear, F.R.S., in the years 1841-48, by David Gill. Cape Town: W. A. Richards & Sons, 1896. Size 13 x 8½, pp. xiv., 174, and 292. *Maps, Plates, and Diagrams.*

This is a report of the utmost scientific value, presenting the full record of the great geodetic survey of South Africa, which forms the basis of all future cartography in that region. Dr. Gill's paper on the subject printed in the *Report of the Sixth International Geographical Congress* presents in brief the results which are here set forth at length.

Sudan Almanac.

Sudan Almanac, 1896. Compiled at the Intelligence Division, War Office. Size, 6 x 4, pp. 18.

Transvaal.

Transvaal, die Südafrikanische Republik. I. Geschichtliche und wirtschaftliche Entwicklung. Eine Studie von — R. Berlin: Commissions-Verlag von Kühling & Güttner, [no date]. Size 8½ x 6, pp. 30.

Transvaal.

Aburrow.

Report of work done and general information relating to the Public Works Department of the Johannesburg Gezondheids Comité, S.A.R., for year ending December 31, 1895. By Chas. Aburrow. Johannesburg, 1896. Size 13 x 8, pp. 22 and 8. *Presented by the Author.*

Tripoli.

Mem. S.G. Italiana 6 (1896): 103-140. **Bricchetti-Robecchi.**

Il commercio di Tripoli, relazione del socio d'onore cav. ing. L. Bricchetti-Robecchi.

Tripoli—Cyrenaica.

Globus 70 (1896): 236-240.

Grothe.

Ein Besuch in Bengasi (Cyrenaika). Von Hugo Grothe.

Tunis.

Ann. G. 5 (1896): 386-406.

Larminat.

Étude sur les formes du terrain dans le Sud de la Tunisie (Frontière de la Tripolitaine). Par le capitaine E. de Larminat. *With Map and Illustrations.*

West Africa—Borgu.

B. Comité l'Afrique Française 6 (1896): 258-263.

Deville.

Dans le Borgou: Le Royaume de Bouay. Par M. A. Deville. *With Map.*

West Africa—Fernando Po.

B.S.G. Madrid 38 (1896): 49-56.

Bonelli.

Exploraciones en Fernando Poo. Por D. Emilio Bonelli. *With Illustrations.*

Recent explorations by missionaries are referred to.

NORTH AMERICA.

Canada—Hudson Bay.

American J. Science (4) 3 (1896): 200-205.

Tyrrell.

Is the land around Hudson Bay at present rising? By J. Burr Tyrrell, of the Geological Survey of Canada.

Mexico.

P.I. Civil Engineers 125 (1896): 243-281.

Corthell.

The Tampico Harbour Works, Mexico. By E. L. Corthell, D.S.O., etc. *With Plate and Illustrations.*

Includes the record of automatic tide-gauges on the Gulf of Mexico.

United States—Bureau of Ethnology.

Powell.

Thirteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1891-92. By J. W. Powell, Director. Washington, 1896. Size 12 x 8, pp. lx. and 462. *Illustrations.*

In addition to the official report, this volume contains papers on prehistoric textile art of Eastern United States, by W. H. Holmes; on stone art, by Gerard Fowke; on aboriginal remains and native dwellings in Arizona and Omaha, by various writers; and a remarkable translation of Zuni creation myths, by F. H. Cushing, showing the primitive ideas of the wanderings of the human race largely actuated by the search for the middle of the Earth.

United States—California.

Perrine.

Earthquakes in California in 1894. By Charles D. Perrine.—Bulletin of the United States Geological Survey. No. 129. Washington, 1895. Size, 9½ x 6, pp. 26. *Presented by the U.S. Geological Survey.*

United States—California—San Francisco Peninsula.

Lawson.

Sketch of the Geology of the San Francisco Peninsula. By Andrew C. Lawson.—Fifteenth Annual Report of the United States Geological Survey to the Secretary

of the Interior, 1893-94. By J. W. Powell, Director. Pp. 405-476. Washington, 1895. Size 12 x 8. *Map and Illustrations.*

The maps include some fine reproductions of relief models of the site of San Francisco.

United States—Census.

[Eleventh Census of the United States, 1890.] Report on Manufacturing Industries in the United States. Part i. Totals for States and Industries (pp. 1002). Part ii. Statistics of Cities (pp. xlv. and 828); Report on Real Estate Mortgages. Washington, 1895. Size 12 x 9½, pp. viii. and 944. *Diagrams.*

GENERAL.

Aërial Navigation. *Scottish G. Mag.* 12 (1896): 290-298. **White.**

Aërial Navigation. By A. Silva White.

Bibliography.

Catalogue of the Library of the India Office. Vol. i. Supplement. London: Printed by Eyre & Spottiswoode, 1895. Size 9 x 6, pp. 384. *Presented by the Secretary of State for India.*

Bibliography.

Ministère de la Guerre. Bibliothèque du Dépôt de la Guerre. Catalogue. Tome Huitième. (Supplément i.) Paris: Imp. Nationale, 1893. Size 10 x 6½, pp. ii. and 530. *Presented by the French Minister of War.*

The supplement contains the titles of works exclusively relating to military science, including military geography.

Bibliography.

Campbell.

The Literature of Geography: how shall it be recorded? By Frank Campbell. Reprinted from the 'Report of the Sixth International Geographical Congress, London, 1895' (pp. 391-398). Size 10 x 6½, pp. 8.

Bibliography.

Geographical Index (Extra-European) to Books, Periodicals, etc., 1895. Map Room, Intelligence Division, W.O., 31st December, 1895. Size 11 x 7½, pp. xviii. and 86. *Presented by the Intelligence Division, War Office.*

This geographical index to books is now being published monthly.

Bibliography—Spanish.

Librería de Penella y Bosch . . . Barcelona. Catálogo de las Obras de fondo y surtido clasificadas por Materias y seguidas de un Índice alfabético de Autores y Traductores. Barcelona: Penella y Bosch, 1896. Size 8½ x 6½, pp. viii. and 228.

A priced catalogue of Spanish works.

British Colonies.

Gill.

The British Colonies, Dependencies, and Protectorates, Physical, Commercial, Descriptive, Political, Social, Historical. By George Gill. London: G. Gill & Sons, [1896.] Size 7½ x 5½, pp. 472. *Maps. Price 2s. 6d. Presented by the Publishers.*

A fairly careful compilation. The maps printed in colour, if somewhat rough, are effective. The spelling on maps and in text differs in many cases; and the deviations from the R.G.S. rules for place-name orthography, which the author says he follows "as far as usage renders it desirable," naturally do not commend themselves to those who strive after uniformity.

British Empire.

Nineteenth Century (1896): 27-33.

Young.

Commercial Union of the Empire. By Sir Frederick Young, K.C.M.G.

Cartography.

XIV. Jahresh. G. Ges. Bern, 1895 (1896): 169-174.

Brückner.

Die Frage der Weltkarte im Massstab 1 : 1,000,000 vor dem Londoner Geographenkongress. Bericht . . . von Herrn Prof. Dr. Ed. Brückner.

Church Missionary Society.

Proceedings of the Church Missionary Society for Africa and the East. Ninety-seventh year, 1895-96. London: Church Missionary House, 1896. Size 8½ x 6, pp. lxxiv., 432, and (366). *Maps. Presented by the Church Missionary Society.*

Colonization.

Bibliothèque Coloniale Internationale. 1^{re} Série. La main-d'œuvre aux Colonies. Documents officiels sur le contrat de travail et le louage d'ouvrage aux Colonies. Tome i. Paris: A. Colin et Cie., 1895. Size 9½ × 6½, pp. vi. and 570. Price 20 fr.

Colonization.

Institut Colonial International. Compte rendu de la Session tenue à la Haye les 9, 10, 11, et 12 Septembre 1895. Paris: A. Colin et Cie., 1895. Size 9½ × 6½, pp. 428.

Education.

Dubois.

Les Colonies et l'Enseignement Géographique. Conférence faite sous le patronage de l'Union Coloniale Française. Par M. Marcel Dubois. Paris: L. Chailley, 1896. Size 8½ × 5½, pp. 32.

A plea for fuller instruction in Geography as an incentive to colonial enterprise.

Education.

Herbertson.

On the Importance of Geography in Secondary Education and the Training of Teachers therein. By Andrew J. Herbertson. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895' (Congress Report, pp. 83-87). Size 10 × 6½, pp. 6.

Education.

Lehmann.

Die Vorbildung der Geographielehrer auf den Universitäten Von Dr. Richard Lehmann. Separatdruck aus dem Berichte des Sechsten Internationalen Geographenkongresses. London, 1895. [Congress Report, p. 72.] Size 10 × 6½, pp. 12.

A reprint of Dr. Lehmann's paper on the University education of teachers of geography.

Education.

B. Union G. Nord de la France 18 (1895): 97-135.

Lejeal.

La Géographie dans l'Enseignement primaire: Conférences faites devant les instituteurs de l'arrondissement de Boulogne-sur-Mer. Par M. Lejeal.

Education.

Levasseur.

La Géographie dans les Écoles et à l'Université. Par E. Levasseur. Extrait des Comptes-rendus du Sixième Congrès International de Géographie tenu à Londres en Juillet, 1895. [Congress Report, pp. 27-70.] Size 10 × 6½, pp. 46.

This comprehensive paper gives the fullest description of the official French system of geographical education with specimens of the syllabus for different school-courses.

Educational—Text-book.

Wethey.

A New Manual of Geography for Middle and Higher Forms in Schools. With a Preface on the Oral Method in teaching Geography. By E. R. Wethey. Vol. iv. Europe. London: Rivington, Percival & Co., 1896. Size 7½ × 6, pp. xii. and 314. Maps and Plans. Price 2s. 6d. Presented by the Publishers.

This is a new manual very carefully compiled, and containing a vast amount of information which is brought together with a surprisingly small number of mistakes. The plan resembles the old type of school-geography, being almost entirely tabular, and every artifice of variety of print and arrangement is employed to give full and clear expression to the grouping of facts. How far this improvement of the old style is preferable to the popular method of continuous narrative must be left for practical teachers to decide.

French Colonies.

B.S.G. Commerc., Paris 18 (1896): 329-347.

Henry of Orleans.

Madagascar, Indo-Chine Française, Yunnan, Assam. Notes commerciales et coloniales. Par le Prince Henri d'Orléans. With Map.

French Colonies.

Roux.

Comment rendre nos Colonies prospères. Conférence faite sous le patronage de l'Union Coloniale Française. Par M. J. Charles-Roux. Paris: L. Chailley, 1896. Size 9 × 6, pp. 56.

Geneva Geographical Society. Le Globe, Mém. S.G. Genève 35 (1896): 1-46. Claparède.

Coup d'œil sur la Société de Géographie de Genève depuis sa fondation (1858-1896).

Par M. Arthur de Claparède, Président.

Geographical Congress. XIV. Jahresb. G. Ges. Bern (1895): 3-26.

Brückner.

Rapports du Comité du V^e Congrès international des sciences géographiques et des commissions spéciales sur l'exécution des résolutions votées à Berne en 1891. Rédigés par M. Ed. Brückner.

Geographical Papers.**Venukoff.**

M. Venukoff. *Études géographiques.* Paris: A. Reiff, 1896. Size 7 x 5, pp. 168. *Presented by the Author.*

A collection of papers reprinted from various French journals, dealing with various geographical questions, chiefly relating to Central-Asian explorations.

Geographical Progress. *B.S.G. Paris* (7) 16 (1895): 405-515.

Maunoir.

Rapport sur les Travaux de la Société de Géographie et sur les Progrès des Sciences géographiques pendant l'année 1894. Par Ch. Maunoir.

Geographical Speculation.**Le Plongeon.**

Queen M^o and the Egyptian Sphinx. By Augustus Le Plongeon, M.D. London: Paul & Co., 1896. Size 10 x 7, pp. lxvi. and 278. *Portraits and Illustrations.*

This curious work argues that the Maya civilization was the most ancient, and gave origin to the civilizations of Egypt and Eastern Asia, professes to find documentary evidence of the former existence and disappearance of the mythical Atlantis, and even reproduces an ancient South-American sculpture which is held to contain a representation of the map of the western continent as known to modern cartographers.

Geographical Year-book.

Jahresbericht des Frankfurter Vereins für Geographie und Statistik. Siebenund-fünfzigster bis neunundfünfzigster Jahrgang, 1892-93 bis 1894-95. Im Namen des Vorstandes herausgegeben von Dr. Friedrich Clemens Ebrard. Frankfurt am Main, 1896. Size 10 x 6½, pp. 152.

Geography.**Markham.**

Address to the Royal Geographical Society. By Sir Clements Markham, K.C.B., F.R.S., President. From the *Geographical Journal* for July, 1896. Size 10 x 6½, pp. 16.

Geography.*B. American G. S.* 28 (1896): 146-156.**Dodge.**

Geography from Nature. By Richard E. Dodge.

Suggestions as to home geographical studies in the neighbourhood of New York city.

Geography.*XIV. Jahresh. G. Ges. Bern* (1895): 73-86.**Poinsard.**

Curiosités géographiques. Comment la Géographie explique les phénomènes sociaux. Par M. Léon Poinsard.

Geography as a Science.**Batalha-Reis.**

On the definition of Geography as a Science, and on the conception and description of the Earth as an organism. By J. Batalha-Reis. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size 10 x 6½, pp. 14.

German and Austrian Alpine Club.**Emmer.**

Register zu den Vereinsschriften des Deutschen und Oesterreichischen Alpenvereins einschliesslich jener des Oesterreichischen Alpenvereins und des Deutschen Alpenvereins. 1863-1894. Von Johannes Emmer. Graz, 1896. Size 9 x 6, pp. 166.

A valuable index to the publications of the German and Austrian Alpine Club.

German Colonies.**Meinecke.**

Koloniales Jahrbuch. Beiträge und Mittheilungen aus dem Gebiete der Kolonialwissenschaft und Kolonialpraxis. Herausgegeben von Gustav Meinecke. Achter Jahrgang. Das Jahr 1895. Berlin: Carl Heymanns Verlag, 1896. Size 9½ x 6½, pp. 318. *Portrait.*

German Colonies.*M. Deutsch. Schutzgeb.* 9 (1896): 49-52.

Geographische Positionen einiger Punkte in Deutsch-Ostafrika, in Kamerun, auf den Marshall-Inseln, sowie im Schutzgebiete der Neu-Guinea-Kompagnie nach den Angaben der Nautischen Abtheilung des Reichs-Marine-Amts.

German Colonies.*M. Deutsch. Schutzgeb.* 9 (1896): 115-116.

Geographische Positionen einiger Punkte in Kamerun und im Schutzgebiete der Neu-Guinea-Kompagnie nach den Angaben der Nautischen Abtheilung des Reichs-Marine-Amts.

Lady Travellers.*Blackwood's Mag.* (1896): 49-66.

Lady Travellers.

An inadequate account of some travellers who happened to be women. Those noticed are Ida Pfeiffer, Alexandrine Tinne, Lady Baker, Mrs. Bishop, Miss Gordon

Cumming, Miss Helen Peel, Miss Annie R. Taylor, and Miss Kingsley. The principle of selection, if any, is difficult to find. So many ladies have made yachting tours, accompanied their husbands on excursions, and gone out as missionaries, that it is perhaps inevitable that some should be omitted.

Languages.

Thimm's Self-Taught Library. French (pp. 80, *price* 1s. 6d.); Spanish (pp. 80, *price* 1s. 6d.); German (pp. 80, *price* 1s. 6d.); Norwegian (pp. 80, *price* 2s. 6d.); Italian (pp. 80, *price* 1s. 6d.); Turkish (pp. viii. and 136, *price* 2s. 6d.); Arabic (pp. viii. and 94, *price* 2s. 6d.). London: E. Marlborough & Co. Size $7\frac{1}{2} \times 5$.
Presented by the Publishers at the request of Captain C. A. Thimm.

Lisbon Geographical Society.

Société de Géographie de Lisbonne. Annexe au Bulletin No. 10. Statuts adoptés par l'Assemblée Générale le 3 Juin et approuvés par l'Autorité Publique le 3 Juillet 1895. (Traduction.) Lisbonne, 1895. Size $10 \times 6\frac{1}{2}$, pp. 46.

Local Geography.

Aus allen Weltteilen 27 (1896): 321-326.

Fitzner.

Die Bildung von Abteilungen für Heimatskunde. Von Rudolf Fitzner.

Maps for Education.

J. Geology 4 (1896): 484-513.

Davis.

Large-Scale Maps as Geographical Illustrations. By W. M. Davis.

Gives lists of sheets of the official survey-maps of European countries which Professor Davis has found of value in teaching the types of geographical forms in his practical classes at Harvard.

Missionary Explorations.

B.S.G. Lyon 13 (1896): 541-570.

Groffier.

Explorations et travaux géographiques des missionnaires catholiques en 1894 et en 1895. Par V. Groffier.

Missionary Reports.

Free Church of Scotland. Missionary Reports (Foreign), May, 1896. I. Foreign Missions (including Report of Woman's Society). II. Colonial Missions. III. Continental Missions. IV. Missions to the Jews. Edinburgh, 1896. Size 9×6 , pp. 114, 74, 28, 18, 32.

Mountaineering.

P.R.I. 14 (1896): 451-459.

Dent.

Influence of Science on Mountaineering. By Clinton T. Dent.

Ordnance Maps.

Committee on Sale of Ordnance Survey Maps. Report of the Departmental Committee appointed by the Board of Agriculture to consider the arrangements to be made for the Sale of Ordnance Survey Maps, with copy of the Minute appointing the Committee. Also Minutes of Evidence . . . with Appendices and Index. [2 Reports.] London: Eyre & Spottiswoode, 1896. Size $13 \times 8\frac{1}{2}$, pp. 10 and 90. *Price* 1s. 4d. and 9d.

Phrase-book.

Thimm.

English, French, Turkish, and Russian Vocabulary and Dialogues, for practical use by the Army and Navy, Travellers, Sportsmen, Cyclists, and others in the East. By C. A. Thimm. London: E. Marlborough & Co. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. [74].
Presented by the Publishers at the request of Captain C. A. Thimm.

Place-Names.

Burgess.

Geographical Place-Names in Europe and the East. By Jas. Burgess, o.i.e., etc. Reprinted from the 'Report of the Sixth International Geographical Congress, held in London, 1895.' Size $10 \times 6\frac{1}{2}$, pp. 12.

Place-Names.

National G. Mag. 7 (1896): 221-227.

Gannett.

The Work of the United States Board on Geographic Names. By Henry Gannett.

Place-Names.

Taylor.

Names and their Histories alphabetically arranged as a Handbook of Historical Geography and Topographical Nomenclature. By Isaac Taylor, m.a., etc. London: Rivington, Percival & Co., 1896. Size $7\frac{1}{2} \times 5$, pp. viii. and 392. *Price* 6s.

A dictionary dealing with the origin of certain selected place-names, and containing some additional matter.

Political Geography—Cables.

Depelley.

Les cables sous-marins et la Défense de nos Colonies. Conférence faite sous le patronage de l'Union Coloniale Française. Par M. J. Depelley. Paris: L. Chaillay, 1896. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 40. *Map and Diagram.*

The author shows, in a very striking diagram, how exactly the development of the British submarine cable-system has corresponded with the increase of trade between

the colonies and the mother-country. He points out the political bearings of the monopoly of submarine cables being vested in one nation; and gives a map of submarine lines coloured to distinguish British, French, and other cables.

Royal Navy List.

Lean.

Lean's Royal Navy List. . . . By Lieut.-Colonel Francis Lean. London: Witherby & Co., 1896. Size $9\frac{1}{2} \times 6$, pp. xviii. and 476.

Sixth International Geographical Congress.

Resolutions considered and passed by the Sixth International Geographical Congress, held in London, 1895. Size $10 \times 6\frac{1}{2}$, pp. 10.

Sixth International Geographical Congress.

Erödi.

Jelentés a Londonban tartott hatodik nemzet-Rözi földrajzi congressusról ('Report of the Sixth International Geographical Congress of London'). [Dr. Béla Erödi.] Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. [16.]

Sixth International Geographical Congress—Report.

Report of the Sixth International Geographical Congress, held in London, 1895. Edited by the Secretaries. London: John Murray, 1896. Size $10 \times 6\frac{1}{2}$, pp. xxxvi., 806, 84, and 190. *Maps and Illustrations.*

A note on this volume appeared in the *Journal* for September, p. 290.

Sixth International Geographical Congress.

Campos.

La Geografía en 1895. Memoria Sobre el VI. Congreso Internacional de Ciencias geográficas celebrado en Londres. Por Rafael Torres Campos.—Bol. Soc. Geog. Madrid. Tomo xxxviii. Nos. 1, 2, y 3. 1896. Pp. 48.

Statesman's Year-Book.

Keltie and Renwick.

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the year 1896. Edited by J. Scott Keltie with the assistance of I. P. A. Renwick. [Second Edition.] London: Macmillan & Co., 1896. Size $7\frac{1}{2} \times 5$, pp. xxxii. and 1164. *Maps. Price 10s. 6d. Presented by the Publishers.*

The Statesman's Year-Book, for, we believe, the first time, has been issued in a second edition on account of the great demand. This year's issue contains a series of excellent political maps bearing on burning questions in South Africa, the Pamirs, and Venezuela.

Tropical Hygiene.

Rev. Scientifique (4) 6 (1896): 326-335.

Stokvis.

La colonisation et l'hygiène tropicale. Par M. Stokvis.

Vasco da Gama Celebration.

Soveral.

The Fourth Centenary of the Sea Route to India. Homage to Dom Vasco da Gama on the Anniversary of the Fourth Centenary of the Discovery of a New Route to India. Presented to the Geographical Society of Lisbon by Vicomte de Soveral. Lisbon: National Printing Office, 1896. Size $10 \times 6\frac{1}{2}$, pp. 6.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

ARCTIC REGIONS.**North Pole.**

Herrich.

Neueste Handkarte der Gebiete um den Nordpol. Scale 1:20,000,000. Nach zuverlässigen Quellen bearbeitet von A. Herrich. 3 Auflage, Glogau. Verlag von Carl Flemming. *Price 1 mark.*

This is a small circumpolar map, on which the routes followed by all the principal Polar expeditions since 1827 are laid down, and is specially interesting as showing the route followed by Dr. Nansen, and also the track of the *Fram*.

EUROPE.**Denmark.**

Danish General Staff.

Generalstabens topografiske Kaart over Danmark. Scale 1:40,000 or 1.5 inch to a stat. mile. Kalkograferet og graveret ved Generalstabens Kjobenhavn 1896. Sheets—Lögstar, Thisted, Feggeøind. *Presented by the Danish General Staff, through H.E. the Danish Minister.*

England and Wales.

Ordnance Survey.

Publications issued since September 7, 1896.

1-inch—General Maps:—

ENGLAND AND WALES:—109, 153, hills photozincographed in brown, 1s. each; 100, 218, 235, 348, 351, 352 (revised), engrave 1 in outline, with contours, 1s. each.

6-inch—County Maps:—

ENGLAND AND WALES:—Devonshire (revision), 117 n.w., s.e., 124 n.w., 130 n.w., n.e., 1s. each. Lancashire (revision), 36, 2s. Yorkshires (revision), 63, 95, 164 w., 2s. each; 82, 83, 96, 97, 114, 118, 148, 151, 2s. 6d. each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—Durham (revision), VIII. 1; XIII. 3, 7; XVII. 1, 2, 3, 7, 11, 12, 16; XVIII. 1, 5, 6, 9, 14, 16; XIX. 2, 8, 9, 10, 11, 14, 15; XX. 2, 3, 5, 6, 7, 10; XXV. 2, 3, 4; XXVI. 1, 3s. each. Essex (revision), XLI. 9; XLIX. 11; LVIII. 7, 10; LIX. 14, 15; LXVI. 16; LXVII. 3, 4, 5, 7, 8, 9, 11, 12, 13; LXVIII. 10, 13, 14, 15; LXXIV. 8; LXXV. 1, 4; LXVI. 1, 2, 3, 8s. each. Hampshire (revision), XII. 7; XIX. 1; XX. 1, 2, 6, 9, 10, 11, 15; XXVII. 16; XXVIII. 3, 7, 9, 10, 11, 13, 14, 15; XXXI. 16; XXXII. 2; XXXIV. 5, 7, 9, 15, 16; XXXV. 4, 5, 7, 8, 11, 12, 13, 14, 15; XXXVI. 1; XXXIX. 11, 12; XL. 1, 2, 3, 4, 5, 6, 7, 8, 10; XLI. 5, 10, 11; XLII. 1, 2, 4, 8, 11, 12; XLIII. 1, 2, 5; XLIX. 3, 3s. each. Kent (revision), XVII. 1, 3, 4, 7, 9, 10, 11, 12, 13, 14, 3s. each. Middlesex (revision), IX. 7, 11, 15, 16; XI. 2, 9, 13; XV. 1, 3, 4, 10, 14, 8s. each. Northumberland (revision), LXXXII. 12, 16; LXXXIII. 11; LXXXIV. 5, 7, 9, 11, 12, 14, 15; XCI. 4, 5, 7, 11, 12, 15; XCII. 8, 13; XCIII. 2, 10, 14, 15; CL. 1, 2, 3, 4, 5, 6, 7, 9, 10, 12; CII. 2, 4, 5, 8, 12, 15; CIII. 13, 14, 15, 16; CVIII. 3, 3s. each. Surrey (revision), X. 5; XI. 11; XVI. 14; XX. 12, 16; XXIII. 6, 16; XXIV. 3, 13, 14, 15, 16; XXV. 12, 13, 15, 16; XXVI. 1, 2, 3, 5, 6, 7, 10; XXXI. 1, 4, 5; XXXII. 1, 2, 3, 6, 7, 8; XXXIII. 1, 2, 3, 5, 6, 7, 8s. each.

(E. Stanford, Agent.)

England.**Bartholomew.**

New plan of Eastbourne from the Ordnance Survey, by John Bartholomew, F.R.G.S. Scale 295 yards to an inch. W. H. Smith & Son, London, 1896.—New plan of Hastings and St. Leonards from the Ordnance Survey, by John Bartholomew, F.R.G.S. Scale 835 yards to an inch. W. H. Smith & Son, London, 1896. Price 1s. each, on cloth. Presented by Messrs. J. Bartholomew & Co.

These plans are reductions from the Ordnance Survey, which have been corrected and brought up to date by the local authorities. They are accompanied by explanatory letterpress, and are furnished with indexes.

England.**Bartholomew.**

London Environs. Fifty mile radius. By John Bartholomew, F.R.G.S. Scale 1: 253,440 or 4 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. Price 2s. on cloth. Presented by Messrs. J. Bartholomew & Co.

The country within a radius of more than 50 miles is included in this map. The approximate distance of any place from the metropolis can be seen at a glance, as concentric circles, 5 miles apart, are drawn from London as a centre.

Germany.**Kgl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1:100,000 or 1.5 stat. miles to an inch. Herausgegeben von der Kartogr. Abteilung de Kgl. Preuss. Landes-Aufnahme, 1896. Sheets: 248, Friedeberg i. d. Neum; 347, Fraustadt; 353, Wesel; 372, Glogau; 378, Krefeld. Price 1.50 marks each sheet.

Scotland.**Bartholomew.**

Bartholomew's Reduced Ordnance Survey of Scotland. Sheet 9, Berwick and Haddington. Scale 1: 126,720 or 2 stat. miles to an inch. John Bartholomew & Co., Edinburgh, 1896. Price 2s. on cloth. Presented by Messrs. J. Bartholomew & Co.

This is a revised edition of Sheet 9 of Bartholomew's reduced Ordnance Survey of Scotland.

ASIA.**Indian Government Surveys.****Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Sheets: No. 14, district Peshawur and parts of districts Kohat, Rawal Pindi and Hazara (Punjab), Buneya, Swat, Kabul, and Terah (Afghanistan), additions to 1892; No. 103, parts of districts Azimgurh, Ghazipur and Benares (N.W. Provinces), Tirhoot, Sarun, Patna, Shahabad, and Gya (Bengal), additions to 1895; No. 121, district Howrah, and parts of districts 24 Paganas, Burdwan, Khulna, Nadia, Jessore, Faridpur, Backergunge, Midnapore, and Hooghly (Bengal), with additions to 1895. Quarter-sheets: No. 35 s.e., parts of native states Oodeypore, Jhallawar, Partabgarh and Banawara (Rajputana), and of Gwalior, Indore and Western Malwa Agencies (Central India), with additions to 1891; No. 38 n.w., parts of district Nasik and of Dang, Baroda, Bausda, and

Dharampur States (Bombay Presidency), April, 1896; No. 69 s.w., parts of districts Jhansi, Hamipur (N.W. Provinces), Gwalior, Tehria, and Datia (Native States), C. I. Agency, with additions and corrections to 1891; No. 70 n.e., parts of districts Banda (N.W. Provinces) and Damoh (Central Provinces), of Native States Bijawar, Panna, Pathar, Kachhar, Chhatarpur, Ajaigarh, Jaso, Charkhati, Kothi, Sohawal, Nagode, and Chobe, Bundelkhand (C. I. Agency), additions to 1889; No. 114 s.w., parts of districts Lohardaga, Manbhum, Midnapore, and Singhbhum (Bengal), April, 1896.—Bengal Survey, 1 inch to a mile. Sheet No. 293 (second edition), districts Darjeeling and Jalpaiguri, Seasons 1858-59, 1861-67, 1880-81, and 1889-92.—Bombay Survey, 1 inch to a mile. Sheet No. 309, districts Dharwar and N. Kanara and Native State Savanur (Dharwar Agency), Seasons 1893-94.—Upper Burma Survey, 1 inch to a mile. Sheet No. 312, Southern Shan States, Season 1893-4.—Lower Burma Survey, 1 inch to a mile. Sheets: No. 272, district Toungoo, Seasons 1890-91 and 1892-93; No. 273, district Toungoo, Seasons 1890-91-92; No. 419, district Thaton, Season 1893-95; No. 423, district Amherst and Thaton, Seasons 1890-95.—North-Eastern Frontier Survey, 1 inch to 4 miles. Parts of Northern Shan States, Season 1894-95.—Gujarat, 16 miles to an inch, April, 1896.—Upper Burma, 16 miles to an inch. Second edition, 1894, with corrections to boundaries up to October, 1895, 2 sheets.—District Noakhali, Lower Provinces (Bengal), 5 miles to an inch, with additions and corrections to boundaries and roads to February, 1896.—District Hazaribagh, Lower Provinces, Bengal, 5 miles to an inch, with additions and corrections to roads up to April, 1896.—District Nowgong, Assam, 5 miles to an inch, additions and corrections to November, 1893.—District Raipur, 5 miles to an inch, Seasons 1862-64 and 1866-72, additions to March, 1892, 2 sheets.—District Mirzapur, 16 miles to an inch, February, 1896, 6 sheets.—District Mizapur (N.W. Provinces of Oudh), 12 miles to an inch, 1896.—District Garhwal (N.W. Provinces and Oudh), 12 miles to an inch, 1896.—District Meerut (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Moradabad (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Muttra (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Muzaffarnagar (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Partabgarh (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Shahjahanpur (N.W. Provinces and Oudh), 8 miles to an inch, 1896.—District Backergunge (Bengal), 8 miles to an inch, 1890.—District Bogra (Bengal), 8 miles to an inch, 1890.—District Purnea (Bengal), 8 miles to an inch, 1889.—District Rajshahi (Bengal), 8 miles to an inch, 1890.—Map of Sundarbans (Bengal), 16 miles to an inch, 1890.—Central Province Survey, Index to the Forest Surveys in District Sambalpur; No. 14 party, November, 1895.—Index to the Forest Surveys in district Bilaspur; No. 14 party, November, 1895. Presented by H.M. Secretary of State for India, through India Office.

AFRICA.

Swaziland.

Miller.

Sketch-Map of Swaziland made for the Umbandine Swaziland Concessions Syndicate, Ltd. By Allister M. Miller. Scale 1: 190,000 or 3 stat. miles to an inch. London: published by Edward Stanford, 1896. Presented by the Publisher.

In the absence of any regular survey of this part of South Africa, this will be of service to persons visiting the country. Means of communication are laid down, and a good general idea of the physical features is given. All land lower than 1500 feet above sea-level is coloured green, and the positions of native kraals, approximate elevations, and nature of the forests are indicated by symbols.

Tunis.

Babelon, Cagnat, and Reinach.

Atlas Archéologique de la Tunisie. Edition spéciale des cartes topographiques publiées par le Ministère de la Guerre, accompagnée d'un Texte Explicatif par M.M. E. Babelon, R. Cagnat, S. Reinach, membres de la Commission de l'Afrique du Nord. Description de l'Afrique du Nord entreprise, par ordre de M. le Ministre de l'Instruction Publique et des Beaux-Arts. Parts iii. and iv. Paris: Ernest Leroux, 1895-96.

This atlas is being compiled under the direction of the Minister of Public Instruction and Fine Arts. It is composed of the sheets of the large-scale government survey of Tunis, on which archæological information is given. It is accompanied by letterpress, written by M.M. E. Babelon, R. Cagnat, and S. Reinach.

West Africa.

Marchand.

Mission Marchand, le Transnigérien, le Bandama et le Bagoé. Carte levée et dressée de 1892 à 1895. Par le Capitaine Marchand. Scale 1: 500,000 or 8

stat. miles to an inch. 2 sheets and letterpress. Service Géographique des Colonies, Paris, 1896. *Presented by the Service Géographique des Colonies.*

This map is based on the results obtained by Captain Marchand during his third journey in the vicinity of the great bend of the Niger, the surrounding country having been taken from Captain Binger's map of 1892. In addition to this, the itineraries of other travellers have been used, while some of the country has been sketched in from native report. The lines of railway which it is proposed to construct are laid down, and the position of all military posts and the limits of forests are shown. The map is accompanied by an index of names and explanatory letterpress.

West Africa.**Pobéguin.**

Carte de la Côte d'Ivoire (Région Côtière de Fresco au Cavally). Levés et dressée par H. Pobéguin, Administrateur Colonial, par ordre de M. le Gouverneur Binger, 1895-96. Scale 1: 150,000 or 2.3 stat. miles to an inch. Sheets: Cavally, Grabo—Haut San Pedro, Kremoue—Kouati, Doboue—Sassandra, Fresco—Haut Sassandra, Daguire—San Pedro, Drewin—Tabou, Béréby—Cap des Palmes, Cavally. Ministère des Colonies, Paris, 1896. *With Index. Presented by the Service Géographique des Colonies, Paris.*

These sheets complete the map of the Ivory Coast, which embraces the country between the Cavally river on the west and the Bandama on the east. It contains a large amount of detail, and is accompanied by an index sheet.

AMERICA.**United States.****U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1: 125,000 or 2 stat. miles to an inch, and 1: 250,000 or 4 stat. miles to an inch. Folios: Stevenson (Alabama, Georgia, Tennessee); Lassen Peak, Smartsville, Marysville (California); Pike's Peak (Colorado); Nomini (Maryland, Virginia); Three Forks (Montana); Cleveland, Pikeville, McMinnville, London (Tennessee); Knoxville (Tennessee, North Carolina); Fredericksburg (Virginia, Maryland); Staunton (Virginia, West Virginia). Department of the Interior, United States Geological Survey; J. W. Powell, Director. Washington, D.C. *Presented by the U.S. Geological Survey.*

Venezuela.**Sievers.**

Nördliches Venezuela. II. Hohenschichten, Hydrographie, Orte u. Verkehrswege. Scale 1: 3,000,000 or 47.3 stat. miles to an inch. Von W. Sievers. Petermann's 'Geographische Mitteilungen,' Jahrgang 1896, Tafel II. Gotha: Justus Perthes. *Presented by the Publisher.*

AUSTRALIA.**Western Australia.****Stanford.**

The Western Australia Goldfields. Scale 1: 1,647,360 or 26 stat. miles to an inch. Edward Stanford. London, 1896. *Presented by the Publisher.*

On this map the positions of all the principal goldfields of Western Australia are indicated, but, in addition to this, it is a good map of the south-west portion of the colony, on which all railways, roads, and explorers' routes are laid down.

World.**Bartholomew.**

Handy Reference Atlas of the World. Edited by J. G. Bartholomew, F.R.S.E., F.R.G.S. Fifth edition, with complete index and geographical statistics, 1896. London: John Walker & Co., Ltd. *Prices 7s. 6d. and 10s. 6d. Presented by the Publishers.*

This atlas has now reached its fifth edition. It has been revised, and several new maps have been added. Being of octavo size, it will be found very handy for reference when reading a newspaper or book.

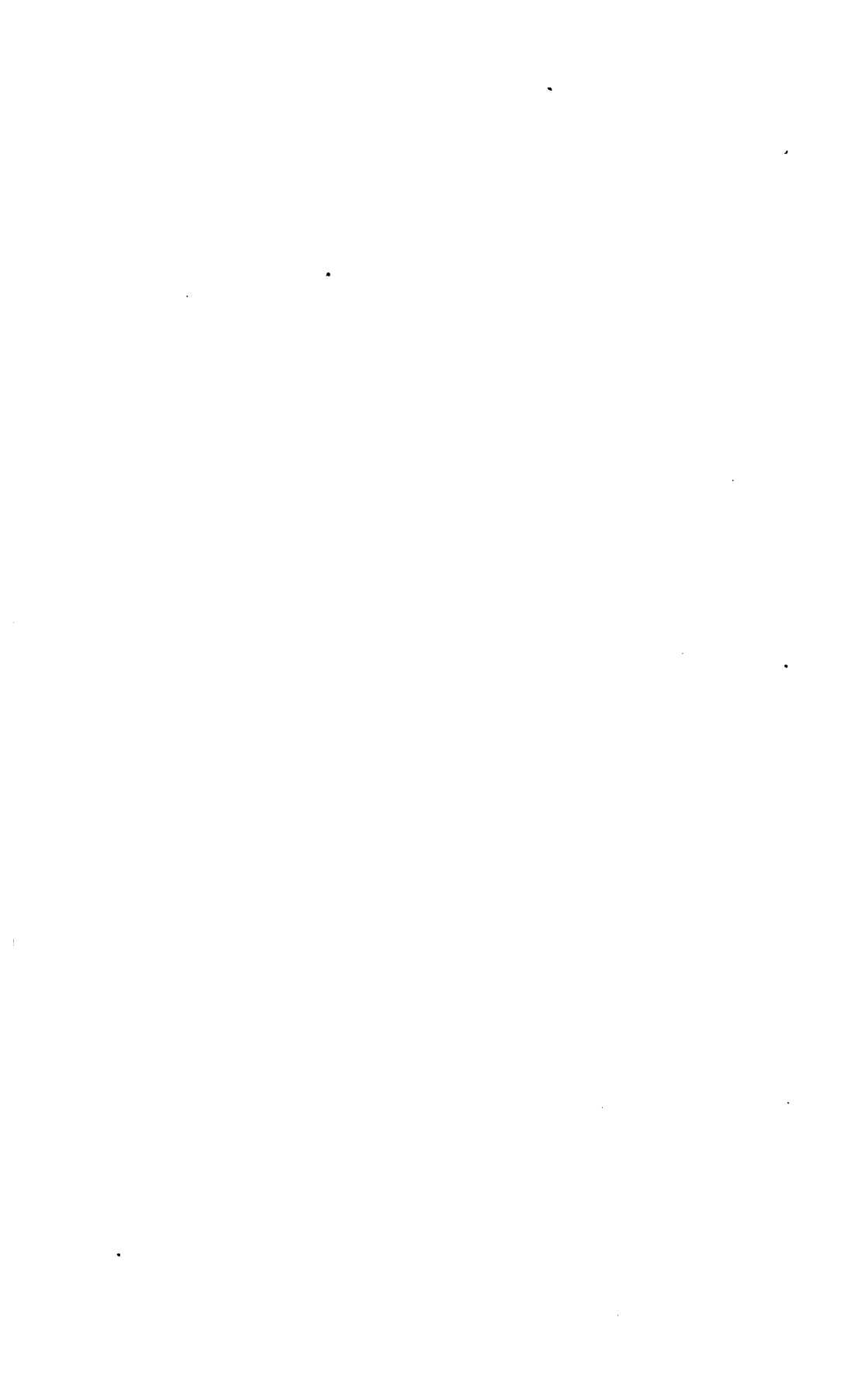
PHOTOGRAPHS.**Malay Peninsula.**

Four photographs of the Sakai natives of the Malay Peninsula, taken in 1894-95. *Presented by George C. Morant, Esq.*

These photographs will be chiefly interesting to anthropologists. They were taken for Mr. George C. Morant, 1894-95.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.





The Geographical Journal.

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VOL. VIII.

OPENING ADDRESS BY THE PRESIDENT, 1896-97.

We open the Session with the prospect of much useful and some important work before us; and we can look back upon the Session that is past, and upon the work of the recess, with complacency. We must, I think, specially congratulate ourselves on having made a complete revision of the Bye-laws, which had not been done since the Charter was granted in 1859. This revision will, I feel sure, be conducive to the best interests of the Society. On the one hand, it gives more flexibility and efficiency to the administrative side of the Society's business; and on the other, it has secured a fuller and less trammelled exercise of the rights secured to the Fellows under the Charter, in a way which I believe has given general satisfaction. All well-wishers of the Society may, therefore, entertain a well-grounded hope that perfect harmony will continue to reign amongst us for many years to come.

The fruits of this mutual good understanding are shown in our increasing numbers, in our sound financial condition, and in our work. The *Journal*, under Mr. Keltie's able editorship, not only preserves the high standard of excellence which marked the opening of the present series, but goes on increasing its reputation. This is said to me not only by many of my associates here, but also by foreign geographers wherever I meet them.

Last session the most important communication was the paper on the Pamirs by our Vice-president, Mr. George Curzon, which was printed in three successive numbers of the *Journal*. This paper appeared to me to be so valuable, especially the last part in which Mr. Curzon gives a masterly and exhaustive *resumé* of previous exploration, that I have recommended to the Council that it should be reproduced in book form, accompanied by Mr. Curzon's new map of the

Pamirs. We have also published two other maps of great importance, which contribute new materials to geography. The map of Tibet, illustrating Mr. Littledale's journey, correctly lays down portions of the northern part of the Tibetan plateau for the first time; while Dr. Donaldson Smith's map makes us acquainted with the exceedingly interesting region between Somaliland and Lake Rudolf.

This year has also seen the completion of the great work on the Caucasus by our late secretary, Mr. Douglas Freshfield, which is monumental in its completeness and in the admirable arrangement of the rich materials which compose it. The descriptive parts are alike entertaining and instructive, and the numerous beautiful illustrations are beyond all praise.

We all remember the account which Prince Henry of Orleans was so good as to come over and give us, of his remarkable journey across the headwaters of the Irawadi. We have now received the results of that exploration in the shape of a map drawn by his accomplished and gallant companion, M. Emile Roux, Enseigne de Vaisseau, in the French navy. M. Roux has also written an excellent critical article in the *Annales de Géographie*, reviewing the labours of former explorers, and tracing out the limits of the Irawadi basin. Prince Henry of Orleans and M. Emile Roux are young explorers, but they have already well earned the admiration and high appreciation of their brother geographers.

With due regard to financial requirements, we have endeavoured to provide for the issue of several valuable papers and memoirs which remain in manuscript, and I am glad to be able to announce that General Schindler's paper on Eastern Persia, and Captain Snow's account of the Kuril Islands will soon be ready for delivery.

In the forthcoming Session, our principal and most determined efforts will be turned towards the promotion of an Antarctic expedition. I am sorry to say that I cannot hold out any hope that our Government will resume that glorious work of Antarctic exploration which, until now, has been peculiarly naval work. Still, I venture to anticipate that neither the Imperial nor the Australian governments will withhold assistance and sympathy when the time comes. Meanwhile any well-conceived and properly provided expedition, designed to execute useful exploring work in the far south, will receive the hearty support and co-operation of this Society.

Several papers of great interest will occupy us during the coming Session, among which I may mention Captain Vandeleur's account of his journeys in Uganda, Colonel Trotter on the source of the Niger, Captain Gibbons on the Barotse country, and Sir Martin Conway's account of his Spitzbergen expedition. I also hope to commemorate this session, at an evening meeting, the fourth centenary of the sailing of John Cabot from Bristol. Our afternoon meetings will be engaged, among other subjects, in the consideration of Mr. Vaughan Cornish's

researches into the action of blown sand in the formation of sand-dunes, of Mr. Bedford's paper on the tapestry maps of English counties in the sixteenth century, and Mr. Andrews' views on the teaching of geography in relation to history.

The great event of the Session will be the arrival of Dr. Nansen. We shall receive him, and hear the remarks he has to offer to us, on the subject of his memorable expedition, on the 8th of next February. Dr. Nansen has already received one of our royal awards. But my distinguished friend has since achieved a success which has justly aroused the enthusiastic admiration of the whole civilized world. He is a great explorer from every point of view—in his conceptions, in his scientific attainments, in the completeness of his preparations, in his power over others, in the way he overcomes all obstacles, in his dauntless courage and marvellous endurance. We are resolved to do him honour when he comes amongst us; and I am quite sure that the resolution of the Council, that Dr. Nansen shall be presented with a special gold medal on his arrival, will meet with the hearty approval of the Fellows of this Society.

Still Mr. Jackson and his gallant comrades remain at their posts, exploring the islands of the Franz Josef group, and collecting valuable information in all branches of science with untiring zeal, and in the face of great difficulties and dangers. We do not forget our good friends in Franz Josef Land, but look forward anxiously for news of their welfare and of their achievements. Last year Mr. Montefiore Brice gave us a very short hour of great enjoyment in listening to the admirable way in which he described to us the proceedings of the Jackson Expedition. A year, exactly a year, has elapsed, and we have the pleasure of welcoming Mr. Montefiore Brice amongst us again. He will explain the more recent labours of our gallant Arctic explorers, and I can promise you a most delightful time this evening, in listening to what he is about to tell us.

THE JACKSON-HARMSWORTH POLAR EXPEDITION.*

NOTES OF THE LAST YEAR'S WORK.

By ARTHUR MONTEFIORE BRICE, F.G.S.

TO-MORROW it will be exactly a year since I had the honour to submit to this Society a report of the work then accomplished by the Jackson-Harmsworth Expedition. This expedition, as you are aware, was despatched from England in 1894 by Mr. Alfred Harmsworth, a Fellow of this Society, and he placed in command another Fellow of the

* Paper read at the Royal Geographical Society, November 10, 1896. Map, p. 656.

Geographical Society, Mr. Frederick Jackson, who is now wintering for the fourth successive year in the Arctic Regions.

Well, I concluded my paper last year with the hope that this autumn we might again welcome the gallant little *Windward* home, "and with her, too, another and even more important budget of news—news of discovery, news of success, and, best of all, news of well-being and good health."

That hope, I have the highest satisfaction in telling you, has been more than abundantly justified. For the *Windward* herself made a most remarkable passage—sailing under the able and energetic command of Captain James Brown from Vardö, on June 29, navigating some 600 miles of pack-ice, discharging a large and very valuable cargo at Franz Josef Land, and returning to Vardö six weeks to the day after she had left that northern port. She brought with her, too, the good news for which we had hoped—news of systematic exploration and its fruit of valuable discovery; news of successful battling with the well-nigh overwhelming odds which Nature in her Arctic mood presents; and news of the continued and almost unprecedented well-being of our gallant explorers in the great White North.

Moreover, the *Windward* brought the world a great surprise. Rather over three years ago, an Arctic explorer—perhaps the most audacious the world has yet seen—had set sail on a voyage which experience, knowledge, and science regarded with feelings not greatly different from dismay. I allude, of course, to Frithjof Nansen and his voyage in the *Fram*. On August 3, 1893, he passed through the strait of Yugorski Sohar into the Kara Sea, and from that moment he was not merely lost to sight, but to all knowledge or opportunity of knowing. For three long years there was silence and, I think, steadily growing anxiety; and then, when the most sanguine of us were looking for him or news of him from the ice-laden waters of Greenland, and the most desponding were telling us it were vain to look at all, the *Windward* steamed into the fishing-port of Vardö, having on board as passengers Dr. Nansen and his companion Johannessen. The delight and the wonder of it were not confined to what we call "geographical circles," but commanded the attention of that world which honours the courage and applauds the prowess of the polar explorer—a world which is as wide as our globe, and only limited by the distribution of the human race. Of the strange chance that brought it to pass that Nansen and Johannessen should be on the *Windward*, and of what had happened in Franz Josef Land before Mr. Harmsworth's polar yacht had reached Mr. Jackson's quarters, I shall endeavour to give some account a little later. But I have referred to these several points now to remind you how abundantly justified has been that hope that "another and even more important budget of news" would come to our hands this year. It is a year, in fact, which will remain an *annus mirabilis* in the history of discovery.

But I may also note, in passing, that a considerable amount of work of secondary importance has been attempted and, in one or two instances, completed in 1896. Peary has made an interesting voyage into Smith's sound, though it in no way compares, of course, with his magnificent journeys across the great inland ice-cap of Greenland. Andrée has accomplished all but the final flight on his great venture of sailing through the air to the Pole. And Sir George Baden Powell has been able, in his yacht, to afford in Novaia Zemliau waters an exceptional opportunity and a new vantage ground for English astronomers.

We must now return, however, to the summer of 1895, to July 8, when the *Windward* started homeward on that memorable voyage through



CAPE GERTRUDE (taken with a telephoto lens).

the ice, which for sixty-three days defied all the efforts of steam-power and the incessant labour of her crew. Exactly three days later—on July 11—Mr. Jackson set sail on a westerly voyage of discovery in the little ship, the *Mary Harmsworth*. This was a whale-boat, rigged with lug-sail and jib, 25 feet 6 inches long, 5 feet 7 inches in beam, and undecked. Accompanying him were Mr. A. Armitage, Lieut. R.N.R., second in command; Mr. H. Fisher, botanist; Mr. J. Child, photographer; Blomvist, an A.B. taken from the *Windward*, and whose record of work in Franz Josef Land is very good; and Mr. S. Burgess, whose place was a day or two later taken by Mr. Reginald Kettlitz, the doctor and geologist of the expedition. The object of this boat journey was to extend our knowledge of the coast-line, to survey and fix the positions of the main points, to enter and explore the intervening fiords and bays, and to

discover, if possible, new land to the westward. The party had a month's provisions with them, some stores for a depôt to be made on Cape Grant, and a canvas boat was towed for additional service and safety. This last was the more necessary as landing-places are few and far between in the almost continuous glacier-wall, which forms a perpendicular face to the coast. Moreover, as we shall see, storms rise suddenly and become severe and dangerous.

On the evening of July 11 the party tied up to the land-floe off Bell island, to find that Eira harbour was full of heavy winter ice, and of no use to the navigator. The next evening they reached Cape Grant, where they established one of the depôts which Mr. Jackson is gradually placing all over this Archipelago—for his own or some other explorer's benefit—and here, too, they left the canvas boat. On the 13th they started again, this time for Cape Crowther; but the sea-ice came in very quickly with the incoming tide, and the boat had several severe nips before she could be got out of the water on to the fast ice of Gray bay. This ice showed no signs of having been broken up that year, and as the sea-ice was still coming in on a strong tide and with irresistible force, Mr. Jackson headed back for Cape Grant. Establishing a camp here, he sent the boat on a mission to Elmwood, the headquarters of the expedition, under the command of Mr. Armitage. Mr. Jackson and his companions in the mean time dredged and made collections of everything that could be procured. He and other members of the party ascended to the summit of Cape Grant by the glacier, and erected a cairn; but on looking over the sea westward, it was evident that the ice was retreating seaward again, and so on the 20th the voyage was renewed. Early on the 21st Cape Crowther was reached, and, bad weather delaying them here for a day, it was utilized in ascending to the summit of the cape, erecting a cairn, and making such observations as were possible. On the 22nd, however, they were able to start again, and late that night they gained Cape Neale. The boat was now sent back to Grant for some provisions, while the remaining members devoted themselves to observing and collecting. The cape was climbed, the usual cairn erected—I may say that in all these cairns a Union Jack was placed—and Mr. Fisher, the botanist, searched for additions to his department, and Mr. Kettlitz, in his capacity as geologist, for rocks and fossils. I may mention, in passing, that Mr. Fisher was able on this journey, as at other times, to make some important and highly interesting sketches.

It was when on the summit of Cape Neale that, the day being clear, Jackson was able to distinguish high land bearing away west of the farthest point previously seen. Anxious to see this new land at closer quarters, he started once more in the *Mary Harmsworth* on the 28th. He sailed across Cambridge bay, and then, and at other times, took every opportunity of mapping it; and at the head of the bay he discovered

a bold and lofty headland which he named Cape Frithjof Nansen. On either side of this headland a strait appeared to lead away to the north and connect with the sea beyond. Passing Cape Ludlow, an unimportant promontory, ice-capped and glacier-faced like the greater part of the coast, he rounded the next point—Cape Lofley—and looked, for the first time at close quarters, upon a cape of majestic if of truly Arctic character. As the boat approached it, the weather suddenly changed for the worse. A storm-cloud lowered in the west; a dense bank of fog came up from the sea. The wind rose to a moderate gale, and set the ice-pack in motion, rendering the position of the boat one of considerable peril. Nevertheless, it was sent slowly ahead, and they drew nearer to the land. Right in front of them the great white headland rose out of the water. At its base there stood a vertical face of ice some 30 feet high; then steep talus, covered with snow and ice, sloped at a steep angle upward to a narrow corona of rocks about 700 feet above; above this, again, came the ice-cap, which rose without a break to an elevation of at least 2000 feet. This cape is one of the most imposing yet discovered in Franz Josef Land, and the circumstances of its discovery were not calculated to depreciate its character. For the storm-cloud which now hung over it loomed very dark; a cold and weird buff-tinted glare flickered ominously beyond on the horizon; the water grew black under the growing darkness of cloud; while the cape rose serene and beautiful from all this gloom—a great mass of pure dead white, with scarcely a perceptible shadow to denote the inequalities of its contour, and blending at its summit as it receded from the sight with the snow-squalls that now whirled round the high cap of ice. Opportunity had, however, been presented for sketching and taking bearings, and the newly found cape received the name of Cape Mary Harmsworth.

It was just at this time, however, that the whole party were nearly lost. The wind had so increased that it blew with the force of a strong gale in gusts, and the broken-up pack allowed a heavy sea to get up. The masses of disrupted ice were in rapid and eccentric motion, and momentarily threatened to crush the boat to matchwood. Neither was there shelter near. The whole of the coast was girded with a wall of ice not less than 30 feet high; there was not even a spit of bare rock, such as occasionally occurs further east, to afford a landing-place.

For two days the gale blew hard, and on the third I find this note: "The gale blowing as hard as ever from the north and north-west. The snow drives incessantly, the sea still high. How the boat keeps up is a wonder." A little later I get this note, showing that even under these uncomfortable circumstances the eye of the observer was not closed:

"Several times during the day I noticed a very remarkable appearance in the sky, as the wind brought up the snowstorms. It appeared as if laths of wood were irregularly distributed over the sky, even to the zenith, wherever the nimbus clouds of the snowstorm covered it; and on

the northern horizon appeared three poles, exactly resembling the three bare masts of a ship with the hull hidden by the high waves. They were white, and at equal distances from each other. The 'laths' were also white, and appeared straight, and the edges ran parallel to each other. They were all of a uniform breadth."

Well, to cut a somewhat long story short, the gale did not lull until the evening of the third day, by which time the *Mary Harmsworth* had been blown about 50 miles off the land in a south-easterly direction. Then, fortunately, a change in the direction of the wind to the eastward enabled them to run back to land under double reefs, travelling about 8 knots an hour, until they once again safely made Cape Grant.

Mr. Jackson notes down in his journal, "Since leaving Cape Neale, three days ago, no one has had any sleep or eaten anything but biscuits, except Child and I, who had a raw dovekie each. The last night was even colder than those which had gone before. The snow and sleet continued, and we were tired and hungry; but sleeping was out of the question, as the boat had to be constantly bailed, and getting at the food was too great a business. Thus we rode out the night, expecting at every moment to go down, so high had the sea become, and so much less buoyant our boat. Every one was more or less cheerful, though. All my men have behaved extremely well, and if we had gone to the bottom they would have done so as becomes men."

The camp at Cape Grant, rough though it was, appears to have been a luxury after the cramped quarters in the boat, but there was plenty of work to do. Twice had the boat been stove in by heavy blocks of ice, and she required repairing in several directions. Moreover, before she was ready to start, another heavy gale sprang up and lasted for six days, leaving the sea strewn with fairly heavy ice and unmistakably in its early winter coat. Jackson consequently determined to return to Elmwood while he could. So on August 5 he left Cape Grant, and after visiting Cape Stephen, Bell and Mabel island, and the intermediate coasts, he regained Elmwood, at Cape Flora, on August 12. "We only got back," he writes, "in the nick of time, for the following day the sea became packed with ice, and it would have been extremely difficult, if not impossible, to cross the intervening water."

Taking this boat journey in review, I may first point out that Jackson's observations during its progress confirmed him in the opinion that June and July are better months for navigating in Franz Josef Land waters than August and September. The influence of the wind, he incidentally points out, is noteworthy in the fact that for two years he had found the ice packed against the land while the sea was open, in June and July.

The next noteworthy feature is the fact that for the first time those capes and that coast which were seen by Mr. Leigh Smith from the *Eira* in 1880 and 1881—in some cases at a considerable distance and under

the disadvantageous circumstances of mist and fog—were actually reached and ascended; their position was for the first time accurately laid down after a series of careful observations; and collections made which, when worked out, cannot fail to decisively establish the geology and natural history of a region never previously visited.

But there is yet another point in connection with this boat journey. Jackson has advanced Franz Josef Land a considerable distance westward of the previously known limit; and in doing this, he has, I contend, rediscovered and at last attained the long lost and most mysterious Gilies Land.

It was in 1707 that Captain Cornelis Gilies, a Dutch navigator



THE ICE OFF ELMWOOD, CAPE FLORA.

sailed eastward of the Seven Islands for some leagues. He then altered his course to south-east and south, and when in lat. 80° N., he saw very high land about 25 miles—old Dutch miles, one to four English geographical miles—to the east from North-East Land. This land has since that time been known as Gilies Land. Many navigators have tried to reach it and failed; only two, indeed, have been fortunate enough to sight it. Captain Carlsen—memorable for having been the circumnavigator of Spitzbergen and Novaia Zemlia—sighted Gilies Land on August 16, 1863, in the brig the *Jan Mayen*; and Captain Tobiesen, when in command of the schooner *Eolus*, sighted Gilies Land on August 7, 1864. This land was seen by Captain Carlsen when sailing down the east coast of North-East Land; by Captain Tobiesen when he was in the

position of 12' N. by W. of the eastern point of North-East Land. From that point Gilies Land bore S.E. by S. The observation of Captain Tobiesen is the more important because he continued to see the land during the two succeeding days.

Now all the three navigators who have sighted Gilies Land closely agree as to its position. However far it may extend north and south, it is quite clear that the parallel of 80° N. lat. runs through it. It is true that you will find it in your maps to-day a degree and a half further north, but that seems to be mainly due to the waywardness of a German geographer and the complaisance of those English cartographers who believe in maps made in Germany—though not, I may add, without reasonable grounds. On this question of Gilies Land, however, the Germans have not the shadow of any evidence in their favour. It will be sufficient, I think, for English geographers if I cite the opinion of Sir Clements Markham—for many years and still our highest authority on early Arctic voyages, as well as in other departments of historical geography. In his valuable summary, 'The Threshold of the Unknown Region,' which has gone through many editions, he distinctly states that the narrative of Gilies' voyage, as given by Daines Barrington, "exactly agrees with Van Keulen's chart" and also "with the bearings taken by Tobiesen in 1864. But," continues Sir Clements, "Dr. Petermann has written rather disparagingly of Van Keulen's chart, and has altered the position of Gilies Land from 80° to 81° 30', referring to Barrington as his authority. Mr. Foster, who was one of the lieutenants in Parry's expedition of 1827, gives a very different estimate of the value of Van Keulen's work. He says, 'We recognized distinctly almost every feature of the lands delineated in the old Dutch chart.'"

That being so, I am content to consider Gilies Land as moved back again to the old latitude of 80° N. Now, Mr. Jackson, in extending the coast of Franz Josef Land to Cape Mary Harmsworth, which lies in 80° 20' N. lat. and 42° 30' E. long., comes (as he approaches from the east) within—putting it roughly, of course—some 30 miles of the western coast of Gilies Land; of that coast, in fact, which was seen by Gilies. No land was seen by Mr. Jackson to the westward or south of westward, and it seems to me perfectly clear that, in discovering that grand cape Mary Harmsworth, Mr. Jackson has also been the first to approach the land which has so long been a matter of debate and speculation. For Mary Harmsworth is, in my opinion, the southern point of the long-sought Gilies Land.

The winter of 1895-96 was passed at Elmwood, the headquarters of the expedition—so comfortable and commodious with its long line of huts that we might call it a village, if there were only a few more villagers. At any rate, it is the most northerly British settlement in the world. And early in the present year, preparations were begun for another journey northward, but the conditions of the late winter and

spring climate were so remarkable as to deserve a passing notice, which I will take from Mr. Jackson's journal.

"Since the middle of February," he writes, "we have had weather I believe to be unprecedented in this latitude. The thermometers during this time have been hovering close up in the neighbourhood of freezing-point, and we have had in consequence great quantities of snow, which lies deep and wet on the floes. On March 5 the air was as balmy as June. There have been no cold winds to harden the snow on the floes, and it is almost impossible to drag the sledges across it. Our furs get



CAMP AT CAPE GRANT, JULY 30, 1895.

dripping wet, and when the inevitable fall in temperature comes, they are frozen hard as steel."

But this sort of weather is frequently broken, even in the summer, by violent gales, accompanied by low temperatures, and "the New Year," writes Mr. Jackson, "opened fire with a gale of wind, accompanied by 73° of frost (Fahr.). A week later we had a hurricane for four days, the temperature falling to 80½° of frost."

It was on March 18 of this year that a start was made for the journey towards the north. The party consisted of three—Jackson, Armitage, and the sailor Blomvist. They had with them seven 9 foot 6 inch sledges, carrying rather over 2000 lbs. of stores. For draught purposes there were one pony and sixteen dogs. Six weeks' provisions were taken, the pony being rationed at 10 lbs. a day (6 lbs. dried vegetables and 4 lbs. oats) for that time, while the dogs had tinned beef at 1 lb. a dog for twenty-four days. Mr. Jackson relied on getting bear's flesh to eke out this ration.

The mild weather, which Mr. Jackson attributed in the early spring to the presence of a considerable body of open water to the north, broke for a time. When they started, the temperature had fallen to -5° Fahr., and by the time they camped that night it had fallen 20° lower. The result was that they marched rapidly, and at the end of seven days were near the 81st parallel. On striking camp on March 26, they proceeded for about half a mile in a dense snowstorm, and then found themselves at the edge of the floe, and confronted by a stretch of thin bay ice, and beyond that again open water. Turning to the eastward and following the edge of the pack, they came to land by evening, and encamped near a cape. The following day turned out to be most gloriously fine, and they recognized in the cape the place where, in the previous year, they had deposited an aluminium boat and some stores. Jackson and Armitage ascended to the summit, and then the truth which the climate, the flight of the birds, and other considerations had even in the previous year led them to suspect, was at once plain.

Before them spread a large open sea, so free of ice that only one solitary berg could be seen in it. Standing on this cape—Cape Riechhofen, as Jackson called it—at an elevation of 700 feet above sea-level, it was seen that the open water was of considerable extent. It reached as far as the eye could follow it to the north; to the west it washed against the glacial faces of the land they discovered as they marched north through the wide sound which Jackson has named the British Channel; to the north-west lay land, apparently two islands, one small and the other of some extent; between north-west and north there was no land to be seen, and the horizon was clear and sharp; north lay an island which Mr. Jackson thought might prove to be the King Oscar Land of Payer. Between north and north-east the distant view was veiled by the land near at hand, by whose shores Mr. Jackson had marched half a degree farther north in 1895; but in that direction, and pointing towards Petermann Land, on the very existence of which some doubt has been thrown, there extended a dark water-sky, clearly showing that this sea lay to the north of the chain of islands which now alone remains of the continental mass of Zichy Land.

“I took bearings,” writes Mr. Jackson, “and made sketches of the various coast-lines in sight, and took a number of negatives of the open water, which have come out well. I longed to be able to dump the *Windward* into this water, for here, at any rate, was a clear run north for a considerable distance. A boat would have been useless, as she would at this season of the year very soon have become frozen into the bay ice, through which it would have been impossible to row, and over which we could not walk.”

This great expanse of water Mr. Jackson named Queen Victoria Sea. It is especially noteworthy that for two years in succession it was encountered, though in the former year thick fog and snow had obscured

the sea, and only revealed the fact of a long stretch of bay ice. It is also to be noticed that Jackson then independently established the fact he had for some time been compelled to suspect—namely, that the main group of the Franz Josef Land archipelago did not extend far northwards, and that a considerable quantity of water, more or less always open, lay to its immediate north. Subsequently, and also independently, the drift of the *Fram* led her in the pack round the north part of this sea—a conclusive proof that Jackson was right in believing that he had practically reached the northern limit of any land mass. He does not



BELL ISLAND, "TWEEN ROCKS," CAPE STEPHEN, AND MABEL ISLAND.

yet know, of course, that the *Fram* has done this; but in the letters he has sent home to Mr. Harmsworth he is emphatic in his statement that no land lies to the north for a very considerable distance.

I cannot now ask you to follow me in the tortuous windings and counter-marchings of his explorations of the islands lying between this point and Hooker island, diverging as they do east and west on occasion considerably. It will be sufficient, perhaps, if I refer you to the map, and ask you to compare it with those published previously to last year. You will notice at once how great a change has come over the face of that part of the world; how sea has flowed in where lofty masses of land once stood; and how islands, large and important, have risen from the depths of the sea. And you will also notice how the great white spaces of the absolutely unknown have been filled up and plotted out into various geographical forms of land and water; and how names familiar

to many of us have appeared in that remote region of the earth. There are many, but perhaps it will be sufficient if I indicate a few. In the northward track there lie Clements Markham bay, Frithjof Nansen island, Cape M'Clintock, Cape Albert Markham, Allen Young sound, Scott Keltie islands, Capes Sybil Montefiore, Alice Armitage, and Fisher, Robert Peel sound; and in the west we find Peary glacier, Weyprecht bay, Nordenskiöld bay; and, finally, at the present western *Ultima Thule* of the archipelago, and on, as I believe, the mysterious Gilies Land, Cape Mary Harmsworth.

I must now pass on to one of the most dramatic incidents that has ever occurred in the whole history of Arctic discovery—the meeting of Jackson with Nansen on the ice-floe to the south of Elmwood. But before telling you something of this wonderful story, I ought to touch very briefly on two aspects of the scientific work of the expedition. The first must deal with the glaciers and ice-cap, and the second with the plant life of Franz Josef Land.

With regard to the glaciers, there are very few of large extent or of the common type. The ice-cap which crowns nearly all the islands seldom descends to the sea, and in only one case does Mr. Jackson record a glacier projecting with a broad tongue well out into the sea. This was on the south-east coast of Hooker island. It is this glacier which launches flat-topped bergs of considerable breadth and length, but lofty bergs have not once been seen, neither have any glaciers been met which are capable of launching lofty bergs. The highest bergs do not exceed 75 feet, and these are rare. Really large bergs—such as Mr. Jackson mentions having seen off the coast of Greenland—he declares to be myths in the Franz Josef Land region.

The ice-cap and inland glaciers show little sign of movement, though observations and measurements have been continuously made. When the movement occurs, it is always slow, and crevasses are few. The angle of their slope is often excessive—far greater, as a rule, than in Greenland, where an incline so little as 2° is not uncommon. In Franz Josef Land a slope of 15° is not rare, but the rule is that the less steep the slope the more frequent are the crevasses. The glaciers are almost invariably smooth in surface, and Mr. Jackson states that he only knows of one exception, where the glacier is very rough and much crevassed. This occurs near the south-east point of Frithjof Nansen island. It is caused, Mr. Jackson thinks, by the ice being forced down from the high land behind into a very shallow bay, where the bergs become detached but remain grounded and unlaunched. They are pressed severely by the oncoming ice, while they, in turn, return the pressure and thus cause excessive crumpling. On the other hand, the pressure of the glacier slowly rolls the bergs over and over before it, causing them to break up, and at the same time leaving them covered with mud churned up from the bed of the shallow sea.

The members of this Society will remember the remarkable glacier-faces which Peary has found and photographed in North-West Greenland, showing many and minute layers or laminations, and exhibiting regular stratification, with occasional folding and false bedding. The photographs of these extraordinary developments were exhibited at the Geographical Congress, and are, I believe, preserved in the map-room of this Society. They have been considered unique. It will interest the Society to know that similar developments have been discovered in Franz Josef Land, and photographs made of them.

Speaking of the ice-cap, which varies from a few to a thousand feet in thickness, Mr. Jackson compares its character in many islands to the



MEETING OF JACKSON AND NANSEN, JUNE 17, 1896.

descriptions given of Antarctic ice, and he instances Bruce island as a good example. The whole island is capped with ice, and the steep coast is nothing else than the face of the glacier. Rocks only appear, jutting out at intervals, on the level of the shore-line. The country west of Cambridge bay is of the same character. On the other hand, Mary Elizabeth island, Scott Keltie island, and one or two plateaux have been found quite free from ice.

The rotten condition of the ice in the sounds and straits between the islands is attributed by Mr. Jackson to the great amount of open water, both north and south; to the rapid currents, to the heavy falls of snow, and boisterous winds. These break the ice up, even in mid-winter, and the great mass of snow weighs down the rotten ice and forces the water up between the cracks. Hence the soft slushy

surface even in the early days of spring. Last year, at the Geographical Congress, Admiral Markham correctly surmised that this rotten ice was likely to prove a great obstacle to exploration in summer; but he will be surprised, I think, to hear that this condition attaches to exploration even from the dark days of the long winter. Indeed, I think that Admiral Markham, who has long made Franz Josef Land a special study, and whose weight as an Arctic authority is in no need of appraisal by me, will have a good deal to say of the series of surprises which Mr. Jackson has given us in the last two years.

For, as a matter of fact, Jackson's work has completely revolutionized our ideas and maps of Franz Josef Land. He has proved that it is persistently an archipelago—a region of islands and straits and seas; and in doing this he has been forced to ignore or condemn the statements of Payer, whose opportunities regarding the central and western area were, I would hasten to add, not those which Jackson has the good fortune to possess. Misled by Payer, our Arctic veterans—Sir Erasmus Ommanney, Sir Leopold M'Clintock, and Sir George Nares—will be inclined, I suspect, to withdraw their support from Franz Josef Land as a point of departure for higher latitudes, and be content to regard it as sufficiently and supremely interesting in itself as the most northerly known land in the eastern half of the Polar basin.

In touching upon the botanical work of the expedition, I prefer to submit to you a brief and interim report which Mr. Harry Fisher, our botanist, who has returned home after practically exhausting the flora of the archipelago, has been good enough to draw up. I will merely preface his remarks by quoting a portion of his leader's appreciation of Mr. Fisher. "He has done," writes Mr. Jackson, "most valuable work for the expedition, and has added immensely to its scientific results." *

As to the geology, several large cases of rocks have come back, and when they have been properly examined, I shall hope to present a report to the Society for publication in the *Journal*. With regard to meteorological, magnetic, and other observations, I may say that for two years, winter and summer, night and day, readings have been taken every two hours.

Studies of the animal life of Franz Josef Land have been steadily maintained. Many photographs have been secured of mammals and birds in their native state, and illustrative of their habits. In photographing bears, Mr. Jackson would go out on the floes with gun and camera, and first attract attention by waving his rifle and making striking gesticulations. Impelled by a somewhat natural curiosity, the bear would approach—stalking the stalker—while Jackson would stoop down and take snapshots with his camera until the object was within ten or a dozen paces. Then he would take another sort of shot.

* This report is appended to Mr. Montefiore Brice's paper.

Though angling with line and hook was tried, it proved unsuccessful; and in order to obtain specimens of fish, it became necessary to stand on the shore and wait for the birds that came flying in from the distant open water with fish in their mouths. These birds were promptly shot, and came tumbling down with the fish still in their grip. This is an instance, I fear, of highway robbery with violence to the person, but science condones much.

And now I come to the story of how the members of the expedition saw Nansen travelling on the ice-floe to the south of Elmwood, making in the direction of Spitzbergen; of how they went out and met him on the ice; how they brought him and Johannesen back to Elmwood, and there entertained them for six weeks; and, finally, of how Nansen returned on the *Windward* under the able command of Captain Brown, and arrived safely at Vardö just a week before the *Fram* issued from her long drift of three years' duration.

It happened that on June 17 of this year, just after the members of the expedition had finished dinner, Mr. Armitage, who had been taking down some readings in the observatory, put his head in at the door and called out, "How many of you are here? I see a man on the ice-floe."

They counted round, and found that all were present. It was evidently a new-comer that was near them. Mr. Jackson at once jumped up, saying, "Whoever it is, I am off;" and he ran out of the house, while the others seized telescopes and binoculars and prepared to follow. The idea of its being Nansen, says Mr. Harry Fisher, did not occur to them until after the lapse of about twenty minutes. He and Mr. Armitage both hazarded the opinion that the distant stranger might be Nansen, and as they watched they saw Jackson and the stranger approaching each other, waving to each other as they walked; and then, as they stood talking with excitement, apparent even at that distance, the watching group exclaimed, "It must be Nansen!"

And Jackson himself writes in his letter to Mr. Harmsworth—

"I at once started off, and saw a man on the pack-ice to the south-east of Cape Flora, and a second person farther off. I fired several shots to attract their attention, and after about an hour's walk we came up to one another. As the man was on 'ski,' I concluded he was a Norwegian, and imagined him to be a walrus-hunter who had come to grief somehow. On approaching nearer, I noticed that he was as black as a stoker from head to foot. His clothes were covered with grease. It was evident that he had been in very rough circumstances for some time past. I walked up to him, and we shook hands warmly, and the following conversation ensued:—

"Jackson: I'm awfully glad to see you.

"Nansen: So am I to see you.

"Jackson: Have you a ship here?

"Nansen: No, my ship is not here.

"Jackson: How many are there of you?

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"Nansen: I have one companion in the distance there.

"During this time I had been steadily looking into his face, and in spite of his long black hair and smoke-black skin, thought that he was Nansen, whom I had known in London.

"So I exclaimed, 'Aren't you Nansen?'

"'Yes,' he replied, 'I am Nansen.'

"'By Jove,' I responded, 'I really am awfully glad to see you.' Then we shook hands again still more heartily. 'Thank you very much,' said Nansen; 'it is very kind of you.'

"I then asked him where he left the *Fram*, and he told me that, after drifting for two years, he left the *Fram* in 84° N. lat., and managed to reach the very high latitude of 86° 14', when he turned back and came on here. After some more talk, we again shook hands, and I told him how intensely pleased I was to be the first person to congratulate him on his magnificent success. We then turned and walked towards Elmwood, and, meeting the rest of my colleagues, I introduced them to Nansen, calling for three cheers for him, which were most heartily given. Nansen appeared very pleased. Again and again he repeated, 'This is splendid.'

Mr. Jackson then despatched Messrs. Fisher and Child to go to Johannesen and to help him bring in the kayaks and sledges.

Mr. Fisher gives the following account of the meeting with Johannesen:—

"After going for a short distance, we suddenly rounded an ice-hummock and saw Johannesen, who had the kayaks with him. Before coming up to the lieutenant, we saw what looked like a black flag on a pole. On approaching nearer we found it to be a shirt, evidently blackened by many months of blubber smoke. Johannesen himself, like his chief, was black from the same cause. His appearance was rendered more grotesque by two white patches under his eyes. We had great difficulty in making Johannesen understand us, as he knew no English. We greeted one another by waving our caps and by heartily shaking hands. We gave Johannesen a pipe and tobacco, and he had the first smoke since he had left the *Fram*. We at once took charge of the kayaks and the other impedimenta, refusing to allow Johannesen to carry anything, and we started off to follow Nansen and Jackson to Elmwood."

I will conclude this part of the story of the last year, which he writes to Mr. Harmsworth, with Jackson's account of the first evening at Elmwood.

"When we reached our headquarters it was midnight, which up here is as light as noon. We began to prepare a good meal for our guests, who, meanwhile, had a much-needed hot bath and an entire change of clothes. After Nansen and his companions had had a shave and hair cut—our photographer operating—none would have recognized them as the dishevelled, smoke-blackened individuals we had met on the ice. Our dinner, thanks to your good care of us, was, I can assure you, a great success, for we managed, to Nansen's astonishment, to add to roast loom, green peas, and other vegetables, jam tart, cheese, and preserved fruits, all washed down by port, sherry, and whisky. I can leave it to you to imagine how hearty were the toasts that followed. Curiously enough," continues Mr. Jackson, "the day before we met Nansen he had fancied he heard some shots and the barking of dogs. He put this down, however, to the noise made by ice-crashes, but, as a matter of fact, I had been shooting in the neighbourhood. I have done

my utmost to make him comfortable, and to give him a good time after his rough experiences. He has made a most extraordinary journey, which for daring is, in my opinion, absolutely unequalled in the annals of discovery, either in the Arctic or other regions. But he will tell his own tale."

What that tale is you have already partly heard. How the *Fram* has found that the deep sea which we knew existed to the north of Spitzbergen, runs round the north of Franz Josef Land and many degrees to the eastward; how in her long drift north of the 80th parallel no land was seen; how the warm water of the Gulf Stream, which we find far below the cold water of the sea north of Spitzbergen, also penetrates far into the eastern half of the Polar basin; all this, however, you have heard, and more will you hear. But I am only concerned now with one or two remarks which Jackson makes in his letters in connection with Nansen's sojourn at Elmwood.

And one is this: "Payer's map, being so utterly wrong, had completely fogged Nansen; and at his winter hut, some miles south of our camp, in the spring of 1895, he believed himself near Cape Lofley, and that the land to the westward, which we had discovered, was Spitzbergen. He came right down in our old route, and, finding himself on the 80th parallel, was pushing westward for Spitzbergen. This spring I was close to him and his winter hut, and, had I suspected his presence, could have crossed over to the place. The letters I had for him I always carried with me on these journeys."

It will be remembered that Nansen's chronometer watches had run down, and that he could not be certain of his longitude. Consequently we find Jackson writing, "I have given him tracings of my map. Armitage and I have given him all the help we could with his map, and he has filled it in with our tracings. I had not wished to publish any map yet, for I hope for further opportunities of making it even more accurate than I believe it to be already; but now that I have given the map to Nansen, it is right that I should also send it back to you. I have also offered him the naming of the country in the neighbourhood of his winter quarters, as I think it rough on him to be unable to name anything in the neighbourhood where he passed a winter under such conditions, and under the impression, too, that he had discovered that country—until, indeed, he saw my map of it made last autumn. He has made an extraordinary journey, but has very little of his own to name. He has some hesitation in accepting my offer, but I know he would like to, and I don't see why he should not, as it only rests between himself and me."

I really cannot refrain from just saying that, in my opinion, for single-mindedness, generosity, and an entire absence of anything approaching a petty sense of rivalry, those few words of my absent friend and the acts they record would be difficult to beat in the annals of exploration. Yet hardly less generous was the responsive act of

Nansen, whose first use of the privilege he received was to give to the island on which he wintered the name of Frederick Jackson.

One word more, and I have done. Mr. Harmsworth is determined, as you know, to maintain the British flag in the Arctic regions, and intends to go on and to go forward with the work he has begun. The journey of Nansen—memorable as it must remain—still leaves immense areas absolutely unknown. The drift of the *Fram*—full of marvel though it be—has only extended our knowledge a few degrees in one direction. But there are more degrees and many directions. The unknown geography of the North Polar world still invites attack, and still holds out the promise of a crowning reward. There is, in short, work as useful as any yet achieved still to be done, and to be done, I hope, greatly to our national credit; when we shall work, too, in the hope of meeting with that most promising of all geographical discoveries—the discovery of land in the heart of the Polar area. The scientific world, and most of all the Royal Geographical Society, cannot afford to pause, and will not be content until we have discovered, explored, and mapped what is still unknown—the greater portion and the most remote region of the North Polar world.

SOME REMARKS ON THE FLORA OF FRANZ JOSEF ARCHIPELAGO.

NOTE.—In this case I have not considered priority in names of importance.

PHÆNOGAMIA.

THE chief features of this remarkably insular flora are the absence of willows, sedges, the heath family, the mountain sorrel, the dandelion, the louseworts, and a few other species which in other Arctic regions attain a latitude as high as Franz Josef Archipelago.

The presence of the rare and beautiful grass (*Pleuropogon Sabinii*, Br.) is quite as interesting as the absence of those plants above mentioned. This remarkable species was discovered by Captain (afterwards Sir Edward) Sabine at the winter quarters in the south of Melville island, lat. $74^{\circ} 47' N.$, long. $110^{\circ} 48' W.$, in 1819. Afterwards it was found in a few places in a south-easterly direction. Then Baer found it in Novaia Zemlia. Then in 1878 it was found in Actinia bay, Taimur island, by the Vega Expedition,* $76^{\circ} 15'$. Now that we have it from Franz Josef archipelago, four degrees further north † than previous records, the distribution, which was always interesting, is now extremely so. We know now that there is a deep sea between Franz Josef Archipelago and the Polar American Islands. It seems probable that the migration is by way of Siberia, and not across the pole. There is, however, nearly a hemisphere (155°) without a record. It should be carefully looked for between Taimur and Behring's Straits. You will notice that it is unknown from Grinnell Land, Greenland, and Spitsbergen, and between Taimur Island and Melville Island.

Most of the islands are completely ice-capped, but on the southern side of a few there are bold headlands of dolerite, which have an average height of 1000 feet,

* Kjellman.

† $80^{\circ} 3' N.$

exclusive of the ice-cap. The upper half of these headlands is precipitous rock, the lower portion being composed of loose *débris*, in some cases down to the edge of the sea. In others we have extensive *débris* on the western side, almost bare of any vegetation; the southern side being grassy and mossy, the eastern side being mossy towards the south and bare towards the north. The Phanerogams are almost confined to the south and south-east side of these headlands. At the base of the talus there is usually a raised beach, sometimes 400 yards wide, as on Cape Flora, but wanting in others, as on the south-east side of Cape Grant. On the west side of Cape Grant there are four raised beaches covered with moes (a doubtful fifth, probably belonging to the same age as the fourth). On Cape Stephen there are three. On Cape Flora there are three. On all of these there is a considerable amount of vegetation, chiefly mosses. In the wettest places they form lovely carpets of crimson, green, and gold.

There are similar raised beaches on other capes, varying in number, however. There is a fine corrie on Cape Stephen, and a smaller one on Cape Grant, but, as these are both on the western side, the flora is almost confined to a few lichens. There is a beautiful corrie on Mabel Island facing south. Here we have an improvement in the vegetation when compared with any other spot, excepting the fine beach on the south-eastern side of Cape Stephen. A corrie is a Scotch name for a hollow in a mountain. In the highlands we look in the corries for the more interesting plants. They are the sources of the streams and rills which trickle down the mountain-side.

In Franz Josef archipelago corries are very bare of vegetation, probably because they are all on the colder side of the headlands. This remark cannot be applied to the one on Mabel island, however. In the height of the summer these corries had about an inch of water in the middle of a patch of mud and grit—I mean the water was an inch deep. This was surrounded by barren *débris*.

Below the raised beaches already named, we have the sea-beach of the present day, usually devoid of vegetation; and even when the plants descend to the very edge of the sea, they are of no interest. Unlike other Arctic regions, we have here no maritime plants.

There is a cold current running along the southern shores of this archipelago from east to west (approximately), the ice clinging to the shore throughout the summer in many instances. When the ice does leave the shore, it is usually so late in the season that vegetation has no chance of existing, if it ever succeeded in establishing itself. I have only seen two spots where maritime plants might be expected, and these were separated from the sea by ice the whole time, excepting one month in 1895. Then the abundance of fresh water which is discharged into the sea at these two places named, renders the water too free of saline matter to encourage the growth of maritime plants, supposing they have ever existed there during similar climates to the present.

On the south-eastern side of Cape Gertrude there is a flat, sandy, marshy-looking beach only a few feet above the sea. I saw this first in September, 1894. It was then as hard as a road, and there was a little snow on it. It seemed to me a very promising place, so the next summer I went to look for those damp-loving plants which are well known to grow in latitudes quite as high as this. I was there on Cape Gertrude eight days, so that I had abundance of time to satisfy myself as to the vegetable life. It must be difficult for you to imagine a more desolate waste than this; not a single flowering plant—not a leaf of one—and this on the warmest side of the cape. On the south-western side of this cape I found a small flora, and on the south side, on raised beaches, there are small but beautiful patches of the purple saxifrage.

You will have come to the conclusion by this time that Franz Josef Archipelago is not a paradise for the lovers of flowers; but we must not take too gloomy a view of this forbidding-looking group of islands. In support of this statement, I must ask you to attend to the cryptogamic flora referred to later in this paper. Before passing to that, I must request you to consider a few remarks on the Phænogamia.

There are fourteen common Arctic plants, which find a home here in every possible place for a plant to grow, some of them of considerable beauty when compared with their stern surroundings; others of them do not flourish, but merely exist. Those plants which may be said to succeed the best here are well known amongst the most Arctic species. I may mention them, as there are not many: *Papaver nudicaule* (yellow and white poppy), *Cardamine bellidifolia*, *Draba alpina*, *Cochlearia fenestrata*, *Cerastium alpinum*, *Saxifraga oppositifolia*, *Alopecurus alpinus*, and *Phippsia algida*.

Now I will mention the few plants which are scarce here: *Pleuropogon Sabinii*, Br., in one pool only. *Sagina Linnæi*, Presl., on Cape Neale only. *Arenaria sulcata*, Schlecht, on three capes, but very scarce indeed. *Saxifraga stellaris*, L. (var. *comosa* = *foliosa*). This is small, but looks like existing as long as most of the phænogams in the three spots where it grows. This is a high latitude for the last.

Cryptogamia.

There are no vascular cryptogams. There are as many musci as we can expect, but very few species are fertile. There are lovely carpets of brilliant crimson, yellow, green, and golden mosses on the wet level raised beaches. Hepaticæ are poorly represented; the only species—*Marchantia polymorpha*—although barren, is luxuriant from near sea-level to 500 feet on Capes Flora and Grant, but not elsewhere. The absence of all other Hepaticæ is unaccountable. Marine algæ are extremely scarce, and very difficult to obtain. I believe I have brought everything that it was possible to procure. The scarcity of open water makes it unusually difficult to procure these forms.

Fresh-water algæ are more plentiful. I devoted much time and labour in collecting, examining, and preserving every species.

Lichens.

These are fairly well represented, the most notable absentee being *Dactylina arctica*.

It is unnecessary to mention any but the most characteristic species. *Placodium elegans* is the one which most attracts the eye, and which gives a warm orange tint to the landscape in some places. Some boulders are almost covered with it, from the present sea-shore up to 600 feet. Then the cliffs are in many places decorated up to about 1000 feet. Snow melts very soon on boulders when this lichen is present in sunny places.

The next most characteristic species is *Neuropogon melananthus*, a pretty and interesting plant. I never saw this on rocks *in situ*. On loose boulders it is abundant up to 900 feet. This plant has a very wide distribution, although it is not found in all Arctic regions.

The *Gyrophora* group, known also as *Umbilicaria*, are here in great profusion, but many of the forms which are known in the Arctic do not occur here. One of the species is represented by a handsome variety (*G. Delisei*). These plants also ascend to 900 feet.

Thamnolia vermicularis, Sw., sometimes called macaroni lichen, is conspicuous at all elevations. There are large patches near sea-level, but the finest examples are in damp hollows on the talus at 500 feet. It ascends to 900 feet, but is small

and much scarcer. At this elevation it is conspicuous owing to the great paucity of other plants, the only flowering plant which ascends to that height being *Phippsia algida*, a common Arctic grass. This does not flower, however, above 650 feet. Small tufts of leaves nearly an inch long are found at 900 feet in one place.

Lecidea geographica is the only other lichen which is conspicuous at 900 feet.

Peltigera aphthosa is in profusion at low elevation. This is a very conspicuous plant, having the upper surface of the thallus an apple-green colour. There is a handsome variety of this, having its upper parts a fine bronzy green, less easily fractured than the common form. I have not seen this form from any other region. There are other species of this genus, but they are neither conspicuous nor frequent.

I only found the pretty *Solorina crocea* in one spot. It is very small there.

It is sometimes difficult to obtain specimens of the saxicolous lichens, some of which only grow on round smooth boulders of dolerite. I did, however, bring back specimens of them all.

Fungi are fairly well represented by *Agarici* and *Auriculariini*, but microscopic parasitic forms are very rare. I never lost an opportunity to look for these, but rarely succeeded in finding any.

The Protophyta are the most numerous forms. Some mossy pools abound with small organisms of this class, including "red snow," which is very abundant in many places. Of the microscopic forms of this sub-division we now have a very interesting collection of the most Arctic forms. I collected examples in some quantity from many places. Diatoms, though very abundant, are not represented by a great variety of species. Desmids are remarkably scarce.

I subjoin a diagrammatic summary of the results as far as they have been worked out—

RECORDS FOR FRANK JOSEF ARCHIPELAGO.

	Phanogams.	Mosses.	Lichens.	Fungi.	Diatoms.	Protophyta other than Diatoms, and fresh-water algae, etc.	Marine algae.
Payer	5	0	9	0	0	1	0
Leigh Smith	12	0	1	0	0	0	0
Jackson-Harmsworth Polar Expedition	27	25	70	10	35 genera	210	10

N.B.—Everything was "dead" when Payer made his collection. Mr. Leigh Smith did not pretend to systematically collect.

H. FISHER.

ZOOLOGY.

Mr. Fisher also gives me the following interesting notes on one or two of the zoological results:—

I have brought many collections of microscopic material for cultivation and further examination. These contain Infusoria, Flagellata, Amœba, etc. These are being worked out.

Dredging in the sea was only possible on a few occasions, but all the specimens dredged were preserved in spirit.

Fishing with the line met with no success, but many specimens were taken from birds, and are preserved and brought back.

NOTE ON THE INSECT FAUNA AND SPIDERS OF FRANZ JOSEF ARCHIPELAGO.

The insects of Franz Josef Archipelago are represented by very few families and species. The absence of all Lepidoptera is not remarkable; on the other hand, no forms are here which were not expected. Hymenoptera are absent. Coleoptera are represented by one species, and that is probably introduced with wood to Cape Flora, as I only have two specimens, both found on the log house (one was just outside).

Diptera are represented by less than a dozen species. One or two species of snow-flea.

ARACHNIDÆ.

There are three spiders and about four Acari.

I have preserved specimens of every insect and spider, and made drawings of them and larvæ. I am now working at them.

The PRESIDENT: We have the pleasure of welcoming here this evening Mr. Harry Fisher, of whom you have heard so much in Mr. Montefiore Brice's paper. He has already passed two winters with Mr. Jackson, and is one of those who formed the crew of that boat in the perilous voyage to Cape Mary Harmsworth. He has also done much valuable botanical work. I am sure we all give him a hearty welcome on his return home. I hope he will address a few words to the meeting on the subject of his collection before we adjourn.

Mr. FISHER: As it is getting so late you will please excuse me, as there are many here who would like to say a few words upon the subject.

Admiral MARKHAM: I feel somewhat inclined to imitate the example of the last speaker; nevertheless, sir, at your call I will say a few words. I am quite sure that I shall only be expressing the feelings of the Fellows of the Royal Geographical Society when I say that we owe a deep debt of gratitude to Mr. Montefiore Brice for the way—or, to quote our President's words just now, the admirable way—in which he has kept us informed of all that has taken place in that far northern settlement of Elmwood since Mr. Jackson left our shores; but, however much we are indebted to Mr. Montefiore Brice, we owe a still deeper debt of gratitude to Mr. Harmsworth, not only for his conception of the enterprise, but also for his munificence in defraying the expenses of an expedition, which has for its objects the exploration of high northern latitudes. We have listened with a very great deal of interest to what Mr. Montefiore Brice has told us this evening, and I, with him, look forward with confidence to the continuation of the good work which I feel sure Mr. Jackson is now doing in Franz Josef Land, and has been doing since the date of the departure of the little *Windward*. When we get all the details of his work to hand, supplemented as these doubtless will be by the account of the discoveries of Dr. Nansen, we ought to have a very tolerable idea of the extent and formation of Franz Josef Land, and the relative conditions of the ice, the sea, and the land in that large archipelago. Our lecturer has this evening very graphically related what he calls the dramatic incident of the meeting of Nansen and Jackson. I do not know—I do not think, that anything of more dramatic interest has ever occurred in the annals of geographical exploration than the meeting of these two explorers on the ice-bound coast of Franz Josef Land. It is, in my opinion, even more interesting than the well-known and almost historical meeting of Dr. Livingstone and Mr. Stanley in the dark continent of Africa, for on that occasion, as we all know, one party was actually in search of the other; but in this instance the explorers met in a practically uninhabited region of the world without having the most remote idea that they were within hundreds of miles of each other. Our best wishes are with Mr. Jackson for a very successful issue to his undertaking. The lecturer has

informed us of the hardships that he and his gallant companions have gone through, and I am sure that we all admire the pluck and the endurance that they have displayed by remaining so long in that inhospitable country solely for the purpose of geographical research.

One word more before I sit down. I have been studying with a very great deal of interest since I came here, the chart placed in our hands by the Royal Geographical Society. I am naturally not a little gratified to find my unworthy name occupying an undeserved place in this map. I find I am surrounded by a goodly company. I see round me the names of other Arctic explorers, and of many eminent geographers, but, I do not know whether it is that age is dimming my eyesight, I fail to see the names of two men who are most intimately associated with the history of Franz Josef Land, except in the little notice at the bottom of the map, which says "that the meridians of longitude are measured from the observations of Payer and Leigh Smith," for it is to the absence of the names of those observers that I allude. I only throw this out as a hint that, when the nomenclature of our new map is being considered, the names of these eminent geographers and discoverers will not be altogether forgotten. I hope Mr. Montefiore Brice will not object to this very mild criticism; neither will he be offended if I correct him in saying that only three expeditions have visited Franz Josef Land. I think he has forgotten the Dutch expedition under De Bruyne, in 1879, which spent four or five days on that continent.*

The PRESIDENT: I think we may look upon this paper, on the second season's work of the Jackson-Harmsworth expedition, as giving us assurance that before long this interesting group of islands will have been completely surveyed. Such a survey will be a most useful and valuable contribution to geography—its value, indeed, can hardly be exaggerated; but, as Mr. Montefiore Brice has said, there is much more to be done, and I look forward, when the exploration of this archipelago is finished, to the hope that other work will be done of still greater importance. Personally, as I do not believe in any land near the Pole, or on this side of it beyond Franz Josef Land, I trust an attempt hereafter will be made to explore another portion of the Arctic regions. I believe there is land, probably in the form of large islands, between Prince Patrick Land and the New Siberia islands. That is a part of the unknown region to which I would venture to draw attention.

Meanwhile our friends are making ready for the third season of exploration, so as to complete the survey of Franz Josef Land. We shall remember them at Christmas-time. We shall remember them when the spring approaches, starting away again to endure the hardship which they now thoroughly understand and do not fear. We shall greet them heartily when they come home to us. Meanwhile it only remains for us this evening to thank their very able expositor, who has so brilliantly, I may say, brought home to us the work of those who are now far away.

In the name of the meeting, I return our most sincere thanks to Mr. Montefiore Brice for his most interesting paper, and for his photographs.

NOTE ON MR. JACKSON'S MAP.—It will be noticed that the longitudes given by Mr. Jackson appear at the top of the map. They are reckoned from the meridian of Cape Flora, which Mr. Jackson has left as 0°. I understand, from Mr. Harry Fisher, the botanist to the expedition, that the mean of a considerable number of observations already taken by Messrs. Jackson and Armitage gives the

* In attempting to correct Mr. Montefiore Brice, I regret to say I was betrayed by a somewhat defective memory, for I find that although the Dutch under De Bruyne were off the coast in 1879, they failed to land on the shores of Franz Josef Land. Mr. Montefiore Brice was, therefore, perfectly correct in his statement that only three expeditions had succeeded in landing on Franz Josef Land.—A. H. M.

longitude of Cape Flora as $49^{\circ} 47' 10''$ E.; but Mr. Jackson has purposely not sent us this, as he intends to make a still larger series of observations before finally deciding so important a point.

I should like to add here that none of Jackson's work has led him anywhere near the locality in which Weyprecht observed. The question of Weyprecht's accuracy or inaccuracy does not, in consequence, enter into Jackson's map; but I know my friend's high opinion of Weyprecht, and the world may guess it from the fact that he has named an important bay in the west of the Franz Josef Archipelago after the commander of the Austro-Hungarian expedition.

A. M. B.

A JOURNEY FROM TONKIN BY TALI-FU TO ASSAM.*

By PRINCE HENRI D'ORLEANS.

THE President of the Royal Geographical Society has invited me to address you on the subject of my last journey. I know what an interest you take in all explorers, irrespective of the special subject they are studying, and particularly in those who are endeavouring to open up the mysterious regions on the borderland of India which form the frontier of China and Central Asia. My fellow-countrymen have told me of the kind welcome they received last year at your London Congress, which my travels alone prevented me from attending. For you all political rivalry is laid aside when you meet on the common ground of geographical science, to develop which you have contributed so much by your encouragement and help. I know the services rendered to humanity by the Geographical Society of London, whose reports I read regularly, and I am therefore particularly flattered by the honour you have paid me in asking me thus to read a paper before such an illustrious assembly.

In January, 1895, we left Hanoi and ascended the Red river, first by steam as far as Laokai, then by junk to Manhao, the port of Mongtse, where we formed our caravan. The voyage was unmarked by any particular incident, but we subsequently learned that had it not been for the favourable wind which enabled us to do the distance between Laokai and Manhao more quickly than usual, we should have been attacked by a band of pirates who had set out in pursuit of us. We had arranged all our plans. We intended to keep along the frontier of China till we reached the point where the Mekong penetrates Indo-China—that is to say, not far from the place where Francis Garnier left it; we would then ascend the river, following as nearly as possible its unknown course through China. The object of our journey was to reach Tseku on the Tibetan frontier. Above Tseku the course of the Mekong has been followed by French missionaries. Our halt would be at Talifu, the great western market of Yunnan. Nothing had been settled about our return journey; we intended to do the best we could according to our means and circumstances.

* Paper read at the Royal Geographical Society, May 18, 1896. Map, p. 656.

Such were the main lines of the itinerary which we proposed to follow: if we succeeded, we were free, on the one hand, to explore a country which interests us particularly on account of our possessions in Indo-China, as it forms the natural zone for peaceful relations and commercial expansion. By collaborating with the work of the Pavie mission on that part of the Chinese territory which forms our frontier, we should unite its operations and those of the staff around Mongtse, Kaihoa-fu, and the Tonkin border, with the older but not less admirable operations of Francis Garnier. On the other hand, it would permit us to take up again, from south to north, that essentially French undertaking, begun thirty years ago by Francis Garnier. The course of the Mekong through Yunnan, that is to say, for over 600 miles, extending from the frontier of Tibet to that of Laos, is still unknown. It was meet that the scientific conquest begun by Frenchmen should be continued by Frenchmen; we had a plan, an idea, and faith, and if we had not the certainty, we had at least confidence in the success of our enterprise.

We arrived at Mongtse on February 16, 1895, and during the eleven days which we spent in this town we were able, with the valuable assistance of M. Guérin, then acting as consul, and of Père de Goastarzu, to organize our caravan, buy animals, hire men, and send on before us by the main road to Talifu a part of our baggage and our money.

On February 27 we left Mongtse. Our troop consisted of our three selves (your servant, M. Roux, lieutenant, and M. Briffaud, one of the first colonists at Tonkin) and two Annamites,—Sao who had already accompanied me in my voyage in the Laos country, and who joined to the qualities of a devoted servant those of a good hunter and an excellent caterer—and Nam, who was our cook. Our interpreter was a Chinese of Shanghai, whom I was lucky enough to discover in Langson. It is very difficult to find French-Chinese interpreters at Tonkin, and especially one speaking the Mandarin dialect such as is used in Yunnan. We had a "makoteu" (head muleteer), with six men under him, and our cavalry consisted of twenty-seven animals (mules and horses).

We returned to Manhao, where we arrived March 1. During our short stay at Manhao both Roux and myself had discovered traces of a road on the right bank of the Red river. This was fortunate for us, as the inhabitants of these regions are not lavish in giving information, and our men and the interpreter not being at all anxious to leave the beaten track, we were continually obliged to resort to artifice and ruse to drag them off the high-roads. During the whole of the journey from Mongtse to Talifu—that is to say, during three months—the chief difficulties we met with came from the muleteers themselves. At the mercy of sordid, grasping followers, who cared nothing for our interests, and badly served by a supercilious interpreter, whose bearing towards us was at times insolent in the extreme, there was nothing for it but to be patient; we had to stifle our feelings, and meet murmurs and

reproaches with the iron wall of indifference. It is only fair to admit, however, that there was some excuse for the discontent manifested by our troop, for the trade of bearer is hard, especially in the region through which we were passing. The country is very hilly; it was one continual up hill and down dale, with very steep slopes, and over a stony, damp, and slippery road. Our poor animals struggled over a surface which gave them no hold, and fell constantly. We forgot what level ground was like. To add to our discomforts, we had to endure that of bad weather—dull, rainy, with continual fogs. At the end of two days our bearers were in despair, and spoke of leaving us. Some gave way like women and shed tears, and we had to bring out a whole arsenal of promises, and paint dazzling pictures of future pleasure in the big towns, in order to get them to go on. I do not add to the number of bodily discomforts those of board and lodging, but imagine the blackest, narrowest, most sordid "holes," and perhaps you will be able to form for yourselves an idea of the dwelling where we turned in for the night. The room which served us for sleeping and cooking was sometimes so dirty that we were glad to seek refuge in the stable or granary, and spend the night on the straw.

But if our bodily discomforts gave us cause to complain, at least as regards study we had ample satisfaction. We came across highly interesting native populations, and I was able to take a good number of photographs and notes. My friend M. Roux devoted himself especially to the topography of the country, and when the weather was fine enough the observations of the theodolite and sextant enabled him to rectify his itinerary. M. Briffand superintended the caravan, often a most ungrateful task, and with the division of labour thus clearly defined, we hoped to get through more work.

On March 13 we reached Issa, a pretty town surrounded by large trees, and built on several hills overlooking the Red river. It formed a smiling picture, which threw a bright note of gaiety over the monotony of the bare hills overhanging the river. The sight which met our eyes during a day's halt at Issa made us partly forget the worries of the Chinese crowd. We were surrounded by that yellow, dirty, insolent multitude which we were to find again in every town of any importance, and which, without being openly hostile, fidgeted and buzzed around us like a swarm of mosquitoes. How greatly I prefer a beautiful prairie in the mountains, with a clear stream and a meagre dinner, but great tranquillity and freedom, to the good inns and civilization of the towns! From Issa we made a turn towards the west, and recognized again the valley of the Red river, which we left definitely almost immediately after.

At Tayangka we noticed, branching off from the road which rejoins the highway of the north, a path going west, and the mayor of the village, whom our interpreter questioned for commercial information,

informed us that it was part of a little road used in the dry season by tea and cotton caravans, and he gave us the names of the various halting-places. We did not hesitate a moment: here was a new road—"Siao lou," little road, said the bearers with a grimace—if mules can pass, so can others; forward. And this is how we reached Ssemao on April 6, having traversed, since leaving Manhao, nearly 350 miles of unexplored country, across which Messrs. Bourne and Colquhoun had declared the passage impossible.

The universally hilly country is partly cultivated as rice-fields. That still under water lies on the hillside like a giant staircase whose steps shine like glass. The effect is strange. One cannot but admire the wealth that the Chinese obtain from the apparently unwilling soil. The smallest plot of arable land is turned to account. The native populations are less industrious than their Chinese rulers. We met with interesting tribes: Lolos, Yaos, Pais or Thais, who are only Laotians, and lastly, the Hu-Nis. The latter are probably the aborigines of Yunnan, whilst the legends of the other tribes extend back to the north and to the east. According to the general impression, the Hu-Nis have in past ages inhabited the hills of Yunnan.

The Hu-Nis, though savages, are generally peaceful, yet are accused of piracy by the Chinese, to whose exactions they will not always submit. We got on very well with these natives. Nevertheless, we twice found these relations slightly strained. Having taken up our quarters for the night in a cottage in the midst of fields, where there were only three inhabitants, I had to unpack my valise, which the men had not fastened the previous evening. The next day it had disappeared. How were we to find it? One of the inhabitants must be guilty. We held a council, and decided to make one of them a prisoner, allowing his relations to ransom him by restoring the stolen property. The imbecile man, after having been fed by the hands of his wife, limped after us. Next evening nothing took place, and we were obliged to let our prisoner go; but the amusing part of the story was that the native, probably finding that he was better fed with us, was not at all anxious to leave us, and we were obliged to adopt strong measures to get rid of him. Once again, Sao and myself, surprised by the nightfall, found that we could not come up with the caravan, and were, therefore, obliged to take refuge in a Hu-Ni house, where we asked for some straw to lie on. After a few minutes the courtyard was invaded by armed villagers, to whom a child had given the alarm, and who took us for pirates. The muskets were fixed full at us. There was no way of escape, and I saw that we were in for a disagreeable encounter, when Sao had a bright idea. He wrote with his finger in the sand of the courtyard who we were and what we wanted. He did not speak Chinese, but wrote it, as the characters were the same as those of the Annamite. Explanations followed, and we were allowed to pay for board and lodging. After

a night passed among half-tipsy armed men, I was delighted to find myself next day in the saddle in the forest.

Ssumao is an important commercial centre. The fixed population is perhaps ten thousand souls, but the floating population, composed of caravaneers and muleteers, who live in the many inns of the outskirts, is considerable. The two principal articles of commerce are, tea, which is exported throughout China; and cotton, sent to the Red river to Yunnan-Sen, and even as far as Ssu-chuan: this cotton is brought by caravan from the Shan States, and even from Burma. From information that I gathered at Ssumao, I learned that there is an annual export trade of 7000 piculs of tea, and the same quantity of cotton. We heard that two Englishmen had just left the town. This news was not calculated to rejoice our hearts. Reconnoitring parties are numerous in Yunnan, and there is a race between the French and English, and even amongst the French themselves. The field of the unknown is day by day being reduced with marvellous rapidity, and to find unexplored ground on the map one must hasten. At Talifu we were told that one of these Englishmen was Captain Davis, who arrived from Burma by way of Tenguyeh and Tali, intending to return by Mianning, Ssumao, Puehrfu, and Tamano. We twice crossed the itinerary of these travellers, and were lucky enough only to travel along 120 miles of the same road.

We only stayed four days at Ssumao, just long enough to rest and to exchange our sick mules for healthy animals. We give nothing but praise to the Chinese mandarin, who was most amiable and polite to us, and we no longer heard in this part of Yunnan those offensive words which continually assailed our ears in Ssu-chuan, to which we were obliged to reply. The crowd is troublesome, but not hostile. When we left Tonkin, people were speculating on the probable effects of the war with Japan. They can rest assured that scarcely an echo reached the provinces, and, with the exception of a few mandarins, it was absolutely ignored.

On April 11 we left Ssumao for the valley of the Mekong, which preceding travellers had depicted as unhealthy and dangerous. They even said that it was difficult to get the bearers to accompany one. I can only say that our men did not raise the least objection to following us. Between Ssumao and the river the road runs through valleys surrounded by chalky hills and peopled by villages of Pais. On April 15, at Longtane, we stumbled on a colony of Pais, who resembled in every respect the Shans that I know. Like them, they wear their hair in pigtails, and are tattooed. The Chinese appear to have for these Pais particular attention, for they give their soldiers rewards, in the shape of medals, that they do not give to any others. Longtane appears like a desert island in the midst of tribes who have adopted, if not the language, at least the costumes, habits, clothing, and head-dress of the

Chinese. This is the only spot where I found the real Thais, residents of China.

On April 18 we reached the borders of the Mekong. I was really pleased to see this old acquaintance again—this river that I had already seen in Cochinchina, in Cambodia, that I came down as far as Laos, and that we crossed far away in Tibet. It was as if we had come across something French—on the border of this river near whose banks so many French had fallen, from Massie, Muhot, and De La Grée, to the most northern point of unknown countries where lie those brave French missionaries, those unknown heroes. The river here is from 350 to about 500 feet wide. It flows partly between wooded hills, whose slopes are less steep than those which form the valley of the Red river. Rapids render navigation impossible in some places. No craft can follow its entire course. All that can be done is to cross it at certain points on great ferries. Up to May 20 we kept to the right bank, except M. Roux, who with two men made an excursion on the left bank.

Before reaching Talifu we saw the Mekong from six different points; the last time was during our journey between Chuningfu and Menghoating. The march is difficult, as we had continually to cross the affluents of the river, so we changed valleys every day, and were continually ascending and descending.

On May 2 a slight bend across a series of wooded mounds made us insensibly pass by the basin of the Salwin, where we remained some days. It is very curious to find such a low watershed between the basins of two such important rivers. This one has scarcely a height of a few hundred metres. Formerly the regions that we crossed were inhabited by the Lo-chais, near neighbours of the Lolos, but possessing no written language like their brethren. Some years ago the Lo-chais were at war with the Chinese; but now peace is established, yet they are still wild. We were obliged to stay several days among them, during which we saw one of their national dances—a stay which was not at all pleasant.

A box belonging to M. Roux had been stolen—a loss the more serious to us as it deprived us of the result of our geographical labour. With patience, the promise of a reward, and the help of the mandarins, my friend was enabled to recover his property. We arrived at Mein-ning on the 4th, and found ourselves in a purely Chinese country. Although the road improved, the difficulties with our men increased. They wilfully mistook the way to follow the most direct and main road to Tali, and we were forced to retrace our steps to make them follow us. Thus we lost two days. Then we were obliged to leave the Chinese muleteer behind us, as he was unable to go on, having been severely attacked with a knife by one of the men, who bore him a grudge. We left Muong-Li more than six weeks ago; both were in the wrong and the aggressor fled.

A few days after we had to break with the interpreter. This was serious, but necessary. François, as he called himself, having become overbearing, was continually stirring up discord amongst our followers. Thinking himself indispensable, he went so far as to insult one of my companions. Two blows soon brought him to his bearings. Thinking that we would beg him to remain, he asked to go. I immediately gave him notice. We were only a fortnight's journey from Tali, and I could speak enough Chinese for our daily needs.

We went from town to town, through lovely plains, rich, inhabited, and large basins—Yun-chu, Shun-ning-fu, and Menghoating. Between these two towns we saw for the sixth time the river Mekong, which we crossed by a bridge. The monotony, the uniformity of this purely Chinese country, made this part of the journey very wearying. We hurried on, making long stages, only anxious to arrive at our destination.

On May 21 an incident happened, the consequences of which might have proved serious. My faithful Sao fell from his mule, and rolled about 20 yards down a very steep incline. A shrub broke his fall, consequently he was not hurt; but if he had fallen a few yards further he must have been killed. On May 26 we discovered the lake of Tali, a long lake, which is bounded on the east by hills bare to the summits, separated on the west by high mountains and a table-land of several kilometres. On this plain are to be seen traces of old fortifications, the remains of the Mussulman insurrection, under which run the telegraph wires of Burma, important outskirts of many villages, and, surrounded by trees, lies the town of Talifu, with its wide streets and low houses. The evening we arrived, our men by mistake took us to the house of the English Protestant minister, who was absent; but his wife and sister-in-law sent their servant to show us the way to the Roman Catholic mission-house. Our men, however, who had never seen any European ladies before, were so astonished at the sight of these new faces, that they allowed two of our mules to be stolen. Fortunately, the police were informed and paid, so we got them back next day. Thus ended the first stage of our journey. We remained with Father Leguilcher, an old French missionary, who had during the Mussulman war conducted François Garnier into the fortifications of the town.

Father Leguilcher, who had been more than thirty years in this country, gave us some valuable information on its history, especially during the Mussulman war and the taking of Talifu by the Chinese, thanks to the betrayal of the chiefs, who had been bribed by their adversaries. He described to us the assassination of the unfortunate Margary, which had been arranged by Lisen Tajen, at the command of the famous viceroy, Tsen. Tsen was punished for his crime by the continual visions in which he was haunted, during the latter part of his life, by the ghosts of his victims.

During the three weeks that we stayed at Talifu we reconstructed

our caravan by buying fresh animals and sending away our old muleteers to give place to those recommended by the missionary.

On June 16 we set out once more. Our new company was greatly superior to the one with which we started from Mong-tse. Our head muleteer was a serious, grave, conscientious man, possessing all the qualities which the people of his race generally lack. We never heard an oath nor a word of complaint from his lips. We could place complete confidence in this chief, and it was for us a perfect rest not to be obliged to continually interfere during the march of the caravan.

Father Leguichez found an interpreter for us, who could not speak a word of French, it is true, but managed to make himself understood in Latin. For the first time in my life a sense of the usefulness of my classical studies was borne in upon me. Joseph, as our new interpreter was called, was a Chinaman, who differed greatly from his countrymen. Reared from his youth by Father Leguichez, he had been formed, and well formed, by this missionary. Devoted, faithful, and indefatigable, interested in everything, understanding all our wishes, he became a real friend to us, and it was a pleasure to talk to him in his Latin-Chinese jargon.

As our idea was to continue the exploration of the Mekong, we struck to the east. A lovely road passing by two hills, one of which was 11,000 feet high, brought us to Yumlong Chai. Our animals went well, the men were good-tempered, and everything was perfect. At Yumlong Chai we were shown a road leading to Failing Kiao, a bridge over the Mekong. This bridge is the last that one meets on that river—I do not speak of the Tibetan bridges—till one arrives at Chouando, the highway from Peking to Lhasa. Fifty years ago the Fathers Hue and Gabet, and more recently Captain Bower—in his splendid journey across Tibet—passed over them. So we once more crossed the river, but on the right bank we were told that the road descended to the So, Tengyen, and Burma. To go further north there is no road unless one crosses to the left of the bank; the right bank is inhabited only by savage tribes, where civilized people—which the Chinese consider themselves—are never to be met with. This was a fine lookout for us. They told us of the trace of a road leading to Lo, a village at three days' distance from Failing Kiao, on the right bank. It will be all on our way and we can see whether we can keep on. Again we start off. We go from stage to stage, and, thanks to information more or less exact, we reach the valley of the Tai-wu. Before entering in this valley we were obliged to give ourselves up to those who rendered our journey so slow to Te-tai; our men were forced to turn roadmakers. Each day they had to load the baggage and make the roadway. We wondered ourselves much if this operation did not take place more than twice a day. Our chief, an ever-ready man, had just ordered the work. It was a difficult task, and with our old troops we

should never have succeeded as we did. The patching finished, we led the mules across. To make things worse, we had a rainy season; the ground became slippery, and the animals, having no foothold, fell often. I remember, among others, one day when, at a particular place, we saw five of our mules with their loads roll down about 100 feet. We all had to go and pick up our pack-saddles, to mend them, and then to catch and re-saddle the animals, which we found calmly browsing at the foot of the ravine, as if they had been made of indiarubber, —all of which happened during a downpour of rain. We had still some hours' march before we reached the cottage where we were to pass the night, every one being obliged to drag along packages which had fallen. The caravan was broken up! I pitied our men—frankly, it was too much labour. At the first village we reached after these hard days some of the men left us, but we replaced them by natives.

Beyond Lao, at Luku, we were well received by the Chief Lissu, another official of the Chinese government. We were on the banks of the Salwin. This river, more than 100 yards wide, can be clearly distinguished, owing to its light grey colour, from the Mekong and Irawadi, which we will speak of later on. The rapids are formidable, and the water rolls in enormous waves. The *tussu* of Luku gave us precise information and a guide. After having ascended the valley of the Salwin, July 9, we again reached the Mekong.

The country is very wild; forests of pine and oak crown the heights which separate the two valleys. The Salwin in this latitude is almost 300 feet below the level of the Mekong, and its valley is in general wider, greener, and more thickly wooded. The Mekong, on the other hand, has the appearance of a great high ditch, supported between two mountains, sometimes rocky and forming profound ravines, sometimes sloping gradually to its banks in bare crumbly dunes. The depth of its waters must be considerable. The inhabitants could give us no information on the subject, and M. Roux, who had only a rope 160 feet in length with him, was unable to reach the bottom. The situation of the valley accounts for the difficulties of the march. We started on July 9, and it took us forty-one days to reach Tseku, a distance of less than 200 miles. On the right bank the track is rarely wide enough for mules to make use of, the footpaths being very narrow and often dangerous. We frequently had to hire gangs of labourers to force a passage for us, and our advance was in consequence very slow. But the study of the tribes we met was some compensation for the difficulties of the journey. They are highly interesting and very little known. Among others we will mention the Lamajen and the Lissu, and these latter—in spite of the reputation for ferocity they have gained among the Chinese—received us well. One evening we were warned that the villagers intended to attack us, but they evidently only meant to frighten us, for a few firm words smoothed things down, and we got off none the worse for a false alarm.

The Lissus and Lamajen, dwelling on the banks of the Meikong, are very easily alarmed. These poor people suffer greatly from the incursions of the Lissus of Salwin, who are dangerous brigands. In nearly every village we hear tales of a band coming from the other side of the mountain two or three days before, and carrying off cattle and sometimes men, who, if they are not redeemed by their relations, are reduced to slavery. I asked the villagers why they did not imitate their enemies and make raids in their turn. "They are stronger and better armed than we are," was the reply: and there was nothing further to be said. In the evening we made the villagers sing and dance. Their movements are picturesque, and remind one of the country dances of Arrerignoe. When they sing, they usually improvise in honour of the great men who have lived amongst them to bring peace and prosperity.

During this part of our journey we were the victims of a serious robbery. Roux's valises, containing his instruments, theodolite, and hypsometer, were stolen during the night, and, in spite of a large bribe and a high reward, we were unable to recover them. After this we were obliged to be content with the marking of the compass.

At last we came across a French missionary, and two days later, on August 15, we were obliged to cross again on the left bank of the Meikong. The precipitous cliffs of the right bank completely blocked our passage, and we could only get across by means of frail canoes, which we launched over the rapids. Our interpreter Joseph, who felt most uncomfortable about the matter, gave a "Deo gratias" of satisfaction when he reached the opposite bank. This circuit on the left bank of the Meikong allowed us to visit a little kingdom, Mawo, whose influence we wanted when we went west towards the Upper Irrawadi.

On August 16 we crossed the river again by means of a rope bridge, down which our men and animals, and one by one, seated in a little wooden saddle. It is the Tibetan way, and the first time one makes use of it, one is somewhat astonished to find one's self hanging 50 feet high over a mountain torrent, but one soon gets used to it. We stopped on the right bank at Tseki.

Tseki is a station of the Tibet mission. Father Imberti, who has lived in the neighbourhood for twenty-eight years, was formerly visited here by the Englishman Cooper. The latter was so struck by the kindly welcome he received from the monks, that when he left Tseki he shouted, "Tseki a France!" There are three European travellers had visited the town, you can imagine there is the hospitable reception that our fellow-countrymen gave us. Without their aid and support we could never have seen the country, nor have brought our enterprise to a successful issue. We were to have attempted the last part of it, I am glad to see a party of men to render you the homage of the government, the missionaries, and some of those who made the name of France so well known in this country.

At Tseku we had finished exploring the course of the Mekong in China; we had thus carried out our purpose, and ended our mission. Now we had to return.

On examining a map of these little known regions, published in the book of Colquhoun, we observed a dotted line which ran through the Salwin, the basin of the Upper Irawadi, and leaving Tseku, ended in Assam. This is the proposed direct route from China laid down by Captain Blakiston. Why should we not try it? It has never yet been done; but, with courage, health, and energy, we would perhaps succeed. We would try to keep as nearly as possible to the southern frontier of the Zayul, and try to settle definitely the problem of the Salwin and Irawadi by crossing the upper reaches of the latter near their source. The information that we gathered about the country stretched out before us was vague. Beyond the Salwin there was a large river, called the Kiukiang, which flowed through a very difficult country, inhabited by naked savages. That is all they could tell us. No matter; let us go, and we shall find out for ourselves.

Whilst I rested, and tried to throw off the fever which had prostrated me, M. Roux made an excursion towards Atentze, three days' journey from Tseku, on the left bank of the Mekong; he was thus able to fix a starting-point, from the indications given by other travellers, on which to base the calculations of the compass. At Tseku I was lucky enough to find some hieroglyphic Mossos manuscripts, of which two specimens have already been brought to Europe. These have not yet been translated. Some sorcerers told me what they were about, and I hope they will prove of some interest to philologists. When my companion returned the fever had left me, and we began to make preparations for our departure.

On September 10 we left Tseku. Our caravan had been reformed. We had sent to Talifu—by the high-road Wei-si, Likiang—the greater part of our mules, with our Chinese muleteers, our collections, and everything that was not absolutely necessary to us. We kept fifteen mules ourselves. Besides our interpreter Joseph, two Chinese, and the Annamites, our troop consisted of twenty-six men from Tseku and the surrounding country. These men dress and speak like Tibetans, but most of them, having intermarried with the different tribes around, are polyglot. Nearly all spoke Chinese, and some Mosso, Lute, and Lissu. The greater number were Christians. These men were both bearers and *mafus*. They undertook to go with us wherever we wanted, and for as long as we wanted them, and we on our side undertook to send them home by the easiest and least dangerous road. After two days' ascent, we left the valley of the Mekong and struck west by a defile of astounding grandeur. At the end of a week we found ourselves again on the banks of the Salwin; the mountain we had crossed was 11,000 feet high. The huge peak that towers above it received from us the

name of Francis Garnier. During our passage we suffered from continual rain. Our animals constantly slipped, and we were obliged to walk the whole way.

From Tionra, where we saw the Salwin again, the river has just the same appearance which we remarked at Luku; the same grey colour, and nearly the same width; it was still 300 feet across, and one felt that it had come from a long distance. There was a difference of two or three degrees centigrade in the temperature of the Salwin at Luku and of the Mekong at Feilung Kiao. We found the same difference in the degrees marked at Tseku and at Tionra. The Salwin here bears the same name as the Luku—Lukiang or Lutzekiang—and it is known by the same designation as far as Mekong in Tibet. When we were ascending the right bank of the Mekong between Piutsen and Tseku, we used to question the inhabitants about the river lying west, and they always called it the Lukiang or Lutzekiang. The river that flows by Tionra is, therefore, unmistakably the same as that which passes Luku. These conclusions are important, as we shall see, in identifying the course of the Salwin. We easily crossed in little canoes, thanks to the aid of the Lutze tribes. We were able to establish friendly relations with the lamas of Chamutong, who, seeing that we were not going towards Tibet, sold us butter and provisions.

A watershed with a pass 11,500 feet high rises between the Salwin and one of its affluents on the right bank. It would have been too circuitous a journey to seek its mouth, so we were obliged to cross the mountain. At the foot of this ascent we were compelled to send back our mules. We packed them off under the guardianship of two Tseku men, and we sent back at the same time any baggage which did not seem to us absolutely indispensable. Henceforth, till November 18, we made our way along paths which were quite impossible for animals. Although very hilly, the landscape is somewhat monotonous in its general aspect—always the same wooded mountains, with their deep valleys, at the bottom of which flow large torrents of deep blue water. In three months we crossed seventeen chains of mountains. Roads, in the true sense of the word, there were none. We scrambled along the declivities on hands and feet, using our hands as much as our feet, and clutching hold of every branch within reach. We climbed rocks, seeking a foothold in the most trifling irregularity; in places where the rock is too high to be attempted, the occasional passers-by have propped the trunk of a tree marked with notches, thus forming a ladder up which we hoisted ourselves. The torrents are crossed by means of cane bridges, on which one hangs in a kind of hoop and propels one's self along with feet and hands; or else one sets out in a bamboo, on which one has to balance. When the water is not too deep, one wades across. Certain torrents are used as roads. This is the most painful kind of march. For two or three days we followed one, leaping from stone to stone,

Roux found that he was not fit to march, even after a day's rest. He begged me to depart with the second column, leaving him behind with two men and twelve days' provisions. Bitter as it was to leave my sick comrade alone in the mountain for perhaps a week, I felt it was my duty to do so. If I stayed I should only add one more to be provided for out of the meagre store which remained to us, and I could be, far more useful in pushing forward as fast as possible and seeing about the revictualling. Briffaud, notwithstanding his weak condition, came with me. Two days after we crossed the pass, which is 10,000 feet high and slightly covered with snow, which separated the basin of the Brahmaputra from the Irawadi. Before us lay the great Indian plain; that is to say, the end of our voyage—and safety. The joy of accomplishing our purpose was lost to me by all the cares which still troubled us. At the foot of the peak we found two men of the first column looking for an old man who, being sickly, could only walk with difficulty, and was lost in the night. Alas! he was not to be found. Tigers are numerous, and we never saw him again.

During the following days it was a forced march, with long stages. Every one did his utmost to husband his strength. We were flying before death. The men had only two meals a day—three cupfuls of rice with a strong addition of water. On we went; only one meal left; then nothing. We were obliged to leave behind two of our sick men who could not keep up with us. We would send them some rice as soon as we had it; the tent and cooking-utensils all were left. We only kept our blankets and one or two pots. Our march was continually impeded by fords, swollen streams in which we waded up to the armpits. The men had marched twenty-four hours without food, when we came across a man who had been left behind the first column, and who had a bag of rice. We were saved! What was more, we were informed that we were at only a day's march from a little village. We immediately thought of the sick men we had left behind, and offered a big reward to whomsoever would go to their aid. An old Tibetan, Jayo, rose and immediately returned, to bring back his comrades after giving them food. Here we were at the first village, inhabited by Mishmi. We picked up the first column, which, having started twenty-four hours before us, had only reached the village three hours before our arrival. We collected all the rice we could find, and sent it to the rear with two natives and one of our men. They could take six days for their journey and revictual Roux's little band, provided that he had been able to cross the pass.

We ourselves started for Bishi with one day's provisions. Our guide lost the way, and our troop were not in good spirits that evening; that was easy to understand. The following morning we fortunately found a fisher-hut—that is to say, some fish and a guide. This time we were really saved. On December 16 we reached Bishi, which is

inhabited by Singphos, a peaceful and hospitable tribe. We waited there for our friends. On December 17 the two invalids, accompanied by the brave Jayo, arrived; then on the 20th, after a three days' rest, which seemed very long and dull, Roux and his bearers came up with us, having had a very wearisome journey. We fell into each other's arms. All his men had been ill in turn, and he himself had been obliged to carry a half-load for one day. A sudden rising of the water had stopped the little caravan for two days; one of the men was very nearly drowned in trying to wade across, notwithstanding the rush of water. However, we were united once again, safe and sound, and in spite of the death of one of the men, we considered ourselves lucky in coming out so well from such an awful experience. I must say that, had it not been for the Tibetan men collected by our French missionaries, we should never have succeeded. I can give no higher praise than by saying that never did I hear them utter a single word of regret or complaint, even during the most trying periods.

To sum up the results of our travels, I may say that, besides our collections of natural history and geography, our notes and photographs, we had opened up 1500 miles of entirely new country. Among these figures I count the course of the Mekong in China. In the latter part of our journey from Tseku to India we were able to confirm the following facts:—

1. On the same latitude as Tseku the Salwin is a large, fairly deep river, coming from a long distance. The information given us by the natives and the missionaries, as well as by our own observations, enabled us to state that the Oi Chu of Tibet, the Lu-tze-kiang, and the Salwin are one and the same river.

2. The Irawadi is formed by three large tributaries—the Kiu-kiang, the Telo, and the Nam-kiu. Of these the Kiu-kiang pours the largest volume of water into it, and its source is further north in a well-known mountain in Tsarong, two days' journey from Men-Kong, *i.e.* 28° or 29° lat. north. The Telo issues from a mountain that we had seen further south. The mountain out of which the Nam-kiu has its source can be seen from Khamti, and is well known to the English.

The whole of the basin of the Irawadi is bounded on the north by the Zayul chain, which seems to be a continuation of the Himalayas, intersected by openings of the Dibang and the Lohit.

I am thus of opinion that the problem of the sources of the Irawadi is solved. What has caused certain geographers to imagine that it came from a further distance than the Salwin is the importance of its volume in Burma, compared to that of the Salwin at the same latitude. But we must call attention to the fact that where we crossed the upper reaches of the Salwin, which is only a narrow dyke about 25 miles broad, that of the Irawadi is about 115 miles wide, that is to say, four times larger than the Salwin. The upper basin of

the Irawadi is a large fen with three principal arms. Two of these receive a vast quantity of water from the group of mountains which stretch southwards to Zayul, rushing onward with a strong current. The formation of the river explains its importance above Bhamo or Mandalay, where they have received other important affluents—such as the Kiuho on the left and the Chindwin on the right, for example.

Such are the main outlines of our travels; while, with the documents which I intend to publish, and our collections, we bring back to France the souvenir of the welcome that we received at Sadiya in Assam and in all our journey throughout India.

It gives me great pleasure to thank you here for the warm reception given to me by your fellow-countrymen.

Before the reading of the paper, the PRESIDENT said: H.R.H. Prince Henry of Orleans has very kindly accepted my invitation, I am afraid at some inconvenience to himself, to come over from Paris, and give an account of his very remarkable journey from China to Assam to the Fellows of the R.G.S. This is by no means the first geographical expedition Prince Henry has made, when with M. Bonvalot he left Kulja, traversed Central Asia, crossed the high plateau of Tibet from north to south, and reached the near neighbourhood of Tengri-nor. You all, or many of you, are acquainted with his work round Tonking and Annam, but I believe his last expedition is the most interesting geographically, and certainly the one in which he encountered and overcame the greatest dangers and difficulties. I am sure the meeting will sympathize with him in his love for geographical exploration, and that it will feel the kindness he has shown in coming to us to-night. I will now request Prince Henry of Orleans to read to you the account of his very remarkable journey. We should be very happy, I am sure, to hear it in his own language; and it will be a still greater compliment, appreciated by us, if he elects to read it to us in English, as I believe he intends to do.

After the reading of the paper, the PRESIDENT said: I would explain that Prince Henry's map is not yet finished; that being distributed to-night is copied from the map prepared for the purpose of illustrating his journey by the Paris Geographical Society. I hope Sir Charles Elliott, the Commissioner of Siam, will address the meeting on the subject of this very interesting paper.

Sir CHARLES ELLIOTT: I think a great honour has been conferred upon me in asking me to speak on this occasion, as representing those who, from the north-east frontier of India, have so long looked with eager and anxious eyes in the direction of the territory which Prince Henry of Orleans has now cleared up, and who are ready to congratulate him in the truest spirit on his adventurous and successful journey. Although I had never any opportunity of taking part in active exploration myself, the problems on the north-east frontier have interested me, as they must interest all Indian officials in those parts. Many years ago, I placed at Sadiya a specially qualified and able officer, Mr. Needham, with the object of investigating the geographical points beyond our frontier. Mr. Needham made one adventurous and interesting journey to Rima, on account of which he received the gold medal of this Society, and he, with the help of the Pundit known as A. K., cleared up that most difficult problem, the course of the San-po, which we all believed flowed into the valley of the Irawadi under the name of the Mekong, but he never had the opportunity of penetrating in the region His Royal Highness has passed through. It may seem disappointing that none of our officers, with their advantage of proximity, should have performed this task, but I should like to explain that

great difficulties are put in the way of servants of the Government of India in prosecuting explorations of this kind. The Government always feels great anxiety, lest it should be led into political complications through any accident happening to one of its servants, for if he started on a journey of this kind, and was taken prisoner or killed, it would be compelled to rescue or avenge him. On this account, it is very seldom that officials of the Government can be permitted to carry on explorations of this kind, but none the less do they show an extreme desire to be allowed to make journeys of this sort, and deep interest in the results of those who have been more fortunate than themselves, and I am quite sure that every explorer, or would-be explorer, on our Indian frontier will congratulate His Royal Highness on his brilliant achievement, and will join with the cry of Mr. Cooper, when he left Seku after hearing the report of the journey of Prince Henry of Orleans, "Vive la France."

THE PRESIDENT: We have here this evening two very distinguished officers belonging to the Indian Survey Department, Colonel Hobday and Colonel Woodthorpe, both acquainted with the neighbourhood of the region discovered by Prince Henry. I trust that one, if not both, will be so kind as to address some remarks to the meeting.

COLONEL WOODTHORPE: I have had the honour of speaking to you on one or two other occasions, but I feel it is an especial honour on this occasion, when we have to congratulate a great nation adjoining our own, divided from us occasionally by political troubles, but individually, I believe, always friends. The first Frenchman with whom I made friends was my French master, forty years ago; I am happy to say he still writes to me, though he is eighty years of age, to congratulate me on any little success I attain. The narratives of the French explorers, François Garnier and others, have always had the greatest fascination for me, and it was with the greatest pleasure that I found I was to be associated with French explorers on the Mekong commission last year. I had a very pleasant time with them; they were very friendly on all occasions, and the kindness with which I was received in Paris by two or three members of that commission was extremely gratifying. Shakespeare says, "One touch of nature makes the whole world kin." I think one touch of exploration has a greater effect. The Frenchmen referred to as "those brave missionaries and unknown heroes" have carried on a great work for years past. Among them a man equally brave, but not so unknown, the Abbé Desgoudin, most highly respected by all explorers, I am proud to say is one of my friends, and did me the honour of sending his book to me some years ago. I, as an explorer, and as a worker in the survey of India in Assam, have always cast longing eyes towards that quarter which the Prince has traversed, and which he told us of this evening. A very distinguished member of your Society, Captain Gill, who came very near to India from the side of China, was also very anxious to cross that territory between India and the point at which his explorations ceased. Just before his lamented death in Egypt, he wrote to me, saying if we could get sanction to go across that route, he would gladly accompany me at his own expense; but the reasons given by Sir Charles Elliott prevented my performing that journey. I took a little trip in company with Colonel Macgregor over a part of the route described by the Prince. There were serious difficulties and obstacles, and I must congratulate His Royal Highness on having overcome these obstacles so successfully. I must also congratulate him on the able manner in which he has spoken to us in English; but for one who did not quail before all these difficulties and dangers, the difficulties of the English language can have no terrors. My short attempt to reach the Irawadi made me appreciate these great difficulties. With him, I have known what it was to cross rivers up to our necks, hardly knowing whether we should be able to get across or not. I remember that, coming back, we arrived at

a stream which, when we had crossed it only a month before, was not knee-deep, and finding 12 feet of water. Our only chance was to bridge it by felling a tree from the opposite side. Two or three gallant little Goorkhas of the 44th G.L.I. swam across, and cut down a tree from the other side. We had previously measured its height to see if it would span the river. The question was whether it would fall at right angles. These expert woodmen had calculated the exact angle, and fortunately it did. The trunk became wedged between the rocks and held firm. The top branches reached to the shallows, where they became embedded in the sand. We were all able to get across, though an hour after the crossing was made the river rose 2 feet over the bridge, and soon it was 10 feet under water. Tigers carried off three of my men on three separate nights from one of our camps; the Prince refers to this danger also. He said that in Kamti he met with a great deal of impudence. I am afraid that is the result of too much civilization. When I visited the Kamtis they were exceedingly civil and kind. They have since visited Calcutta, which seems to have turned their heads. I am exceedingly pleased to find that our geographers' views have been confirmed by the Prince's observations. In a paper Colonel Hobday prepared some time ago, he corroborates the theory Colonel Macgregor placed before you in his paper read in 1886, that the Irawadi did not come from any great lake, but rose in three great branches in the hills surrounding the small basin of the Kamti country. Colonel Yule said in his introduction to 'Rivers of Golden Sand,' "Colonel Hobday goes on to show that the vast discharge of water into the Irawadi binding the Mekong and Chindwin areas, tend to make it develop rapidly into a noble river." It is very satisfactory to us, who have always held that view, based on accounts received from native travellers. You will observe that some of the Prince's slides are very similar to the illustrations shown with my paper on the Shan tribes.

The PRESIDENT: Prince Henry of Orleans has, from what we have heard to-night from his own account, from Colonel Woodthorpe, and from Sir Charles Elliott, solved one of the few remaining problems of Asiatic geography; and I think we must all admire the resolution, gallantry, and high intelligence which enabled him to achieve this great success. I think it right that I should, in a few words, take the opportunity of the presence of this young French explorer to refer to the reciprocal good feeling which has almost always existed between the travellers and explorers of the two nations. The history of the intercourse between English and French geography has been one of friendly rivalry and generous emulation. Whenever that intercourse has become necessary, we have all felt that. More especially we felt it with the lamented explorer, François Garnier, who came over like Prince Henry to this country, and received the highest honour we have it in our power to bestow, the royal gold medal, from the hands of Sir Roderick Murchison in 1870. I then had the pleasure of making his acquaintance. He was not long amongst us, but he was with us long enough to form enduring friendships. I may mention among them that which he formed with Sir Henry Yule, for whom he had an affectionate regard, and with whom he corresponded until his lamented death in the discharge of his duty three years afterwards. The mantle of François Garnier has fallen on the shoulders of Prince Henry of Orleans. Prince Henry has emulated, and with no small success, the honourable and patriotic work of his predecessor, Garnier; and I trust he will be like him in this respect also—that when, after his very short visit at this time, he leaves the country, he will leave it with nothing but pleasant reminiscences of his English friends. There now only remains the pleasant duty of conveying the hearty and cordial thanks of this great assemblage to His Royal Highness for his kindness in coming here. Indeed, we have to thank Your Royal Highness for many things: for the trouble you have

taken; for addressing us so admirably in our own language, and in a voice which has enabled every one in this room to hear you, which I could see from the attention which has been paid. We have to thank you for the most interesting and important paper which you have read to us this evening; and while conveying to you the thanks of the meeting, the meeting will also, I am sure, wish me to convey to you our sympathy and our admiration for the splendid geographical work you have achieved.

PRINCE HENRY'S MAP.—The map is principally compiled from those which appeared in the *Bulletin* of the Paris Geographical Society, 1895, and in the *Comptes Rendus* of the same Society, 1896.

THE ERUPTION OF AMBRYM ISLAND, NEW HEBRIDES, SOUTH-WEST PACIFIC, 1894.*

By Commander H. E. PUREY-CUST, R.N.

AMBRYM island is one of the New Hebrides group situated in the south-west Pacific, in a line of volcanic activity extending from the active volcano of Tinakula, in the Santa Cruz group, southwards through the



LOPEVI.

extinct volcano of Vanikoro in the same group, the boiling springs of Vanua lava in the Banks group, Ambrym, Lopevi, and Tanna in the New Hebrides, away to the southward to Matthew and Hunter islands, a distance of some 800 miles. This line is probably continued to the

* Paper read at the Royal Geographical Society, June 22, 1896. Map, p. 656.

north-west through the Solomon islands and New Britain to Java, and to the southward possibly to New Zealand.

The New Hebrides are all more or less of volcanic formation, or exhibit signs of volcanic upheaval in the numerous elevated masses of coral limestone raised in distinct terraces, marking successive upheavals, to heights of over 1000 feet.

Of the active volcanoes, Tanna, near the south end of the group, has always been reported in a state of very regular activity ever since it was first visited by Captain Cook in 1774. In 1878 it was particularly active, when a severe earthquake and extensive upheaval nearly entirely destroyed the fine harbour of Port Resolution.

Lopevi, just to the southward of Ambrym, is a magnificent perfect cone of cinders rising from a base of 3 miles in diameter to the height of 4755 feet, with apparently a small crater at its summit. In clear weather it is visible from far and wide, and forms one of the finest sights in the New Hebrides. At present it is inactive, but it was seen in eruption in 1864 by the mission schooner *Southern Cross*, when Bishop Patleson was on board. Mr. T. B. Whytehead, at present chapter clerk at York, and then mate on board, says, "I think the eruption occurred about daylight on June 9. There had been a thin eddy of smoke round the crater for a day or two. When the explosion occurred it was preceded by some tremendous reports, and then a fierce rush of smoke and red-hot stones took place, the column ascending to an immense height. It then spread out like a mammoth umbrella, and the descent began. Some of the stones must have been large, for we could hear them falling into the water, and our decks were covered to a small depth with black impalpable ash. As the breeze gradually shifted the smoke from the crater, we could see the red-hot lava pouring over the edge of the lip where it had been broken down. It welled over in a succession of waves, which ran over and over one another until they reached the water, when they produced a furious roaring noise and a succession of waves outwards, whilst clouds of steam rose high into the air. This lasted for two or three hours."

Lopevi was again in eruption mildly some ten years ago, when the natives threw cocoanuts down the crater to stop it, but without any effect.

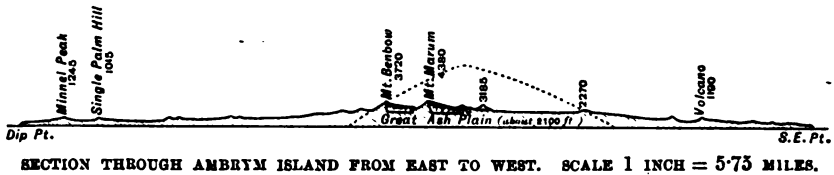
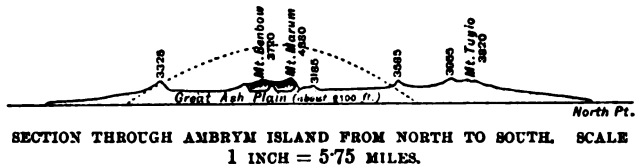
Ambrym is an entirely volcanic island. The centre of it is occupied by an extensive plain of ashes elevated some 2000 feet above the sea-level, and from 5 to 6 miles in diameter, with an encircling unbroken rim of hills all round seldom more than 100 to 200 feet above the level of the plain, possibly the remains of an enormous crater, and the basal wreck of a mountain which must have been some 10,000 feet high.

Near the western end of this ash-plain rise two of the highest summits of the island—Marum, 4380 feet, and Benbow, 3720, both containing huge craters about a mile in diameter.

Like most volcanic islands, vegetation grows very luxuriantly, particularly cocoanuts, which can be seen here in more abundance than in probably any other island of the group.

Numerous hot springs are found along the shore, especially on the north side, the temperature of the water ranging from 107° to 110° Fahr.

Captain Cook, when he first visited the group and named them the New Hebrides in 1774, mentions seeing two very high columns of smoke rising from the centre of Ambrym, and from the scanty reports of visits to the group from that time to this it has evidently always been in a mild state of eruption, but never on such a scale of magnitude as we had the luck to see in October, 1894.



ROUGH SECTION OF LAVA-FLOW AFTER ENTERING THE SEA, OCTOBER 16, 1894.
SCALE 125 YARDS = 1 INCH.

H.M.S. *Dart* had been employed surveying the north coast of Ambrym, and at 6 p.m. on October 15 the survey was completed, and the ship anchored for the night at Dip point. During the night a slight glare was seen over the centre of the island, but thought to be only a bush fire. However, the next morning (October 16), on getting under weigh at 6 o'clock and rounding the point to the eastward, a vast cerebiform mass of cloud was seen rising to a great height over the centre of the island, and, when a little further along the coast, black smoke was plainly visible behind the low coast hills rising in dense columns, and it was evident that an eruption of the island had commenced.

Soon it was apparent that a lava stream was rapidly finding its way towards the sea; the course of the stream could be distinctly traced by

the dense black smoke from the burning bush as it wound its way through the hills like a great fiery serpent. Occasionally a puff of white steam would show where water had been met with, and, it being evident whereabouts it would finally reach the sea, the *Dart* was steamed



PHOTOGRAPH OF STEAM COLUMN ABOUT TWENTY MINUTES AFTER THE LAVA-FLOW ENTERED THE SEA ON OCTOBER 16.

up to the vicinity and stopped some 300 yards off the shore to await events. As the head of the stream got nearer, bursts of flame could occasionally be seen, and the noise was most indescribable and awe-inspiring. Presently the head of the stream appeared—a red-hot, rapidly moving mass of molten lava, some 30 yards wide, with lumps of clinker tossing about on the surface. In another moment it entered the

sea, and then a most wonderful sight was seen, such as none of us who then saw it will probably ever see again as long as we live: a dense pillar of steam rapidly rose straight up to a height afterwards measured by sextant and found to be 4600 feet. There was no explosion as the lava touched the water, but a few seconds later enormous bubbles of water commenced to rise some 100 feet or more, like the explosions of heavy submarine mines, and then burst violently outwards in radiating tongues of water and black masses of presumably lava. Considerable waves began to set up and steam to rise from the water in the vicinity, and, as both the violence and area of the explosions appeared to be rapidly increasing and spreading outwards, the *Dart*, which had a steamboat towing astern, was moved off to a safer distance.

Fine dust and *débris* of burning bush now began falling. Canoes full of natives were leaving the shore in all directions; many natives could be seen running along the beach seeking a place of safety; one woman was seen carrying another on her back. The steamboat picked up several canoes and towed them clear of danger towards Dip point. Many of the natives wanted to abandon their canoes and come on board, but, as I wished to proceed at once round the other side of the island and get a view from to windward of what was happening, I persuaded them at length to go ashore at the mission station, promising to return again in the evening—"No gammon," as they said.

From the weather side, *i.e.* the south side, it was seen that all the western end of Ambrym was enveloped in smoke; a dense black wall of it was rising from the vicinity of Fo-luk, one summit looking as if all the bush was burnt off, with the exception of the bare trunk of a very large tree that stood out against the blackened sky, and smoke and steam were rising from the crater of Benbow, to the westward of which all was black as night.

On our way back, as we rounded Dip point, the cliffs, which are here composed of loose volcanic sand, were seen to be falling down into the sea in constant landslips, and at this moment a fresh outbreak of smoke was observed, apparently just to the southward of Single Palm hill, behind the mission station. Dust was falling heavily, and we could only just see the shore when we anchored only a few hundred yards off it. Flames at that moment appeared over the gap of the hills behind the mission, and the noise of the explosions and burning was continuous and alarming. The natives could be seen assembled on the beach in groups, and I accordingly sent in boats to take off as many as cared to come. On landing, the ground was found to be in a constant state of tremor, and the natives, as well they might be, in a very terrified condition, the women and children crying and huddled up together. Over eighty men, women, and children were soon embarked, together with all their effects, and our little quarter-deck, packed as full as it would hold, presented a strange sight. Some of them were our

friends of the morning, but the greater number belonged to the mission station. Dr. Lamb, who had established here the first Medical Mission in the islands only about two years before, and already done an immense amount of good, had, in the beginning of 1893, seen the mission utterly destroyed by the great hurricane of that year; having been rebuilt, it was, a few months before the eruption, again destroyed by fire, and he had returned to England to raise funds to start it once more. I am glad to say that since leaving Australia I have heard from him, saying that he has a third time started again in the same place both mission and hospital, in spite of the eruption.



POINT FORMED BY LAVA-FLOW OF OCTOBER 16. PHOTO TAKEN FROM FORMER HIGH-WATER LINE LOOKING SEAWARDS.

A labour vessel from Queensland, which happened to be anchored here, had, as soon as the eruption commenced, sent their boats on shore in the hopes of getting plenty of recruits anxious to get away from the dangers that threatened them; however, they only succeeded in obtaining two. The natives said, "Me no want go along Queensland; me fellow got man war." One of the men in the labour vessel's boats remarked to our boat that we had served them a nice little trick; but my own opinion was, that recruiting under such circumstances, when the natives were all in terror of their lives, was, to say the least of it, a rather low-down game, and I took care afterwards to make certain that the two men they did get were really willing to go. We took our eighty natives to Rannon, near the north-west point of the island, a place of comparative safety and clear of the thickly falling dust, and the same evening comfortably housed them in a small schoolhouse belonging to Dr. Lamb, where they

remained until four days after, when we took them back again to their homes when all immediate danger appeared to be over. They were exceedingly grateful to us, and seemed very pleased to be once more at home, although their houses and all around were covered with a thick covering of dust.

On repassing the scene of the morning's outflow of lava, it was seen to have apparently stopped flowing, a fan-shaped point having formed out for some 200 yards into deep water, still steaming. All along the shore the water was of a light green colour like shoal water, and quite warm. A great quantity of dead fish and turtle were floating about, evidently killed by the hot water and violent submarine explosions.

On shore at Rannon the next day (October 17) earthquake shocks were occurring about every ten minutes, sufficiently strong to produce a very uncomfortable feeling of insecurity when seated in M. Rossi's house, a French trader that lived there. During the day they became so violent that towards the evening he embarked all his people on board his cutter and proceeded to Port Sandwich for safety. We steamed round the island to the eastward, and as we proceeded along the coast numerous fires were lit on the beach, the recognized signal in the Pacific for natives wishing to communicate with a ship; but landing here on the weather side of the island was next to impossible, and as there appeared to be no immediate danger, I did not stop.

Whilst steaming along the south coast, another dense cerebiform mass of cloud rose up perpendicularly over Benbow to a height of close on 15,000 feet, similar to what we had seen on the morning before.

We visited Dip point again, but the natives appeared quite reassured; "Fire he finish," they said, the possibility of further outbreaks never entering their heads, and the minor discomforts of earthquake shocks and a heavy coating of fine dust over everything not appearing to trouble them much. Dust was falling continuously, and was very distressing to the eyes, etc.; objects were not visible over a quarter of a mile, and we were very glad when we got out of it on our way to Port Sandwich for the night, but it was not until 9 miles to the westward of Dip point that we ran into daylight again, and rigged the steam hose and had a good wash down of everything and everybody fore and aft.

On the way across several earthquake shocks were felt on board, and during the night whilst at anchor about thirty were counted between 10 p.m. and 6 a.m., one about 2 a.m. being sufficiently severe to wake all hands up, tired as we were. The shocks continued more or less for three weeks afterwards, being felt all over the group, and we soon got quite used to them.

A heavy pall of dust and smoke now constantly overhung the island and drifted up the coast before the south-east trade, dust falling at Vao island, 50 miles off, the day after the outbreak, and in Santo, 80 miles distant, five days after, thick enough to cover the trees. Dense clouds.

of smoke and dust were constantly welling up from the crater of Benbow, attaining altitudes of from 10,000 to 15,000 feet, and on one occasion, whilst lying at Port Sandwich, some 25 miles distant from the crater, we saw an unusually great mass of dark-coloured smoke rising rapidly over Ambrym; in the course of about ten minutes it had attained an altitude of 26,000 feet, when a small perfectly white cloud of steam issued from the summit of it and quickly faded away, the whole mass assuming a modified "pine-tree" form, and spreading as a pall of inky blackness up the coast of Malekula. This, we found out afterwards, was evidently caused by a fresh outbreak from the crater when a second vent was opened up.

No rain fell for nearly a month after the outbreak on the western half of the island, *i.e.* to leeward of the crater, though frequent heavy showers were felt at Rannon and to windward. Dust fell continuously, and in consequence this end of the island changed from its natural hue of bright green tropical vegetation to one uniform light slate colour; the sides of Benbow and Marum looked, with the sun on them, as if snow-clad, and the cliffs at Dip point showed from Port Sandwich as white as the cliffs of Dover. The whitewashed marks we had made along the coast for surveying purposes disappeared in the general greyness, the weight of the dust caused the trees to droop, and the whole country looked as if a great blight had fallen on it. A certain amount of damage was done to the fruit trees, *i.e.* coconuts, yams, bread-fruit, etc., which were only just beginning to recover from the effects of the great hurricane of 1893, and on which the natives depend for their food-supply. However, about the middle of November a cyclonic disturbance set in, with heavy weather and abundance of rain, and the island once more resumed its normal bright green appearance, the dust all mixed with the soil or turned into a layer of stiff mud.

We paid constant visits to the island, and as far as possible visited all the points of interest connected with the eruption. A climb to the top of Single Palm hill near Dip point, one day when the wind happened to be from the northward, enabled us to get a good view of what had happened in this part of the island. A stream of lava had come from the direction of Fo-luk, its course being easily followed by the numerous vents of steam right away up into the hills, which looked bare and burnt, with steam rising from their summits, as if the lava had come over them. Almost directly under us, where the ground was fairly flat, the lava had spread out until it formed a lake nearly a mile in diameter, with an occasional small hill rising up like an island in its midst. The surface was being constantly travelled by small whirlwinds of dust rising to a considerable height, and at first sight looking like distinct "fumaroles," until, on watching closely, they could be seen to be rapidly moving. From the west side of the lake two streams led off towards Craigh cove, and these we visited on two occasions. Landing

at the mission on October 20, everything was found to be covered with a deposit of dust nearly an inch thick, of a dull grey slate colour, the trees all drooping with the weight of it, and much of the undergrowth broken down. A number of natives accompanied us, and it was curious to observe the different effects of the dust, our party gradually turning black, and the natives white, until all were of the same sombre hue, a fact which hugely delighted the natives. This dull grey covering and the general disconsolate look of the dense bush produced a scene of the utmost desolation, which became intensified as the neighbourhood of the lava streams was approached. Occasionally small parties of natives were met, all of the same grey colour, some pursuing their ordinary occupations in their gardens as if nothing had happened, others carrying their household goods on their backs, and sometimes even the plaited palm-leaves that form the roof of their huts, moving house to a safer spot.

Presently a very excited conversation took place between our natives and two women we met, and evidently something unusual was up; but we were, nevertheless, a little startled, on turning a sharp corner of the narrow path, to see an advancing stream of red-hot lava, some 10 feet high, blocking up the road. However, it was only moving some 5 or 6 feet an hour, and consisted of great rough lumps of clinker, which every now and again fell over down the advancing slope, the lower portion being red hot and in a semi-fluid condition. Only the bush in the immediate vicinity was on fire.

We retraced our steps a short distance, and then by another path reached what was apparently the main stream; this had stopped short in its advance in the middle of a banana garden. At one place the wall of lava, some 30 feet high, was actually touching a large banyan tree, but had not burnt it. The lava was comparatively cool, but still too hot to walk on more than a few feet from the edge. It was tremendously broken up into rugged heaps of slag and clinker, and thickly covered with dull grey dust. A few days later we paid a second visit somewhere near the same spot, and walked on the flow for some 200 yards, but in about ten minutes were only too glad to get off again, our boots being nearly red-hot. Down many of the fissures could be seen the still molten lava a few feet below. Curious masses like broken water-pipes were lying about, some 2 to 3 feet in diameter, and 3 to 4 inches thick, smooth inside and out; these proved to be the broken-off chimneys of the "fumaroles" or vents for the escape of vapour leading down to the molten lava below. That they were vent-holes for vapour I had practical experience, being nearly knocked head over heels by a sudden red-hot stifling puff that came up while looking down one of them. Trunks of trees were lying about on the surface, and one large tree still stood in the middle of the stream, with the lava piled up on the weather side of it, as well as lumps lodged in the forks of the branches; the trunk was charred in for about

a foot. We returned to the ship dirtier than the blackest chimney-sweeps, to find the dust falling heavier than ever, and the ship herself a dull grey mass from truck to water-line, the decks being covered with a deposit nearly a quarter of an inch thick.

The next expedition was to view the actual crater of Benbow. I had already, before the eruption, paid a visit to the centre of the island, curious to see what was behind the range of coast hills, and, after a long climb up over 2000 feet through the dense bush, was surprised, on descending 100 feet or so the other side, to suddenly emerge into the daylight on to a dry river-bed of hard ash some 200 yards



VIEW FROM (A)* LOOKING TOWARDS CRATER.

wide, which led to a great plain of ashes, bare of all vegetation except a few scanty shrubs in places, 5 or 6 miles in diameter, at an elevation of about 2000 feet, in the middle of the island, from the centre rising Marum and Benbow—both, as we afterwards found out, containing huge craters. This visit, curiously enough, was less than thirty hours before the actual eruption commenced, and gave rise to a story among the natives that I had set fire to the island, or, as they said, “Captain man war put mashes (matches) along ground and make fire.”

On October 23 a party, consisting of Lieutenants Dawson and Marescaux, Mr. Bracey (boatswain), six men, and myself, landed about 2 miles to the westward of Rannon, and, after considerable difficulty, induced some ten or twelve natives to accompany us. On reaching the dry river-bed, we met with the first signs of the effects of the earthquake shocks: large portions of a cliff, where the river made a sudden

* See Map, p. 656.

fall of 70 feet, had fallen down, as well as numerous slips in the nearly perpendicular banks. On arriving on the plain, a bitterly cold shower of rain drenched us to the skin, and made the ground very greasy and difficult to walk on. As we skirted the slopes of Marum, it began to be much broken up by deep ravines into ridges of loose ash-hills 100 to 200 feet high, up which we had to climb, often on hands and knees, the ash giving way at every step, and then slide down the other side at a great rate, frequently having to retrace our steps and make long détours to find leveller walking.

Eventually a small summit (marked A on plan) was reached, with a post fixed on the top, evidently a landmark of the natives.



VIEW FROM (A)* LOOKING OVER THE GREAT ASH PLAIN TO THE NORTH-WEST.

From here a good view was obtained towards the crater some 2 miles away, the dense clouds of smoke rising from it forming a grand sight at this distance. All around, the loose ash-hills had been simply shaken to pieces by the earthquakes, and the scanty coarse vegetation growing on them was nearly buried out of sight; great cracks traversed the ridges, and they appeared almost too unsafe to venture on. From what we had already experienced, it seemed nearly hopeless to expect to cross the endless succession of ash-hills that lay before us. The natives now declared there was no road, and refused to go any further. However, when they saw we were determined to push on, three out of the number followed us, and soon discovered the road. After climbing a few more razor-back ridges, a gully was hit off leading in the right direction, and, with one or two checks,

* See Map, p. 656.

this led right up to the crater; the ground became firmer and better walking, and the noise of eruption nearer and nearer, until, after a most fatiguing tramp of over six hours, a final scramble along a narrow knife-edge of ash, with an almost perpendicular descent on either side of about 200 feet, landed us on the actual lip of the crater.

The sight that met our gaze was ample reward for all the fatigue and trouble we had undergone. The crater was nearly a mile in diameter, with almost perpendicular sides ranging in depth from 800 feet under where we sat to about 1700 feet under Benbow summit, the actual floor of the crater being quite flat, of cooled lava, and about the same level as that of the great ash plain outside. It was thickly covered with snow-white ash and dust, as well as the walls of the crater all round, from which with each fresh concussion it kept falling in huge landslips. On the further



side of the bottom of the crater was a great hole or vent, almost completely obscured by the dense volumes of smoke issuing from it, which rose some 2000 to 3000 feet above our heads; the dust all round it kept slipping down into the depths below, only to be shot up again among the smoke. Every two or three minutes a fresh explosion would take place and stones be thrown up, making a strange crackling noise as they hurtled together in the air. No outlet could be seen for the escape of lava from the crater anywhere. Owing to shortness of time, we had to start back again after a stay of only half an hour, and, as it was, were overtaken by the darkness, feeling our way at a snail's pace for the last mile through the bush, carefully guided by a native, who seemed to intuitively find his way through the pitch darkness under the trees. We followed in Indian file, and his warning cries of "Stick along ahead," "Stick along ground," were passed from one to the other along our long line, and saved us many a nasty knock. Finally, we reached the boat about 8 p.m., after a most fatiguing tramp under a tropical sun of quite 30 miles, the

greater part over loose ashes, and suffering much from want of water. A bathe, however, in the hot springs on the beach made us feel ready to commence the ascent again. A month later, in company with Lieut.-Commander Cuddy and a party from H.M.S. *Karrakatta*, a second visit was paid to the crater. This time, knowing the road, the crater was reached in better time, and allowed of a longer stay there. The sight was even finer than on the former occasion. A new and much larger vent had opened up (probably when from Port Sandwich we saw the sudden burst-up of smoke to the height of 26,000 feet), dense volumes of black smoke were issuing from this new vent, whilst only steam or light-coloured smoke came from the old one, though only a few yards separated the two. At times, as the smoke cleared for a moment, we could see for a considerable distance down this new vent, which appeared to be more in the form of a fissure than a hole. Far down below in the bowels of the earth could be heard a roaring like a heavy surf beating on the shore; this would gradually increase in sound as each fresh explosion slowly mounted up the hole, dense volumes of thick black smoke welling out, with volleys of stones rising up above the smoke and describing beautiful parabolas in the air as they mounted up almost on to a level with where we were seated, their paths often marked by a trail of light-coloured smoke like rockets, then falling back into the hole or on to the ash at the sides, and occasionally into a pool of water that had collected after the heavy rains since our first visit, always with a sharp explosion and emission of steam, showing that they must have been nearly red-hot. The crackling of the stones as they struck one another in the air was like a constant heavy roll of musketry-fire, with occasional louder reports and echoes back from the walls of the crater, until it sounded as if a general engagement was taking place. It was altogether a sight and sound hard to equal in grandeur of effect, and most fascinating to watch. The ground where we sat was in a state of constant tremor, with occasional rather severe shocks. Shortly before we left the explosions increased very much in rapidity and violence, the smoke rose to an enormous height above our heads, and, owing most likely to a slight shift of wind, gradually filled the whole crater right up to where we were—and, in fact, it appeared high time to be off.

Many of the party had already started, making a bee-line for a water-hole 5 miles distant that on this occasion we had discovered at the edge of the ash plain on our way up. Curiously enough, the natives, who usually go all day without food or drink, even on such arduous expeditions, seemed unable to resist the temptation of the water on this occasion, and from that moment became slaves to drink and quite useless, frequently losing the path on the way back, and dropping to the rear with fatigue, and we had some difficulty in keeping them up at all. By doubling down all the last part of the descent, we just saved daylight this time, and reached the boats about seven o'clock.

Lieut. Dawson and a small party had in the morning separated from us on reaching the ash plain, and branched off to explore the eastern slopes of Marum, where, from the ship when off the east coast of the island a few days before, we had seen steam rising. After a laborious climb on hands and knees up the steep slopes of loose ashes, he reached the lip of Marum crater (marked C on plan), which he found of much the same size and shape as that of Benbow, only quite extinct. So steep and dangerous-looking was the edge of the crater, which was composed of ashes and stones that kept falling in small landslips, that it could only be approached near enough to look down by lying flat on his face, while the remainder of the party held on to his legs. At the eastern end of the crater was a broken lip with another small crater outside it, from which steam was rising. This small crater was visited in 1883 by Lieut. Beresford and a party from H.M.S. *Dart*, who ascended from Port Vato on the south side of the island, and *en route* looked into the crater of Benbow, which was then partially filled up with ashes, sand, etc., and looked as if it had been extinct for a very long time. An account of their expedition appears in the *Proceedings* of the Royal Geographical Society for 1884. Lieut. Dawson's party passed down the hill an hour before us, leaving a notice to that effect stuck up in the path; but they had, unfortunately, to part with their natives at the last village, about a mile from the shore, and lost their way—an easy matter in the dense bush—and eventually, when darkness overtook them, had to spend the night where they were without food or water, a very trying experience after the fatigues of the day. They were picked up at daylight the next morning, and luckily no after ill effects were felt.

Besides visiting the actual outflow of the lava into the sea, we paid two visits to the neighbourhood of the village of Fo-luk, from where the lava stream was reported to have come. Just before reaching it we crossed a deep gully, down which a lava stream had flowed; the high line of the banks was quite 50 feet above the present level, the surface of which was concave in shape, the stream having been apparently drained dry, so to speak. It was still hot and steaming in places, and the natives had constructed a sort of "corduroy road" over it of sticks to save their bare feet. The hillsides were covered with cinders and dust to a depth of 6 inches. A small ravine that led up to the village of Fo-luk was full of lava up to the head of it, 100 feet above the main stream. The huts, as well as all the trees round, had been burnt, and were now thickly covered with ash; confused masses of lava were scattered about, with numerous big blowholes of steam some 30 feet deep. Several tree-trunks were still standing in the midst of the lava, the branches thickly clogged with dripping lumps of it, seemingly without being burnt much. Under one of the trees two women and two small children had been overtaken by the lava and buried beneath it—the only loss of life on the occasion, strange to say, the remainder

having managed to run away in time. The natives declared the lava had all come from somewhere further up the gully, through the air "all same pigeon," a theory that seemed rather improbable, and we eventually found that it had actually burst out of the ground in this vicinity.

After a walk along the ridge on the south side of the gully to a higher summit 200 feet above the level of the lava-stream, a good view was obtained looking up the ravine. The sides of the hills were perfectly bare, every vestige of vegetation having been burnt, and only a few tree-stumps lying about, and the dust and cinders covering the ground from 2 to 2½ feet thick. All was chaos and desolation; lava and cinders were heaped up in all directions, reaching in places nearly 300 feet up the hillsides; and on the top of the hill where we were standing, good-sized fragments some 3 feet in diameter were lying about—the "pigeons" of the natives. In the centre of the lava-stream was a hill of solid lava nearly 200 feet high. Steam was issuing in places all over the hillsides, which had caused us to think, when viewing it at a distance from Single Palm hill, that the lava had flowed over the hills. There was no regular crater, and it was evident that the lava had burst up from the ground in all directions, and had been either violently impelled up the hillsides by hydrostatic pressure, or else the hillsides had been themselves split open.

On the other side of the gully we were able to get right up to the head of the outburst. Part of the ridge we walked along had been overflowed by a mass of clinker, which was still very hot, with deep cracks running through it in the direction of the ridge, down which solid lava or clinker could be seen for at least 15 feet. It was some considerable time before the natives with us could be induced to cross this, which was not to be wondered at, considering how hot the ground must have been to their bare feet, and how dangerous it looked. The head of the gully was at length reached, and a small watershed, so to speak, found to distinctly separate this outbreak from a similar though smaller one on the opposite side. From the former had originated the stream flowing west that spread out into the lake under Single Palm hill; from the latter flowed a well-defined stream some 30 yards wide in the direction of the sea to the northward. About a quarter of a mile down it there joined another stream coming from the eastward, and the two combined had formed the one we had seen enter the sea on the morning of October 16.

We followed up the bed of this latter stream for about a mile; it was very rough and broken up, still hot and steaming in places, with pools of hot water tasting strongly of sulphur. Occasionally a swiftly rushing stream of water could be distinctly heard, running apparently only just under our feet—evidently the drainage after the heavy rains that had lately taken place flowing down the hollow left in the lava-stream when the more fluid central portion had flowed away (*vide*

Judd on 'Volcanoes,' p. 111). The lava-stream was comparatively narrow—only about 10 feet wide in places—and, as it wound through the hills, we expected at each sharp turn to come to the head of it; but it shortly straightened out and became wider, leading right away to the eastward. By climbing up a high tree, its course could be traced for some considerable distance, right up to a curious V-shaped aperture some 2 miles to the west-north-west of Benbow crater, amidst a bare, volcanic-looking mass of hills. It is from this spot that I believe the flow to have originated, but, unfortunately, it was too far off to visit.

I may as well mention here the rather ingenious account by the natives of the formation of the two distinct lava-streams, viz. that one stream had flowed down to the sea to the northward, and, having "kai-kai'd (eaten) all the salt water," had flowed back again and gone down the other way to the eastward.

The natives altogether seemed to be less affected by the eruption than one would have imagined; although extremely terrified as long as the actual outbursts were taking place, they appeared to have little fear as soon as they were over. "Fire he finish," they said, and seemed perfectly contented to resume their ordinary occupations, quite undisturbed by the dust and scene of desolation around them, and with an utter disregard for the possible events of the morrow, due to a blissful ignorance. With the exception of some of the more enlightened natives belonging to Dr. Lamb's mission, who seemed to understand that the eruption was due to no human agency, most of them had some story or other to account for it, such as the following: "Two chiefs, living on opposite sides of the island, quarrelled, as frequently happens, about a woman. One said, 'Very good, s'pose you take Mary belong me, me fellow make fire along you;' to which the other replied, 'S'pose you put fire along my place, you must pay pig.' This is supposed to have been done, and the pigs thrown into the fire to stop it—first of all small pigs, which the fire spat out again as of not sufficient value, and lastly big tusked pigs, which had the desired effect, and caused the cessation of the actual lava-flow, and both parties were satisfied. The subsequent fate of the woman, who had caused all the trouble, was not stated."

Our time being limited, H.M.S. *Dart* left for Sydney at the end of November, just six weeks after the eruption commenced, the crater still belching forth dense volumes of smoke with undiminished activity. Since leaving, the French man-of-war *Scorff* reports seeing Volcano, a crater near the south-east point of the island and which was active in 1888, at the end of December (1894) in a state of eruption, smoking heavily with a red glare over it, the side of the crater having burst out to the southward, and a lava-stream run down that way.

A trader at Dip point reports a second eruption having occurred on the north side of Ambrym in February (1895)—no lava-stream, but

a stream of hot, black, thick sulphurous water lasting from 6 a.m. to 5 p.m., accompanied with earthquake shocks; the smoke from Benbow crater still continuing undiminished, and the natives still throwing in pigs to stop it, with every prospect of denuding the island entirely of them if the eruption went on much longer.

There remains an ample and most interesting field for future exploration, which would more than repay the labours of any scientist who hereafter visits this locality; but much time is required to be spent over it, owing to the great fatigue experienced in the necessarily long and rough walks in a most trying, hot, moist climate, often without the possibility of procuring water, entailing a thorough rest of some days between each successive expedition.

What the next event may be in that vicinity it is impossible to forecast, and perhaps all that I have just related may fall into comparative insignificance with the next outbreak, as in the case of Krakatoa in 1883.

Before the reading of the paper, the **PRESIDENT** said: We receive from the hydrographer to the Admiralty a detailed report from year to year on the work done by the naval surveyors. But we rejoice when we are able to welcome one of those surveyors in person. Captain Purey-Cust, when surveying in H.M.S. *Dart*, was a witness of a most extraordinary eruption at Ambrym, an island of the New Hebrides, an account of which he will now give to us.

After the reading of the paper, the **PRESIDENT** said: We were going to have an animated discussion on this paper, but I am afraid that those who intended to address the meeting have gone to the Queen's Concert. I do not see the hydrographer, who appears to have left us. Lord Stanmore has also gone to the Queen's Concert, and Sir Henry Norman. One or two geologists of eminence intended to be present this evening, and, in their absence, I will ask if any one else wishes to speak. If not, I will merely say that we are very much obliged for papers of this kind relating to the volcanoes which occur along this marvellous fissure running south-west and north-east, extending almost to Krakatoa. The more we know of them, and the more details we obtain regarding their nature, and the periods of eruption, the more likely are we some day to come to a knowledge of the causes of these fearful devastations in the New Hebrides and elsewhere along that line of volcanic activity. I trust that naval surveyors will often favour us with papers, and become Fellows of our Society. You will all, I am sure, desire me to express to Captain Cust your cordial thanks for the very interesting paper he has read to us this evening, and for showing us so many interesting views on the screen.

THE BONDE COUNTRY, EAST AFRICA.*

By the Rev. H. W. WOODWARD.

THE accompanying map was made to illustrate the work of the Universities Mission in that part of East Africa known as Ushambala and Bonde (more correctly Boonde, but that leads to its being miscalled

* Map, p. 656.

Bunde). It includes part of the most westerly range of Ushambala mountains, and the Bonde country which lies between them and the wilderness. The northern limit is the river Zigi, beyond which the people are Washambala, and the southern limit is the Luvu, but there are many Zigua villages north of it.

The map has been made by the aid of the prismatic compass only. The foundation of it was the triangle formed by Kitulwe peak, Magila mission station, and the highest point of the low hill east of Magila, and larger ones including Mlinga, Kitulwe, and Magila peaks, Umba, and Kiguluni hill. The rest was filled in by bearings taken to and from these points wherever possible. The scale is approximate only. The variation of the compass was taken at 10° exactly for convenience. The whole was worked out very carefully, and frequent visits in the course of duty enabled me to take the chief bearings more than once. When I had tested them many times, and felt sure that Magila and Umba were in their true relative positions, I divided the space between them into eight, taking each division as a mile. Mr. Keith Johnston, who visited the country in 1879, fixed the positions, I believe, of both Magila and Umba, and he told me that the distance between them as the crow flies was exactly 8 miles. Many little brooks exist which I have not traced. The principal rivers are the Luvu and the Zigi; smaller ones are the Kihuhwi and the Maluka, tributaries of the Zigi and the Ukumbine.

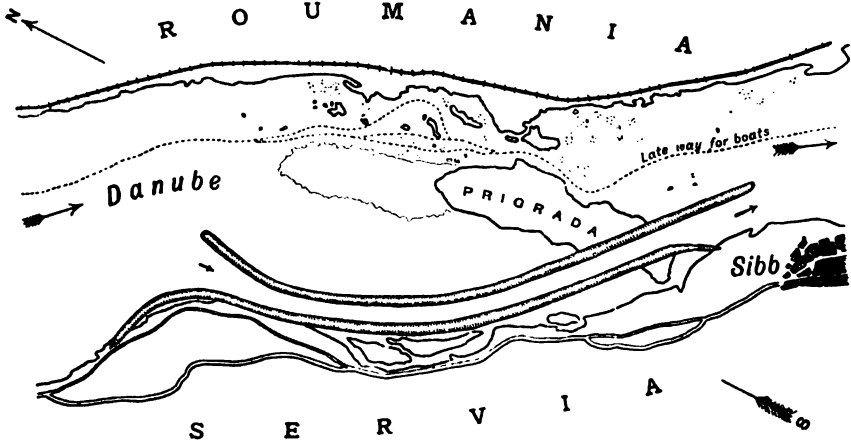
Descriptions of the country will be found in the *R.G.S. Proceedings*, vol. i., New Series, by Rev. J. F. Farler; and p. 545, Mr. Keith Johnston's own account of his journey, together with a paper on the geology of the country by Mr. Thomson. This country is now in the German sphere of influence, and there are already promising plantations of tobacco and coffee, and a railway has been commenced from Tanga, which is to go *viá* Segá and Kologwe to Kilimanjaro.

THE REGULATION OF THE IRON GATES.

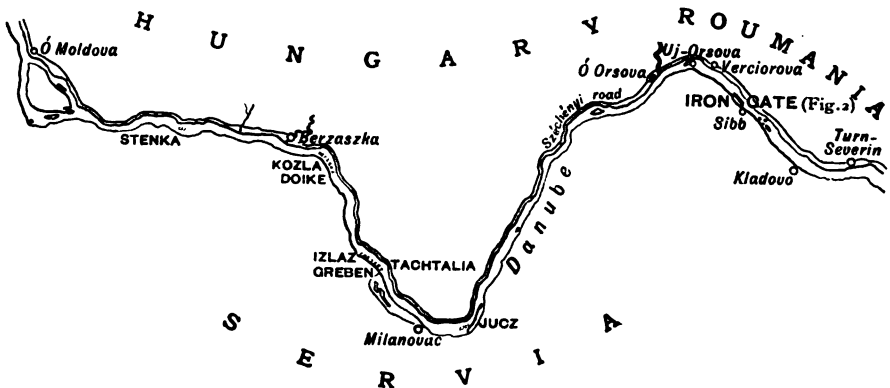
By Dr. K. PEUCKER, Vienna.

WE have already, from time to time, noticed the progress of the great engineering works begun in 1890 at the Iron Gates, with the view of opening the upper Danube to navigation by vessels of considerable size. The expectation that the works would be practically complete by the end of 1895 has been justified, and the formal opening of the channel took place on September 27 last, in the presence of the Emperor Francis Joseph and many princes of neighbouring states. The main object of the works was to clear the stretch of some 50 miles of the rapids and shallows obstructing it, and especially to cut a clear channel 200 feet wide and 10 feet deep through five dykes crossing the bed of the river (Fig. 1), consisting of hard rock, which had to be blasted with

dynamite. The first ridge was at Stenka, where 2800 feet had to be cut through under water; and 10 miles lower down the Kozla Dojke barrier was pierced by a canal following the course of the river for about a mile. Five miles further on the Izlaz-Tachtalia rocks presented a whole series of obstacles, which were circumvented by the construction of a canal and the erection of a dam, giving the Danube a new



right bank for a distance of 4 miles, and narrowing its bed from 6500 feet to 1000 feet. The Jucz cataract is also overcome by a dam 2 miles long. At the last and largest rock shoal, the Iron Gate properly so called (Fig. 2), it was not deemed advisable to open a clear channel



on account of the strength of the stream, and a canal was accordingly cut round it.

To avoid interference with traffic during the five years the works were in progress, it was necessary to operate on the bank opposite to the old channel, *i.e.* the right or Servian bank, and the erection of dams

and the blasting work were done at low water, when the rock was exposed. On the Prigrada bank the workmen discovered remains of two immense unfinished dams, erected by Trajan to confine the waters of a canal. Here the new dam next the river is 130 feet wide at its base, 13 feet wide at top, and is composed of blocks of about $1\frac{1}{2}$ cubic yard contents. The dam on the landward side is really built in the river-bed, but is supported by an embankment which brings it into contact with the former Servian bank. Both dams are 7200 feet long, and the channel they enclose is 260 feet wide at low water; the bottom is black limestone throughout.

At Orsova there is a deep channel for the larger barges of the lower Danube, where these can discharge into vessels of lighter draught. There remain a few obstacles below the Iron Gates, which it is hoped will be removed by the end of 1898, and when these later works are completed the channel will at last be wholly clear from Moldeva to Turn Severin.

AN ATTEMPT TO RECONSTRUCT THE MAPS USED BY HERODOTUS.*

By JOHN L. MYRES, M.A.

THE Problem. To visualize the geographical passages in accordance with the principles of geographical interpretation which they assume.

The character of the passages—

- (a) Descriptive.
 - (b) Schematic. (1) Lines; (2) Areas.
- N.B.—Lines are—(a) Meridional.
(b) Equatorial.
- (c) The principle of symmetry.
 - (d) The doctrine of three continents.

The growth and method of early Greek map-making.

Route-maps, ancient and modern.

The Ionian Map.

A sixth-century Ionian map.
Aristagoras.
Herodotus knows of variants.
Development of the Ionian map.
The history of the equatorial axis.
A crucial instance. Italy and Scythia.

Nile and Ister.

The Persian Map.

The column of nationalities.
The two promontories.
The equator of Tyre and Ecbatana.
The river of India.
Did Skylax edit the Persian map?
Explanation of the Ionian inaccuracy in the North.
Explanation of the Persian inaccuracy in the South.
The doctrine of three continents.
Its history and development.
The Phasis-Tanais controversy.
The Scythian square.
Cosmography distorts topography.
The twofold plotting of the royal road.

* Paper read at the Royal Geographical Society, March 16, 1896.
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One of the principal and most obvious difficulties, which the 'History of Herodotus' presents to the student, is occasioned by the fact that the work was planned with a breadth of conception and an amplitude of detail, which far outran the limits of literary form prescribed by the circumstances of the time. It is difficult to depict fully the advantage which a modern has over an ancient author in the superior mechanism at his command for the systematic, and particularly for what may be called the graphic, arrangement of his subject-matter. The elasticity of the diagrammatic scheme which is supplied by the printed page; the accuracy with which parenthetic, explanatory, and confirmatory sections can be distinguished from, and subordinated to, the main thesis of an essay by differences of type; and the accommodation supplied by footnotes and appendices, render the exposition of a complex theme, and the proportion of its various parts incomparably easier, than when text, footnotes, appendices, illustrations, and atlas have to be arranged as consecutive or parenthetical paragraphs and periods of a roll of manuscript. This, however, is notoriously exactly what has happened in the case of Herodotus; and the suggestion may be ventured, whether a considerable service might not be rendered to our author by an "edition," in the modern sense, of his work, dissected into the elements just indicated, and printed as Herodotus himself would prepare it for the press, were he able to re-issue it himself in modern volume form.

The present note is an attempt to realize only one department of such a scheme: to extract the passages which serve in place of the maps of Herodotus; to visualize them in accordance with what we can infer, from his work, to have been the current notions of map-making in his day; to trace the individual maps, so far as may be, to their several sources for different sections of his work; and to supply what explanation is possible of the geographical theories which they embody, and of their divergences from our presumably more scientifically constructed charts.

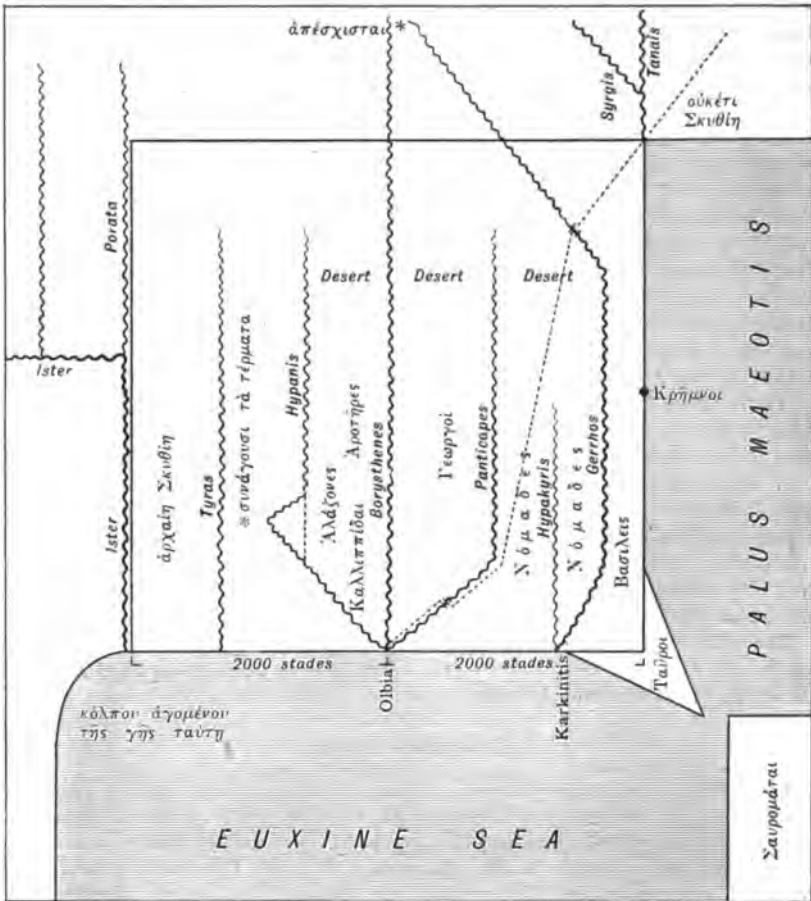
All previous criticism of the geographical statements of Herodotus has been more or less wholly content with pointing out their divergences from the real map; and it is time that the attempt were made to recover and state explicitly the principles, however erroneous, which underlie those statements, and to build up, however diagrammatically, the outlines of the "Formæ Orbis" which lay ready to the hand of Herodotus. Much of what follows will seem to rest upon a very slight foundation in ancient literature; but it will claim to have served its purpose so long as it is based upon the facts of the history of Greek commerce and adventure, and so long as it is borne out by those undesigned allusions in the narrative of Herodotus, which are so numerous, so artlessly insinuated into the story, and so difficult to harmonize with any ordinary map.

That depicted maps existed even before the time of Herodotus, is clear from his account of Aristagoras in E. 49, and from his graphic criticism of Hekataios and other nearly contemporary map-makers in B. 23 and 36; and is suggested by what he says of the current controversy about the three contingents Δ. 36, *ἐν ὀλίγοις γὰρ ἐγὼ δηλώσω μέγιστος τε ἐκδοτής αὐτέων καὶ ὅη τις ἐστὶ ἐς γραφὴν ἐκδοτή*, and of the circumnavigation of Africa by the Phœnician expedition of Necho Δ. 42, and of southern Asia by Skylax of Karyanda Δ. 44; for the comparison which he institutes between the results of these two expeditions presupposes graphic means of representing the proportions and relations of land masses on a general map of the known world. We shall see that he was himself acquainted with more than one of these universal maps, and perhaps with more than one edition of one of them; and it is with these maps of the world that we shall be chiefly concerned.

The geographical passages in Herodotus fall into two classes: some give bald and diagrammatic outlines of the general features of well-defined geographical areas, and of their relations to one another; others give details of physical and

AN ATTEMPT TO RECONSTRUCT THE MAPS USED BY HERODOTUS. 607

topographical features only. The latter are clearly intended to be plotted out upon a skeleton map constructed by means of the former. For example, the famous Scythian square (A. 99-101) is not intended as a literal word-sketch of the pictorial map lying before the writer, but only gives a series of construction lines like those of a trigonometrical survey, upon which the actual sea-coast, mountains,



SCYTHIA: A DIAGRAMMATIC MAP (HEROD. IV. 99 ff.).

The dotted line from Olbia to the mouth of the Tanais represents the route indicated by Herod. iv. 18-20, as follows: *Olbia*—[three days]—*Pantikapes* ford—[fourteen days. N.B.—No *Hypakyris* ford]—*Gerrhos* ford—[days not given]—*Tanais* ford—[*Tανάιν δὲ ποταμὸν διαβάντι οὐκέρτι Σκυθίῃ*: thence the route is given, Herod. iv. 21 ff.].

rivers, and tribal frontiers might be drawn in. *How* they were drawn in, we have to determine from indications scattered up and down the narrative.

The indications which Herodotus supplies of the general proportions of his maps are of two kinds. Sometimes he gives lists of place- or tribe-names which lie in the same direction across the map, and so indicates parallel or interlacing

lines, like the *memoria technica* of places of same longitude or latitude, in our school-books. For instance, the columns of names in Scythia (Δ. 17, 18, 19), between the Persian Gulf and the Euxine (Δ. 37), along the royal road (κ. 49), or from the Nile westward at ten days' intervals across the Sahara (Δ. 181-4). A notable instance is the line from the mouth of the Nile, through the Cilician Gates and Sinope to the mouth of the Ister (B. 34). Another—important because deflections in it are determined with care—is the north-eastern trade route across Russia (Δ. 21 ff.). Elsewhere he encloses the geographical areas in rectilinear boundaries, such as the Scythian square (Δ. 99-101), the rectangle which encloses Asia Minor (Δ. 37), and the parallel zones of Libya (Δ. 168-186).

The reason for this, at first sight, elementary method of map-making is fairly obvious. We moderns also divide up our maps into a series of parallel latitudinal strips of equal width, each subdivided transversely by the lines of longitude. And we too begin all important surveys by cutting up the country into a network of triangles, and plot out its features with reference to these. But the idea of a network of rectangles whose sides are parallel to a meridian and an equator was first clearly expressed only by Eratosthenes in the third century B.C., and triangulation does not come within our present field of view at all. In the word-sketches of Herodotus, however, we have certainly the germ of the system of fixing positions with reference to a meridian and an equator; and we shall see that use of this method led him and his contemporaries to important consequences.

The evidence for this early use of prime meridians is the otherwise inexplicable stress which is laid, in Herodotus (B. 34), on the straight line which connects the lower courses of the Nile and Ister, *viâ* Sinope and the Cilician Gates; and again in Δ. 37, on the column of nationalities which extends from the southern or Red Sea to the northern or Euxine Sea. Their use, in the maps to which they belong, is as perpendiculars on the equator, by which the extreme northern and southern sections may be duly oriented and correlated. We shall see reason to believe that some maps had subsidiary meridians, parallel with the principal one; the best instance of which is the columns of tribal areas within the Scythian square.

The evidence for the equators is somewhat more complicated, and it will be best to proceed to the description of the maps, and to take the equator in close connection with their other features.

INFERENCES FROM SYMMETRY.

But first it is necessary to emphasize briefly the admitted importance in Herodotian geography of the postulate of symmetry. He clearly reckons this a legitimate and valuable instrument of geographical research, τοῖσι ἐμφάσι τὰ μὴ γιγνωσκόμενα τεκμαιρόμενος, as he says in B. 38. He uses it to prove that because Asia and Libya are circumnavigable, Europe is so too, though it has not yet been circumnavigated actually (Γ. 115) (Δ. 36). In B. 43 he goes further, and argues that because Libya and Asia are circumnavigable, and there is no continuous land as far or beyond the absolute south, therefore not only is Europe also circumnavigable, but the continuous land must stop short of the absolute north, and therefore he discredits the current legends of a Hyperborean country and people; that is, of continuous land up to and beyond the absolute north. It is, of course, understood that throughout early geography the north is not a point, but a *line*, as in Mercator's projection, or in any other "Flat-land."

Again, in Δ. 40 he assumes that the Caspian, as a part of the undiscovered "northern sea," corresponds with the known Red or "southern" sea, a conclusion which reappears in Eratosthenes, who, with greater precision, equates the Caspian with the Persian Gulf. It is true that this is inconsistent with Herodotus' own

statement in A. 203, where he describes the Caspian as a separate piece of water, and gives measurements of its length and breadth; but in that passage he is clearly using information derived from Milesian traders of Dioskurias or Trapezus, and incorporated with an Ionian map where the Caspian is equated with no southern sheet of water, and where the width of the land from north to south is taken to be very much greater than it is in the map which he follows in A. 40.

Best instance of all (B. 26, 33-4), he uses the known upper sections of the course of the Ister as evidence for the unexplored sections of the Nile, and the known lower course of the Nile to correct the empirical orientation of the corresponding section of the Ister; and builds an elaborate and important group of theories upon the symmetry thus obtained; and it is in this passage that he explicitly affirms his belief in the validity of the method which he employs.

Now, any symmetry of north and south is necessarily symmetrical about an east and west axis lying between them. Therefore, by plotting out all the instances of symmetry in Herodotus, so that the middle points between each pair of symmetricals are in the same straight line, we shall be able to identify the axial line of the map which he is describing. Now, all these instances of symmetry are symmetries of north and south, and consequently the medial line about which they are symmetrical must lie east and west; that is, the axis of his map is always an equatorial axis. The displacements of the real map which have to be effected in order to co-ordinate these axial points, will be a measure of the degree of distortion in one or another section of the ancient map. But if it is found that within any area the distortions are so violent that the map cannot be filled in, then we may suspect that our author means to indicate in the same area more than one set of axial points, and consequently more than one axis. And if it is further found that in the same or similar contexts the axial points are consistent, but that in different contexts they are inconsistent, then we may be allowed to inquire whether, to illustrate different parts of his history, Herodotus did not use different maps.

THE IONIAN MAP AND THE PERSIAN MAP.

To anticipate the general result for a moment, we shall find that he uses two great maps, of which the one is a sailing chart of the Mediterranean, constructed on the meridian of Naukratis and Sinope, which is distorted north-westward to the mouth of the Ister, and on an equator passing through Sardis, Pteria, and Susa; we shall allude to this as the Ionian map, and justify the name hereafter. The other is a map of the Persian empire and adjacent countries, constructed on a meridian connecting the mouth of the Choaspes with that of the Phasis, and on an equator lying along the axis of the Levant (very nearly along the 34th parallel of latitude), passing through Cyprus, Crete, and Sicily as axial land masses, and produced eastwards through some Phœnician town, and probably through Ecbatana. These two maps overlap from the Archipelago to the lower Euphrates; they are, in this area, inconsistent with each other, and their inconsistency is mainly explained in principle by the fact that the Ionian map takes the Royal Road from the Euphrates to Susa as running east and west, whereas the Persian map takes it as running north and south.

To appreciate fully, however, the significance of the accuracies, and still more of the inaccuracies, of the map of Aristagoras (E. 49) and such other maps as we can identify, we shall do well to recapitulate briefly the genesis of Greek map-making from this point of view.

The Homeric poets display no small talent for topographical description, and there is at least one example of a description of a habitual route across the Archipelago and round Peloponnese (Od. iii. 172). But there is no framework at all

of the kind we have indicated, and consequently all attempts to construct a map of the remoter regions are foredoomed to failure; not to mention the fact that it is by no means clear that the successive adventures of Odysseus, for example, have any original connection with one another, or with the hero who relates them as his own.

On the other hand, the spread of Greek adventure, colonization, and commerce in the centuries succeeding the Homeric age could not but give occasion for the formulation of sailing directions, written or unwritten, for the principal lines of traffic. Now, it is above all things necessary to emphasize the fact that, not only in Greece, but universally, early maps originate in the pictorial representation of physical features as seen along a route by land or sea, and that the details which are subsequently determined are usually filled in to right or to left of the nearest such road. This principle of cartography may be most clearly and completely studied in the early maps of Japan, where, as for instance in the navigating chart reproduced in Siebold's 'Nippon,' Plate xxvi., the topography is plotted, on a sort of rectangular projection, on either side of a route from Nagasaki to Osaka, which is represented on the map with a series of very gentle curves; whereas on the real map it is very devious, and bends through nearly a right angle, first one way and then the other. The same is the case also with the maps of Saghalien in the same work, in which the coast-line is much simplified, the breadth of the island much exaggerated, and the bird's-eye view of the mountains regularly drawn to be looked at from a point of view over the nearest sea.

The Peutinger Table is a conspicuous instance nearer home. Here changes of direction in the itinerary are indicated by short bends, after which the route resumes its former course, so as to keep within the limits of a narrow roll of manuscript. Nor is the device extinct in more recent itineraries. Ogilby's road books have only this advantage over the preceding, that the angle of deflection is indicated by a compass mark; but the modern boating maps of the Thames, and the printed itinerary of the Great Western Railway, want even this simple corrective; while the maps which the South-Eastern Railway displays in its carriages are monumental instances of the distortions incidental to the representation of a route as axis of a peninsula [cf. The President's account of Paterson's road-map, *infra*].

Further, if a road forks, there is a strong tendency either to represent each branch as going off at an equal angle from the trunk road, or else to represent the straighter or more frequented as a continuation of the trunk, and so exaggerate the deflection of the by-path. Now, as soon as the moment arrives when an intelligent geographer attempts to represent two or three routes in different directions on the same diagram, the results of this tendency to straighten the road become a serious source of error, and unless the compiler shows distinct knowledge of a deflection, we are probably right in assuming that he transcribed the route as he found it in his authorities, approximately straight. This is, at all events, the practice of Herodotus; in Δ . 21 ff., when he is describing a route through South-West Russia which he knew to be curved, he marks, like the Peutinger Table and Ogilby's maps, the exact point at which each principal deflection occurs, by giving a new orientation for the next section of it. But in most cases he is content to give one orientation to begin with, and none further on. And in these cases we are entitled to draw the whole road in the same line, unless we can bring other evidence to show that he knew it to be curved—a case which does not seem to occur.

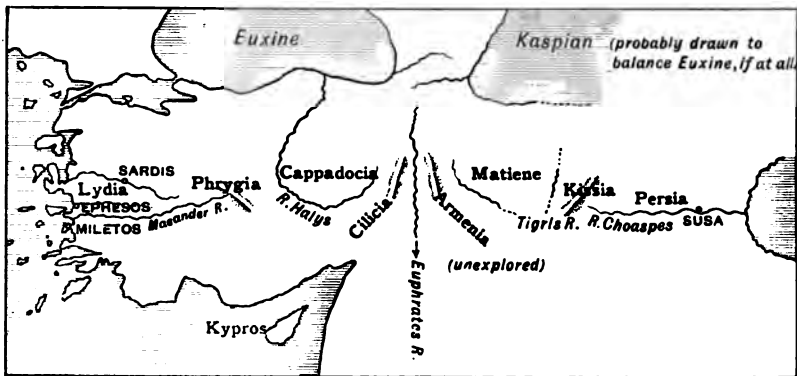
We have seen, from the text of Herodotus, that his own method and materials were very much of the kind thus indicated, and we may also see already, as in the case of Scythia, how much trustworthy and serviceable topography may be fitted into a

diagrammatic scheme which is grossly inaccurate, without seriously damaging the map for practical purposes.

In order, then, to recover the type of map which Herodotus may be supposed to have used, let us start simply with route-surveying, and the doctrine of symmetry, already described, as the principles of our geographical method; and the historical growth and extension of Greek enterprise as our data: develop, in accordance with them, the account preserved by Herodotus of an actual map in use shortly before his time; and check our results, wherever this is possible, by comparison with the geographical statements or allusions in the work of Herodotus.

THE IONIAN MAP.

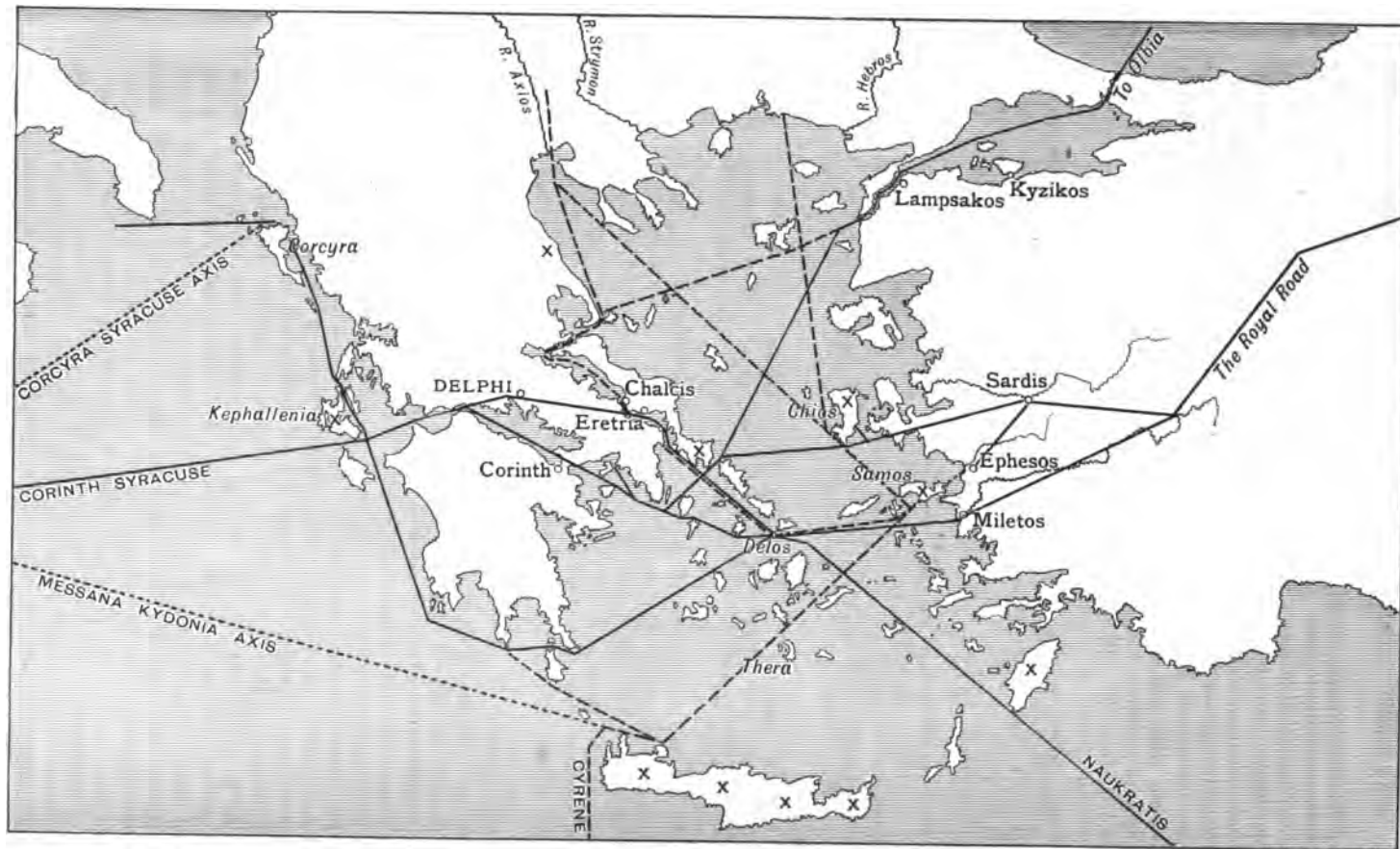
According to Herodotus (E. 49 ff.), Aristagoras of Miletos brought to Sparta in 501 B.C., a bronze engraved map of the circuit of the whole Earth, with all the sea and all the rivers; which, in his attempt to induce Sparta to attack the great king, he describes as follows: "The peoples I shall mention adjoin one another. Here



ARISTAGORAS. 501 B.C.

An earlier edition of the Ionian Map.

are the Lydians adjoining the Ionians; here are the Phrygians adjoining the Lydians on the east; the Kappadokians, whom we Ionians call the Syrians, adjoin the Phrygians. These have a common frontier with the Kilikians, who come down to this sea here, in which here lies Kypros." (In Cilicia he includes the population of the whole of the Tauros, as far as the Euphrates.) "Here are the Armenians adjoining the Kilikians here, and the Matienians inhabiting this district next to them. The Kissian country adjoins these; and here by this river Choaspes is the city of Susa here, where the great king dwells, and where his treasures are." He adds that Susa is three months' journey from the sea-coast of Ionia. Herodotus confirms this account from his own knowledge, that is, from maps or road-books extant in his time; but adds that the distance given is that from Sardis to Susa, and that the distance from Ephesos to Sardis ought to be included in a more precise estimate. Here Herodotus ignores the fact that Aristagoras comes from Miletos; that Greek maps were, so far as we know, earliest and best constructed at Miletos; and that consequently Aristagoras may be presumed to be using a Milesian map; that Miletos has a road of its own into the interior, up the Maeander valley, shorter and better than that by Ephesos and Sardis; and that if Aristagoras had meant to indicate the Hermos valley road, he could hardly have avoided mentioning the



REAL MAP, SHOWING THE PRINCIPAL GREEK SAILING ROUTES.
 (——— "Milesian;" - - - - "Samian;" - - - - axes deduced from these; x principal landmarks.)

existence of Sardis, and also the fact the expedition was not to start up country from its own town, but from Ephesos. Moreover, the emphatic introduction of the town Susa, and the river Choaspes as the objective of the expedition, is rhetorically and diagrammatically superfluous if it does not correspond to a town on a river understood at the start. Now, the only town and river which could be thus tacitly introduced by a Milesian speaker are Miletos itself, and its own route-valley of the Mæander. What Aristagoras means to indicate, as the outline of the campaign, is that Kleomenes will go up a river (the Mæander), cross a river (the Euphrates), and go down a river (the Choaspes), and then he will be at Susa, which faces the eastern sea, as Miletos faces the western.

Now, this symmetry of the Mæander and the Choaspes is itself faulty and superfluous, unless the royal road was depicted on the map of Aristagoras as crossing Asia from east to west in an approximately straight line. We have already seen instances of the universal method by which lines of route are combined into a general map; and it is clear from the words of Herodotus, "all the sea, and all the rivers," that this was such a map. We have seen, also, that changes of direction are only indicated where they are important for the guidance of the traveller; and the argument, though negative, is of some weight, that the absence of a re-orientation mark means that this route was regarded as straight by the draughtsman, if not also by the compiler. Now, Aristagoras begins by orienting his road $\pi\rho\delta\iota\ \eta\delta\epsilon$ from Ionia, which is actually correct, and then leaves it alone. We may add the further argument that he is discussing the invasion of a land empire by an alliance of Greek states which would command the sea, and, as his object was to minimize the difficulties of the expedition, he would certainly have proposed to attack from the Syrian coast if he had had any suspicion that Susa lay so far south as it really does; that the Euphrates, though forded at mid-journey, reaches the sea within a few miles of the Choaspes; and that both this and the road itself could be reached by a comparatively short march from the coast opposite Cyprus.

In the succeeding chapters Herodotus volunteers a very much fuller account of this road, tabulated in the form of a road-book, and probably, in part at least, derived from one; but here again there is nothing whatever to indicate any change of direction in the road. Meanwhile it is clear that Herodotus himself is using an edition of map and road-book intended for the Ephesos-Sardis route. This is the route, not for Milesian, but for Samian trade, and since Herodotus shows himself otherwise peculiarly well acquainted with Samos, we shall probably not be far wrong if we assume that he is using a Samian map. In any case he is not using a Milesian map; so that we have evidence that there existed more than one variety of this group of maps and road-books; that these agreed from the Phrygian frontier eastwards; but that they were constructed on divergent road lines when they approached the Ionian coast.

Now, in all probability these divergences were continued seaward, firstly, by producing the road-axis itself, and secondly, by appending the maps and sailing directions of the westward sea-routes which originated in the respective termini of the land-roads. We are, consequently, justified in asking what conception of the rest of the Mediterranean is implied in, or at least is consistent with, the geographical scheme here presented, and for this purpose we must look back to a rather earlier stage of Greek geography. We see here that each of the great Ionian seaports probably had its own version of the type of map of Asia Minor here indicated, with the Royal Road as its axis, and detailed surveys plotted out north and south from one or other section of the royal road as a base-line. Now, the route-axis of the Milesian map of Aristagoras, which passes down the Mæander valley and through Miletos itself, follows, when produced westwards from Miletus, the

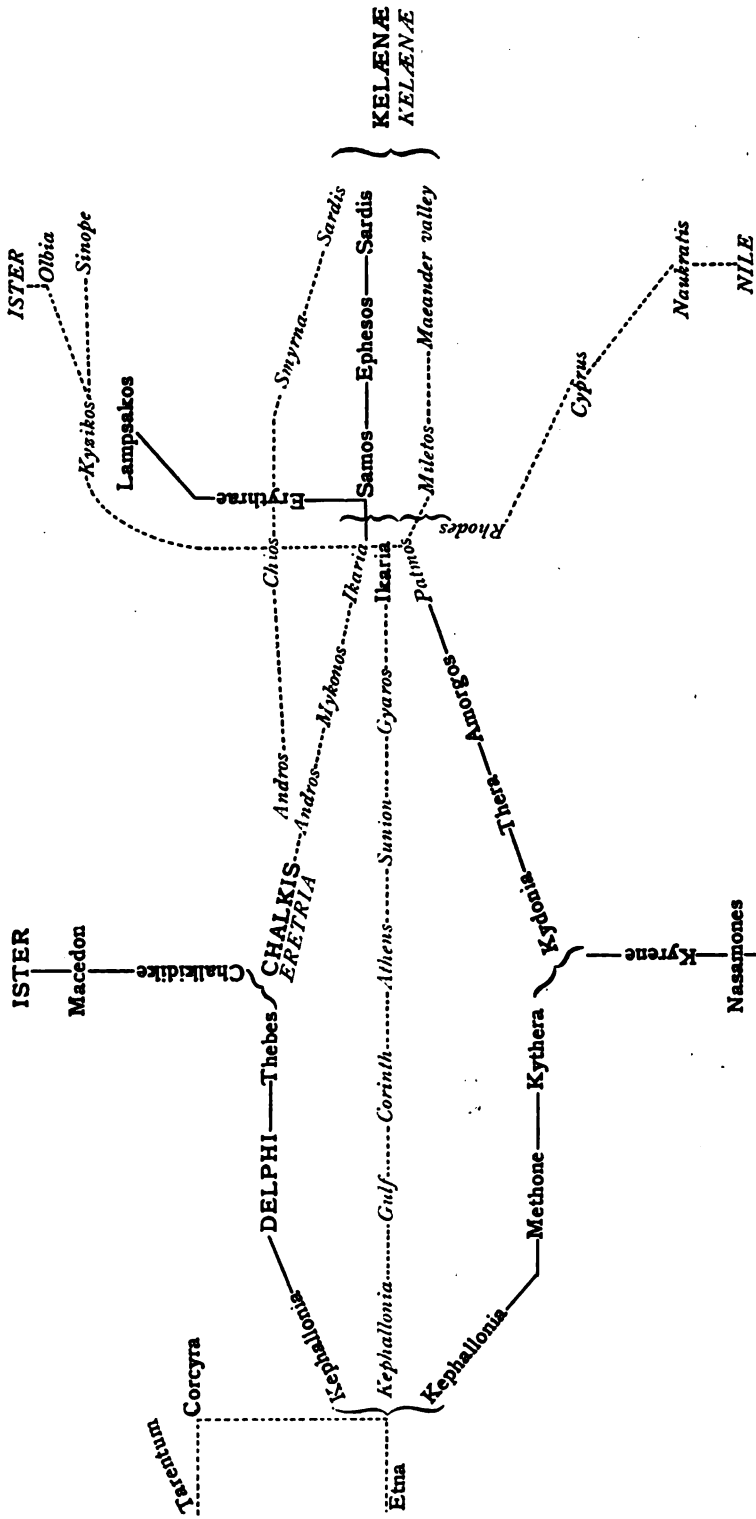


DIAGRAM OF THE PRINCIPAL GREEK SAILING ROUTES, ILLUSTRATING THEIR APPARENT SYMMETRY ABOUT AN EQUATORIAL AXIS.
 Names in Roman type represent towns in commercial alliance with SAMOS and CHALKIS.
 Names in Italic type represent towns in commercial alliance with MILETOS and ERETRIA.

main route through the Cyclades under the lee of the chain of islands which end in Eubœa. This line is actually curved, but, as in the case of the Royal Road, its curvature, being gradual, was easy to underestimate, especially if the ships followed then, as they follow now, the convex side of the curve, and consequently do not attain at any point a conspectus of the whole route. Now, the bulk of the trade of Miletos with Greece in the sixth century was consigned either to Eretria or to Athens, while some went on to Corinth. The ships for Eretria parted company with those for the Saronic gulf under Tenos. This fork would be naturally represented, as we have seen, as diverging on either side of an ideal production of the axial line, which would strike the mainland at Sunion, and run up the axis of Central Greece.

Again, Herodotus (A. 18, and other passages) proves that Chios was in commercial union with Miletos, but shares with its geographical neighbours a prolongation of the Hermos valley road through Sardis. Now, from Chios, Mount Ocha in Eubœa is visible on a clear day; consequently, Chian ships bound for Greece have no need to go round by Icaros and Tenos. This is one of the alternative routes recommended, for ships crossing the Ægean, in Od. iii. 172. The Chian axis of the Ægean, therefore, goes straight across, and this is, moreover, actually a continuation of the line of the last section of the mainland road, Sardis—Smyrna—Erythræ. Now, the Chian axis, produced into Central Greece, actually cuts the Milesian axis in the mountain mass of Parnassos, namely, at Delphi, the *δμφαλος γῆς* of early Greek universal geography. The actual latitude or heliacal orientation axes both of Eretria and of Chalcis meet it at the same point.

Now, the geographical reason why Delphi is the *δμφαλος γῆς* is twofold. First, the Delphian theory that the extreme east and extreme west are equidistant thence, which is probably itself a deduction from obvious empirical data; second, that both the observed and the theoretical divisions between the three continents meet there. These divisions, as we shall see, are the following: between Libya and Europe, the axis of the Mediterranean from between the pillars of Herakles through the central island Sicily; between Europe and Asia, the axis of the Hellespont and the Bosphoros; and between Asia and Libya, the axis of the Arabian gulf, which, when produced into the Mediterranean, coincides with the direct route to Egypt *viâ* Rhodes; all three, when produced, meet on the side of Central Greece which faces the Corinthian gulf. The conspicuous mountain-peaks of Parnassos and the world-renowned pilgrim shrine of Delphi combined in the sixth and seventh centuries to fix the exact spot beyond question. Now, the axis of the Western Mediterranean, if produced to Delphi, almost exactly coincides in reality with the heliacally determined equator of Delphi itself, and the Chian and Eretrian axis already referred to; and the alternative Milesian axis of the archipelago rectifies itself at the same point. What more natural than that the common axis of the Ægean, of Central Greece, and of the Western Mediterranean should be taken by the map-makers of the Milesian league (let us say at once by Thales and Anaximandros) as a natural, or, as we should say, providential continuation of the axis of the Royal Road?

The Samian line of traffic with Greece follows the same course as the Milesian, under Icaros and the chain of islands, its objective being Chalcis, and to some extent Corinth. But Chalcis and Samos are also the earliest and most important of Greek navigators in the west, and the westward-bound Samian ships went by Patmos, Amorgos, Thera, Kydonia, and the Kythera channel. Here they divide, some going southward to Kyrene and Egypt, but the majority to Sicily. This latter involves a considerable change of course to the westward; but as no boat left the coast of Peloponnese, except by accident, before reaching Kephalleuia, and

as the majority followed Eretria and Corinth, and made the longer, but safer, detour by Corcyra and Tarentum, there was no means of estimating the total distortion. This western trade is of increasing importance, and consequently the Samos-Kydonia route, which has the further recommendation of being in the same line with the Sardis-Ephesos section of the great road, becomes axial for the cartography of the southern Ægean, and the Kydonia-Sicily axis for the middle basin of the Mediterranean. Greece and the Kyrenaica, South Italy and Tunisian Africa, are plotted as pairs of symmetrically opposed promontories on each side of it; and Crete and Sicily as axial, or nearly axial, islands.

We have seen that the actual axis of the central and western Mediterranean very nearly cuts Delphi; but we owe the appreciation of this fact to an independent and early Corinthian symmetry on the axis of the Corinthian gulf, and to the fact that Eretrian trade kept mainly northward, close to Peloponnese, and avoided Kyrene. It is thus that we must account, first for the early local antithesis between Europe and Peloponnese, and then for the tendency in Delphic, Eretrian, and Corinthian circles, to regard Peloponnese, and not Crete, as the medial land mass. Thus, in the rhetoric of Aristagoras, Sparta, as champion of the West, stands pictorially, as well as politically, opposed to Susa in the East, with the great road from Miletos lying as a direct avenue between them.

The westernmost basin of the Mediterranean, beyond Sicily, was explored, so far as Greeks were concerned, wholly by the Phocæans, whose great depôt was at Massalia. They were in close commercial union with Samos, and therefore used the Samian charts, in which the axis runs north of the true west from Kythera to Sicily, and in which the trade routes converged upon Messana. Now, the Italian coast route was closed to philo-Samian traders by the commercial alliance between Miletus, Sybaris, and the Tyrrhenians. Consequently, Phocæans bound for Massalia steered first for the Samian colony of Lipari, and then between Sardinia and Corsica, as the homeward-bound for Marseilles still do. Therefore Sardinia and Corsica were placed symmetrically about the newly-prolonged axis. This ended for the moment at Massilia, and consequently all subsequent routes west of Massilia were appended either as prolongations of this or as bifurcations from the Bonifacio channel. The identification or re-identification of the Pillars of Herakles at Gibraltar, which must needs be on the axis of the Mediterranean; the discovery of the Balearic chain, in a position which is actually nearly axial; the growing importance of the direct trade with Tartessos; and the exploration by Phœnicians, Tyrrhenians, and Greeks of the coast of Mauretania and Numidia, combined to substitute, as axis, the actually very crooked line Messina—Bonifacio—Minorca—Gibraltar, for the actually straight line Messina—Bonifacio—Massilia. We have already commented on the difficulty of estimating, without instruments, the amount of a change of course where the change is not almost instantaneous; and it is worth noticing that any empirical distortion which might be noticed was probably fully compensated for by the great gain in symmetry between the north and south shores of the basin. For, in proportion as Sardinia and Corsica are shifted more nearly into line between the Pillars of Herakles and Sicily, the more the great bay between Spain and Italy must be flattened out, and the more the north coast of Africa must be pressed in, if they are to maintain their observed radial distances from the central pair of islands.

It will be noticed at once that on this hypothesis the breadth of North and Central Italy is enormously exaggerated, and the two coasts are set at a right angle with each other. Here is a crucial point in which this theoretical reconstruction of the map may be tested, and tested, as it happens, from a passage of Herodotus himself. The west coast of Greece and Illyria was traversed and surveyed by

trading vessels up a well-defined route from Corcyra to the head of the Adriatic. Now, there are points enough in the Adriatic from which both coasts can be seen simultaneously, so as to make its extreme limits of width a matter of certainty; consequently, the east coast of Italy must have been mapped parallel with the west coast of Illyria. And there can be very little doubt that the tendency was to regard the axis of the Adriatic as meridional rather than as equatorial.

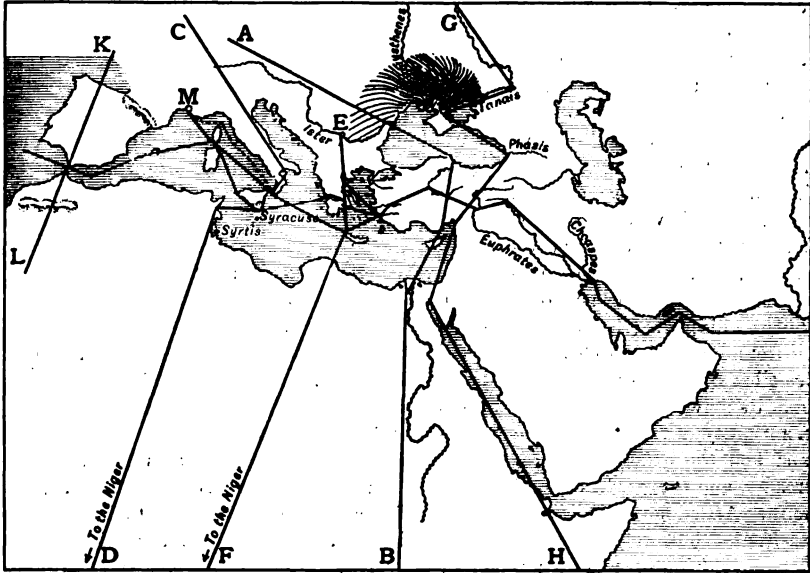
But, on the other hand, we have seen that the Western Mediterranean was first regularly traversed and surveyed on the line from Messina to Massilia, and that this tended to be regarded as equatorial. Now, the west coast of Italy does actually lie approximately parallel with this line, and we know that it was itself provided with an inshore route from Sybaris *viâ* Laus to Populonia and the Etruscan ports. Therefore the west coast of Italy, as surveyed from the sea, also tended to be plotted as equatorially situated, and consequently at a right angle with the east coast. Of this view of Italy we have a totally undesigned confirmation in Herodotus (A. 99), where, after comparing the Tauric promontory of Scythia with Attica, he says, for the benefit, obviously, of a South Italian audience, "If any one has not sailed along these coasts of Attica, I will explain to him another way. It is as though in Iapygia (the heel of Italy) another race, and not Iapygians, were separated off from Brentesion to Taras (Taranto), and inhabited the promontory." Now he describes Scythia as a square with two sea-coast sides, and the Tauric $\alpha\kappa\tau\eta$ projecting from its seaward angle; and there is reason to believe (from the general admiration in antiquity of the race back to Athens after Marathon between the defenders overland and the attacking force round Sunion) that Attica was regarded as being broader, and the angle of Sunion obtuser, than it really is. Now on the real map neither Attica nor Italy enclose anything like a right angle between their principal sea-fronts; but, unless Herodotus believed that they did, why did he select them, as he says, "out of a large number of suggested instances," to compare with his rectangular Scythia?

How little Herodotus himself knew of the top of the Adriatic is shown by his scepticism about the existence of a river Eridanos (r. 115), which some one had described to him as flowing northward through Europe—probably a confusion of Eridanos-Rhodanos-Rhe[de]jnos. If he knew much of the Po, he could hardly have written as he did; if, however, he knew of its bare existence, it would only strengthen the parallel with Scythia, by indicating the north side of the Italian square.

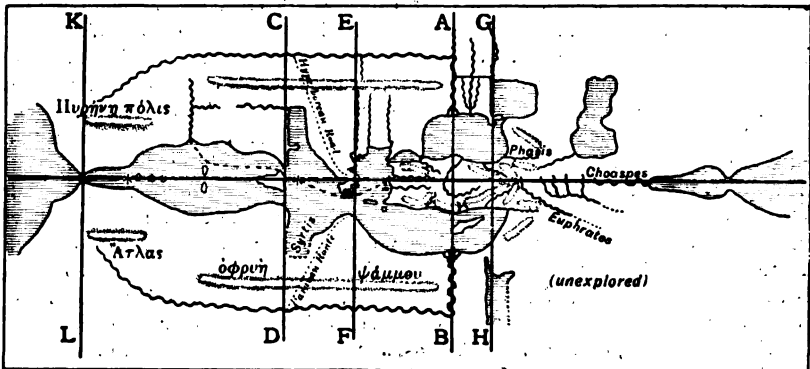
Look now for a moment at the result we have gained: a Mediterranean on the Greek map, narrowed in proportion to its length, but admirably symmetrical. The Pillars of Herakles, with the Pyrenees and Atlas in the background; the central Balearic chain, the twin islands Sardinia and Corsica; the central island Sicily between Italy and Tunis, Tyrrhenians and Carthaginians; then the Syrtis and the mouth of the Adriatic—the tumultuous ravening Scylla, perhaps, and the bottomless, insatiable Charybdis, of the early voyagers; then Greece and Kyrene. Here we see why Herodotus makes so much of the fall of Kyrene, if it *corresponds*, in his historical geography, to Sparta and Athens, and why he would note with such care that the southward road from Kyrene past the Nasamones (B. 32), and the northward road from Chalkidike through Macedon—both largely used by Samians—strike respectively the upper course of the Nile and of the Ister. Then come Crete (in the Samian scheme) and Peloponnese (in the Milesian), approximately central islands between two great bays. Then Asia Minor, dividing the eastern arms of the Mediterranean, and washed on the one side by the "Cyprian Sea" of Aristagoras, on the other by the Euxine, and crossed by the great meridian, from the Cilician Gates *viâ* Pteria and the Halys frontier to Sinope; then, in the angles, the correspondent rivers Phasis and Pyramos,

Note that the Sinope-Pteria-Cilician line is again, as Prof. Ramsay has shown, a very early and very important *cross-road*.

The exploration of the Euxine, and the opening of Egypt under the XXVIth Dynasty, both within the same fifty years, and both largely due to Milesian enter-



REAL MAP.



THE IONIAN MAP.

prise, led to additions to the Milesian map, which are, even actually, fairly symmetrical; and the quadrilateral scheme of indigenous Egyptian geography may very well have suggested, as its northern counterpart, the quadrilateral symmetry of the "Scythian square."

The great passage about the Nile and the Ister (B. 33) shows how the courses of the two rivers have been made to supplement each other. For because the Nile

flows, for all its known course, along the great meridian from south to north, so the Ister must flow in its lower course along it also from north to south; which means, that when local surveys of Western Scythia, with the lower Ister as base-line, came to be incorporated with Central Scythia, surveyed up the Borysthenes, with Eastern Scythia surveyed along the Mæotis coast route, and with its Egyptian counterpart in the general mercantile chart at home, the local orientation of the lower Ister, *πρὸς ἄρκτον ἄνεμον τὸ στόμα τετραμμένον*, preserved for us by Herodotus (Δ 99) in describing the large-scale local chart, was ignored; and so the Ister was erected into the western boundary of a Scythia, the central and eastern parts of which had been independently surveyed from the base-lines of the Euxine coast, the Mæotis coast, and the course of the Borysthenes. Conversely, because the trade road up the Ister is known to have a general westerly trend, and because its upper course, as calculated from itineraries, ought to extend into the Celtic country, namely, behind the Alps and the Pyrenees (the *Πυρρήνη πόλις*, Herodotus, B. 33), therefore the Nile must continue the westward trend it acquires where it is last known, and must rise *ἐκ τῶν ἰσῶν μέτρων τῆς Λιβύης*, that is to say, behind Atlas, which for these purposes is symmetrical with the Pyrenees. Observe here that the Milesian editor knows nothing of the wholly inconsistent river and road system of Southern Gaul, which must by this time have been established by the Phocæan traders of Massalia, Phocæa being philo-Samian, and Miletos having consequently no dealings in Gaul.

The diagrammatically westward course assigned to both rivers is probably partly due to the desire which the whole of the Libyan section shows to construct the map for these parts on a series of latitudinal belts. And a similar parallel of latitude was obviously of the greatest value in determining the probable depth of the Hinterland at the top of the Adriatic and the Gulf of Genoa, where the error in the long traverses must have been getting serious. Of course the conjectural westward course of the Nile was held to be *demonstrated*, when the news came up from Kyrene that a westward-flowing river (probably the Niger) had been found beyond the Libyan desert, and far west of the meridian of Kyrene (B. 32).

With the better investigation of the Isthmus of Suez and the Sea of Azof, a conflict between the theoretical and the empirical geographers appears to have arisen, which has left a curious trace in the narrative of Herodotus. In theoretical geography there ought to be a water-channel between the Arabian gulf and the Mediterranean, for the Arabian gulf corresponds, in Ionian symmetry, with the Palus Mæotis, and the Palus Mæotis opens freely into the Euxine by the Kimmerian Bosphoros. See, then, what Herodotus says about the future of Egypt (B. 11). After describing how the Nile has silted up its own former estuary, and how the Arabian gulf runs parallel with the Nile valley, he continues, *εἰ δὲ ἐπιέλθῃ ἐκτρέψαι τὸ βέθρον δὲ Νείλος ἐς τοῦτον τὴν Ἀραβικὸν κόλπον, τί μιν κωλύει βέροντος τοῦτου ἐκχωσθῆναι*; the Nile, that is, may be expected some day to swing round and fill up the Arabian gulf; and if everybody had their rights, and an impish *τύχη* did not interfere in the dispositions of Nature, the Arabian gulf would be continuous with the Nile valley, and would be only waiting, to be silted up, till the bar at the existing mouths had become sufficiently extended to impede the northward outflow.

Hence the interest with which contemporaries regarded, and Herodotus records, the attempts to rectify the omission by cutting a canal from the Nile to the Arabian gulf. It involves more than the mere admission of Milesian traders into the theoretical counterpart of the Palus Mæotis, which is theirs already; it is a definite rectification by human agencies of a flaw in the natural universe. Such power has the *à priori* conception, when supported, as this theory was, by a number of confirmatory and subsequent discoveries. Exactly the same ideas are involved in another passage (Δ. 39), which we shall learn to regard as belonging

to the Persian map, where after describing the narrow tie which binds Libya to the Arabian ἀκτή, Herodotus says of Arabia, Λήγει δὲ αὐτῆ, οὐ λήγουσα εἰ μὴ νόμῳ ἐς τὸν κόλπον τὸν Ἀραβικόν, ἐς τὸν Δαρείος ἐκ τοῦ Νείλου διάρρυχα εἰσήγαγεν, which we may paraphrase. "The promontory ends, or rather it does not end except in theoretical geography, at the Arabian gulf. This is the point where the Great King has done his best to make it end actually, by cutting a continuous water-way,"—an association of irrelevant ideas, which, except on this hypothesis, is not easily explicable.

Passing further east, we have already seen how the eastward slew given to the Royal Road from the Euphrates to Susa makes the Persian gulf face eastward, and leaves the Milesian map-maker free to accept the statement of his explorers that the Caspian is a closed sea of no great extent, and consequently to r. 115 to mark the presumed sea-passage round the north of Europe as *totally* unexplored; whereas in Δ. 40, on the Persian map, the Caspian is equated to the Red Sea or Southern Ocean, and consequently must be supposed to have been represented as opening into the Northern Ocean, as it is in Eratosthenes' map, which is likewise largely indebted to Oriental sources.

THE PERSIAN MAP.

The account thus given of what it is convenient to describe as the Ionian Map includes nearly all the passages of Herodotus which bear upon the geography of the Mediterranean basin; but there is an important group in the early part of Book Δ. which are utterly inconsistent with the scheme thus laid down. No amount of distortion will reconcile the axial points indicated with the axis of the Ionian map, whereas they conform to one another in a nearly direct axial line. Further, though the passages have a peculiarly formal and authoritative tone, there is no mention of the Nile-and-Ister meridian, which is replaced by another meridian much further east; and, though Herodotus claims to be describing the appearance of all three continents, he says far less about Europe than he elsewhere shows that he knew. As he begins with the significant words *οἷη τις ἴστω ἐς γράφην ἐκδοτῆ*, it is clear that he is describing somebody's map; and, in the conclusion of the section, he mentions Skylax of Karyanda as the authority for one of the most important statements in the whole passage. The whole passage may be rendered as follows:—

"The truth in this matter I will now proceed to explain in a very few words, making it clear what the real size of each continent is, and what shape should be given them.

"The Persians inhabit a country upon the southern or Erythræan Sea; above them, to the north, are the Medes; beyond the Medes, the Saspirians; beyond them the Colchians, reaching to the northern sea, into which the Phasis empties itself. These four nations fill the whole space from one sea to the other.

"West of these nations there project into the sea two tracts (or promontories, Gk. ἀκταί), which I will now describe. One, beginning at the river Phasis on the north, stretches along the Euxine and the Hellespont to Sigæon in the Troas; while on the south it reaches from the Myrrandian gulf, which adjoins Phœnicia, to the Triopic promontory. This is one of the tracts, and is inhabited by thirty different nations.

"The other starts from the country of the Persians, and stretches along the Erythræan Sea, containing first Persia, then Assyria, and after Assyria, Arabia. It ends, that is to say it conventionally ends, though there is no breach of continuity, at the Arabian gulf—the gulf whereinto Darius conducted the canal which he made from the Nile. Between Persia and Phœnicia [*i.e.* between the ἀκταί] there lies a broad and ample tract of country, after which the region I am describing skirts our sea [the Mediterranean], stretching from Phœnicia along the coast of

Palestine and Syria till it comes to Egypt, where it terminates. This entire tract contains but three nations. The whole of Asia west of the country of the Persians is comprised in these two regions.

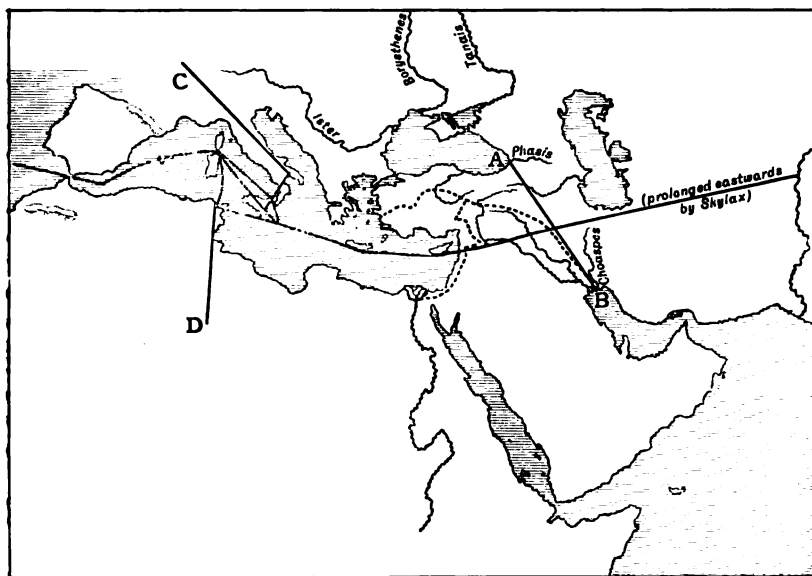
"Beyond the tract occupied by the Persians, Medes, Saspirians, and Colchians, towards the east and the region of the sunrise, Asia is bounded on the south by the Erythraean Sea, and on the north by the Caspian and the river Araxes, which flows towards the rising sun. Till you reach India the country is peopled; but further east it is void of inhabitants, and no one can say what sort of region it is. Such, then, is the shape, and such the size of Asia.

"Libya belongs to one of the before-mentioned tracts (*ἀκραί*), for it adjoins Egypt; in Egypt the tract is at first a narrow neck, . . . but from the point where the neck ends, the tract which bears the name of Libya is of very great breadth."

Here we have a map which is essentially a map of the Persian Empire and its immediate neighbourhood. Its principal meridian joins the mouth of the Choaspes and the mouth of the Phasis, which apparently are symmetrical and both flow east. This meridian, though designated from south to north by means of four nationalities, Persians, Medes, Saspiri, and Colchians, either actually *is*, or at least is parallel to, the line of the Royal Road from Susa to the Armenian frontier, produced, however, northwards through Armenia and the Colchian country, as soon as the road begins to trend appreciably westwards towards Kappadokia. In the same way, the two *ἀκραί* are constructed about two great roads, which are taken as their axes: in Asia Minor, the Royal Road from the Euphrates to Sardis; in Arabia, the caravan-route from Carchemish through Palestine to Egypt.

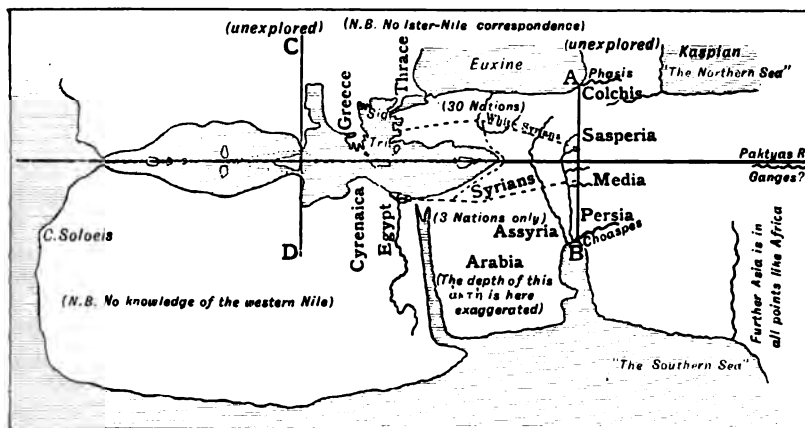
The southward slew of the Royal Road throws Arabia westward, and the error of the South Sea explorer (*Δ.* 44) in crossing the mouth of the Persian gulf, under the impression that he was close to the known estuary of the Choaspes and Euphrates, obliterates the eastward sea-coast of Arabia, and makes it look on the map like an *ἀκτῆ* bounded by sea-coasts on north, west, and south. Observe that Eratosthenes, who greatly exaggerates the breadth of the Persian gulf, makes it symmetrical with the Caspian, as narrow-mouthed gulfs of the northern and southern sea respectively. The slewing round of Arabia, in its turn, affects the coast of Syria and Palestine, which comes to look north-west, so that the (dark-complexioned) Syrians in the southern correspond to the (Kappadokian or white) Syrians in the northern peninsula (*Δ.* 72, *Ε.* 49, *Η.* 72); the Egyptians, who have quite lost touch of their Scythian antipodes, correspond, though forcedly, and less exactly, with the Kolchians (*Β.* 105), north and south of this Syrian area; and the Mariandynic Gulf (Gulf of Alexandria) is made much more nearly an eastward termination of the Levant than it really is. Cyprus is a central island, like Crete and Sicily. Now an axis, on which Cyprus lies, and about which Asia Minor and Arabia lie as symmetrical *ἀκραί*, cannot but be the local axis or equator of one of the northern towns of Phœnicia, whose earliest sea-trade was first to Cyprus, and thence obliquely down to the Delta. Such an axis it is easy to conceive gradually produced, like our Ionian axis, westward through Crete and Sicily, as Phœnician trade went westward, and made the basis of a sailing chart of the Mediterranean which corresponds more and more closely with the Ionian as it gets further west, and becomes identical with it just in the area where Greek and Phœnician trade most clashed; namely, in Carthaginian, Sicilian, and Tyrrhenian waters. We may safely affirm that we have here, as one source, at any rate, of this Oriental scheme, the general Phœnician chart of the sea, which in this aspect is literally "Mediterranean," *i.e.* between the two *ἀκραί*. The Euxine is here made symmetrical with the Southern or Red Sea, which argues very imperfect acquaintance with the Caucasian and Scythian regions. The passage about the Kaspian (*Δ.* 40) is equally vague, and has been already shown to be inconsistent with the passage

(A. 203) of the Ionian scheme. All that is clear is that the south shore of the Euxine, the river Phasis flowing west, the river Araxes running east, and the south shore of the Caspian, are conceived as lying approximately in the same straight line. But nothing is known of the northward extension of the Caspian, or of the Hinterland



Walker & Boutall sc.

REAL MAP.



Walker & Boutall sc.

THE PERSIAN MAP.

of the Caucasus, except, in a vague way, that Europe extends along the whole north of Asia, from which it is separated by the Caspian just as the same northern continent extends over the whole north of Libya, and is separated from it by the Mediterranean. Here we have the explanation of Herodotus' insistence that the

north-eastern sea, that is to say the Caspian, ought to be accessible from the south-eastern ocean; for if the Caspian is truly co-ordinate with the Mediterranean, it must have its own Pillars of Herakles somewhere in the far east. East of the Phœnician coast, the axis was in all probability co-ordinated with an equally old, but quite independent, equator of Nineveh, which is on the same real parallel of latitude as Myriandos, and was the natural basis of earlier Assyrian surveys.

Further east, again, the equator of Ecbatana is on the same real parallel as Tyre, and nearly halfway between the Caspian and the head of the Persian gulf. This equator, in its turn, was the natural basis of the Median surveys on which Darius founded the assessment of his new satrapies, with which we may well compare the improved maps which were made for Augustus in compiling his statistical account of the Roman Empire. Of one of the expeditions connected with these surveys, Herodotus gives an account (A. 44) which is of importance as indicating the authority from whom he got this map. Skylax of Karyanda was ordered to strike eastward, and prolong the meridian to the eastern sea; then to turn southward and westward, and return by way of the Arabian gulf. Herodotus confuses this eastward expedition, which may or may not have reached and descended the eastward flowing Ganges, with an exploration, very likely undertaken by the same Skylax, of the lower course of the Indus. Now, the upper Indus must have been already known perfectly well to the border states of Persia; it flows too definitely south to have been mistaken, even by the most theoretical geographer, for an eastward stream. Moreover, *Ἰνδὸς ποταμὸς* does not necessarily mean more, even to Herodotus and Skylax, than "an Indian river," though, in fact, the name was probably already acquiring its special significance. In any case, we are dealing here with a purely empirical discovery, whatever structural use was made of it afterwards. This discovery is the determination of an eastward-flowing river, which reached a sea whence there was a return to the Arabian gulf southwards and westwards, which proved Asia to be *in all points* like Libya. This last point is important, because it tacitly proves that a southward extension of Asia, well within the tropic, was observed, like that reported of Libya,* and affords a hint in favour of, rather than against, the obvious conjecture that the eastward-flowing river with crocodiles is the Ganges, and that an expedition, whether that of Skylax or only reported in his 'Indica,' doubled Cape Comorin; a voyage for which thirty months is not too long, though it is too long for the journey home from the mouth of the Indus. The period of thirty months is, moreover, one of the strong points of resemblance between the two voyages. For thirty months make two and a half years, and the circumnavigation of Libya is stated (A. 42) to have occupied between "two and three years" (twenty-four to thirty-six months).

The Ganges, when found, was of course of great theoretical value, as a natural feature which could be taken as coinciding with the Persian axis; and it replaces the eastward Choaspes of the map of Aristagoras, in the map of Eratosthenes, by whom it is placed rather south of the equator of Rhodes, but north of that of Alexandria.

The cosmographic Persian Map, thus outlined, is evidently of composite origin. It includes the Mediterranean geography of the Phœnician charts, the older surveys of Mesopotamia and Media, and the recent discoveries of the expeditions of Darius. The amount of symmetry imported into it may of course be indigeneous to Persian geography, of which we know very little, but it certainly looks as if the

* A. 42. The Phœnician explorers sent by Necho circumnavigated Africa from the Red Sea to the Pillars of Herakles. As they went round thus *westward*, "they had the sun on their right"—*i.e.* north of them at midday—when they made their observations.

fusion of the surveys had been effected by some one trained in the methods of the Ionian school; and with the name of Skylax in the narrative before us, we can hardly doubt that it was he. The distortion of the well-known coast of Syria, Palestine, and Egypt also looks like the work of a compiler to whom the southern ocean was more familiar than the Levant. A further piece of incidental evidence in favour of the same view will be adduced later on.

So much for the two universal maps which Herodotus appears to have used. All the geographical passages in his work seem to fit in with one or the other of the outlines thus indicated:—the majority with the Ionian map; the descriptions of Oriental countries, without exception, with the Persian.

An Explanation of the Ionian Inaccuracy northwards, and of the Persian Inaccuracy southwards.

It remains to give some account of the divergence of these outlines, especially of the north and east of the Ionian map, from the real geography, and in the course of this to consider a few subsidiary questions which will answer themselves in the course of the discussion; in particular, the problem of the proper division of the world into continents.

It will be seen at once, by a comparison of the Ionian with the real map, that though, so long as they remain in Asia Minor and the Mediterranean, the meridian and the equator maintain their proper directions with tolerable regularity, the case is quite different with their northward and eastward extensions. And it is also noteworthy that the distorted part of the meridian, namely, from Sinope to the mouth of the Isser, if produced upon the real map, very nearly coincides with the trend of the section of the royal road from Euphrates to Susa, which forms the distorted eastern arm of the equator. It will be also seen that the angle enclosed by the southern half-meridian, Nile—Cilician Gates—Pteria, and the western half of the equator from Pteria to Sardis and beyond, is in the real map less than a right angle. The general result of this comparison between the Ionian and the real map may be expressed as follows: That, of the quadrants of the Ionian map, the north-eastern is practically a semicircle, while all the other three quadrants are correspondingly reduced.

Now, it is precisely of this north-east quadrant that Herodotus, and fifth-century geographers in general, have nothing to say. His account of the Kimmerian invasion of Asia (A. 12) indicates the prevailing ignorance of the physical features of the Caucasian side of the Euxine; and his account of the Caspian Sea and the "endless plain" east of it contributes very little more. He knows that the Caspian cannot be entered from any known sea (A. 203), and he gives its proportions fairly well; and we have seen reason to suspect that the sea-passage round the north of Europe, which he argues *must* exist, because Asia and Libya are circum-navigable (r. 115), is associated in his mind with the existence of this sea on the north of the Persian "Hinterland," for he equates it (A. 40), in his "Persian" symmetry, with the Red Sea to the south of the same "Hinterland."

But, beyond the merest outlines, Herodotus, and the Greek world generally, knew practically nothing of the north-eastern semicircle of the real map; and having, as a map-maker would say, no "tie" between the long eastward traverses north and south of their equator, they naturally tended to underestimate its extent in proportion to the south-eastern semicircle. This is in itself enough to account for a very considerable distortion of the Ionian map; but there is a further consideration which tended in the same direction, and which was particularly cogent at the time when Herodotus wrote.

In Δ. 36, 42, 45, and Β. 23, Herodotus criticizes severely his geographical predecessors (with patent reference to Hekataios) for dividing the known universe into three equal continents, and in particular (Δ. 42) for making Europe equal in extent to Asia. Canon Rawlinson (on Δ. 45), Sir E. Bunbury (vol. i. 146), and others, say that two different theories are here in question: an earlier division into two continents only, Europe and Asia; and a later into three, Europe, Asia, and Libya. But as Libya is well known to Greece as far back as Homer's time, at all events, it is not clear to what period the earlier classification is to be assigned; and, besides, the principal authorities for the twofold division (Hippias of Elis, pp. 2, 4; Isokrates, 'Paneg.,' p. 179 (Baïter); and in Roman times, Agathem., II. 2; Sall., B. 7, 17, 2; and Varro, L.L. v. 31) are all later than Herodotus; earlier is only Æsch., 'Prom. Sol.' 2—

*τὴν μὲν διδυμον χθονὸς Εὐρώπης
μέγαν ἢδ' Ἀσίας τέρμονα Φάσιν,*

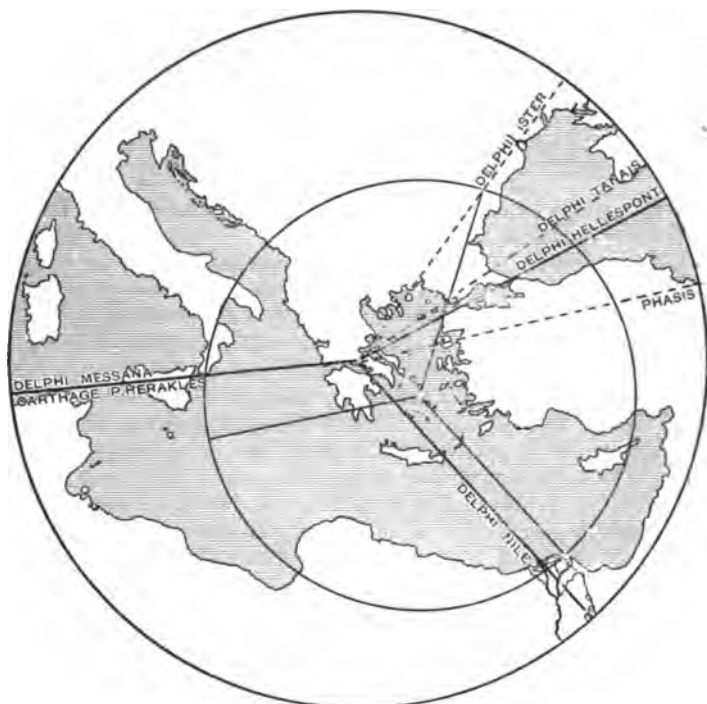
which proves nothing for or against a Libyan continent, as only the Europe-Asia frontier is under discussion.

It is not a twofold division which Herodotus is criticizing, but an equalization under the form of thirds, of two divisions, which for him are a half and a quarter respectively. Sir E. Bunbury was, further, certainly not in accord with Herodotus when he said that Hekataios recognized the established division into three continents, regarding Asia and Africa together as equal in size to Europe; this is exactly what Herodotus himself proposes as an amendment to the Ionian, and apparently Hekataian theory. The latter point is closely connected with another controversy, on which also he has a positive opinion of his own, directly opposed to that of Hekataios. The latter had divided Europe and Asia at the Tanais; Herodotus, like Æschylos (P.S. 2, above), divides them at the Phasia, i.e. east and west, i.e. north and south, making Europe, as he expressly says (Δ. 42), as long as Asia and Libya put together, along their joint frontier east and west; that is, he gives Europe the whole northern semicircle. Hekataios had given Asia the whole eastern semicircle. The view of Hekataios prevailed, though not absolutely, in later geography, and our maps still make Europe end at the Ural, and gives Siberia to Asia. There are those who believe that Russia supports the view of Herodotus!

The whole controversy about the limits of the three continents arises from the fact that, in the fifth century, empirical geography was beginning to upset the traditionally accepted meaning of the terms in question. The names Europe, Asia, and Libya are, in the first instance, nothing but a geographical classification of the shores of the Mediterranean Sea, probably at a time when it was practically unknown beyond Sicily and Cape Bon, and when it was taken to be literally "Mediterranean," the nave of a wheel-shaped universe of which the Okeanos or "Extraterranean" sea is the rim. Mediterranean and Extraterranean were in primitive geography united by three radial straits, each with an inward flowing current like that of a river—(1) that between Scylla and Charybdis, namely, the Strait of Messina; (2) that between the Blue Wandering Islands, namely, the occasional pack-ice in the Bosphorus; (3) the Nile, which Hekataios believed to rise somehow in the Ocean; probably based on a Soudanese tale of a visit to the Great Lakes. Odyseus, it will be remembered, has his choice between the Messina and the Bosphorus route, on his return from the ocean-washed Kimmerian country, namely, the Hinterland of Europe.

When the Euxine was explored, and the Nile was found by more up-to-date thinkers than Hekataios to be only a river, with its source in West or Central Libya, the map was rectified by subdividing the land area between the Mediterranean and Okeanos by three radial frontiers between the Hinterlands of these three divisions

of the coast. As the coast lands are *à priori*, and empirically also, nearly equal, the doctrine of three naturally equal continents arises as a natural corollary. The division between Europe and Libya is obvious; it lies along the axis of the Mediterranean, and issues into the circumambient ocean between the Pillars of Herakles. We have seen how this axial line was adopted as the production westwards of each of the great geographical equators. The frontier between Libya and



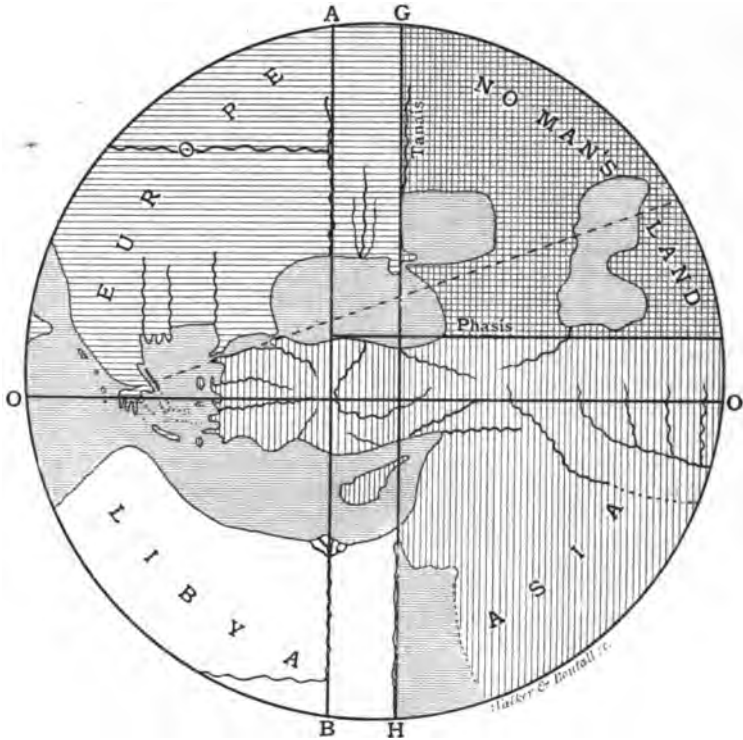
REAL MAP, SHOWING THE EMPIRICAL BASIS OF THE THEORY OF THREE EQUAL CONTINENTS.

- (1) *Small circle*: Primitive Ægean geography with Delos (probably) as centre; the angles subtended by the continents are *actually* 120° each.
- (2) *Large circle*: the same with Delphi as centre, somewhat more advanced.
- (3) The dotted lines show the *first* stage of the "Phasis-Tanaïs controversy."

Asia is equally clear. It is at first the axis of the Nile valley; and later, when that is rejected as bisecting a nationality, it is parallel to the Nile valley, and lies in the axis of the Arabian gulf. This latter is also the more obvious to a geographer approaching from the east, and is accordingly adopted in the Oriental map, which, as we have seen reason to conjecture, may have been edited by Skylax of Karyanda. Let us note, in passing, that in the Ionian symmetry, the western shore of the Arabian gulf is co-ordinated with the western shore of the Mæotis Palus (Sea of Azov). This is why Hekataios, looking for a landward production of the same meridian, makes the Tanais the natural frontier between Europe and Asia.

To return to the continents, however; Libya being thus delimited by the Mediterranean Sea and the Arabian gulf, the remaining land-mass of Europe and

Asia is at first simply bisected by the line of the Hellespont and Bosphorus, which does actually, if produced, cut the axis of the Western Mediterranean in Central Greece, not far from Delphi, the theoretical point of intersection. But the exploitation of the Euxine by Milesian navigators removed the problem one step further afield. The Hellespontine frontier, if produced on the real map, cuts the Caucasian coast about midway between the Kimmerian Bosphorus and the Phasis,



IONIAN MAP, SHOWING THE SECOND STAGE OF THE "PHASIS-TANAIS CONTROVERSY."

Three *quadrant* continents, and the fourth quadrant assigned by Hecataeos to Asia |||; by Herodotus to Europe ≡.

and in a region where no natural frontier exists. Consequently, pending further exploration (for this piece of coast remained unattractive, unknown, and probably underestimated in extent), the line between Europe and Asia was left arbitrarily drawn, and two schools of geographers arose, one arguing, in favour of the Phasis, that either the frontier must be twisted southward or the topography northward; the other, that either the frontier must go north, or the topography south, in favour of (1) the Kimmerian strait, (2) the western shore of the Mæotis, and (3) the course of the Tanais, when that was discovered beyond. This meridian of the Tanais was known to Ptolemy and adopted by him. We have already seen how the fact that the Arabian gulf frontier lay nearly in a line with the Tanais was adduced in favour of the latter view, when once the idea of continental equality was shaken.

Herodotus, as we have seen already, treats this view as ridiculously old-

fashioned, and it is easy to show how and when this change of attitude took place. One of the first and most important pieces of empirical geography on the grand scale was the circumnavigation of Libya, about the year 600, for Pharaoh Necho of Egypt; which we may probably take to be historical. This, at all events, if not earlier researches, perhaps even native Egyptian doctrine, seemed to indicate (though, as we know, wrongly) that the axis of the Arabian gulf is more nearly at right angles to that of the Mediterranean than at the 120° which the tri-continental scheme demands, and which corresponds much more nearly with the facts. The equation of the Red Sea coast with the Mæotis-Tanais meridian of the Nile with the Ister, and of the Egyptian with the Scythian square, confirmed the distortion thus suggested. At all events, the Nile valley was always taken to be at right angles to the Mediterranean axis; and the Arabian gulf was taken as parallel to the Nile valley, as Herod. B. 11 seems to indicate, and as is otherwise probable.

Here, then, was a problem. Libya is, *à priori*, equal to either Europe or Asia, for all three are "Hinterlands" of equal coast-lines. Compare the tacit reasoning that Euxine and Mæotis are equal in area, because they stand on equal coast-sides of the Scythian square. But Libya has been shown to be contained within 90° or one quadrant, instead of 120° or one-third of the circle. Therefore both Europe and Asia, properly so called, ought also to be contained each within one quadrant; and recent researches, mainly Milesian, had shown that the Phasis, running east and west, bounds the quadrant of known Asia, and the Tanais, running north and south, bounds that of known Europe. But though the equality of the continents is thus reconciled for the moment with the quadrant form of Libya, there is a fourth quadrant on the real map, which is still unaccounted for, namely, the No-Man's-Land between Tanais and Phasis; and it is the question whether this quadrant ought to be counted as European or as Asiatic, which exercises the contemporaries of Herodotus. A new school has arisen, which throws overboard the theory of equal continents, and gives the odd quadrant either (with Hekataios) to Asia, which thus becomes an eastern semicircle, with a quadrant Europe and a quadrant Libya west of it; or (with Herodotus) to Europe, which becomes a northern semicircle, with Asia and Libya as east and west quadrants of it. Herodotus, moreover, as we have seen, makes a further step towards emancipation by his critical examination of the names Europe, Asia, and Africa, and by his positive declaration (in the case of Egypt and the old Nile-frontier, which was retained by Hekataios) that, continents or no continents, geographical divisions must not be allowed to bisect a nationality.

All these considerations, however, only affected universal geography, and the fitting together of the departmental maps. These latter, as we have seen, were probably throughout constructed by plotting out empirical topography on roughly rectangular construction-spaces, of which the base or axis was usually a line of road. These lines might of course lie in any direction, but preference was apparently given to those which were approximately oriented. Consequently, when these local maps come to be co-ordinated by Ionian theorists, who did not always know the ground, their several principal meridians tended to be forced into parallelism, irrespective of their true orientation. In particular, the lines of the Ister and Tanais were brought through a considerable real angle from north-east towards north-west, to square with the meridian and equator of the Ionian maps of Asia Minor, to which they were now appended. That Herodotus had indications of the true bearing on the separate map of Scythia is, however, probable from his statement (Δ . 99), that his mouth of the Ister points *πρὸς ἔδρον ἀνεμῶν*—that is, east-south-east. This is the compass mark, as we should say, which gives the true local and empirical orientation of the lower course of the Ister, and so of the Scythian square. In the general

map, the indication either was wholly disregarded, or was interpreted, as the expression of Herodotus suggests, as applying merely to the estuary of the river (B. 34).

Similarly, all local work, both Greek and Persian, in Asia, was probably surveyed left and right from the Royal Road. As the Royal Road in the section from Sardis to Euphrates is, over all, fairly direct, and even more so in the section from the Euphrates to Susa, these two sections of it naturally became the continuous baselines for more general maps. All Greek work, in particular, was plotted in, as we have seen, as though the Royal Road continued east of the Euphrates in the same line as its western half. Consequently, the topography of the Persian empire is, on the Ionian maps, slewed round from south-east to north-east.

If the country behind the Caucasus had been as well known to Greeks as the roads in Scythia, or even in Mesopotamia, the compression of the intervening areas, between the northward slew of Mesopotamia and the eastward slew of Scythia, must have been obvious and intolerable, and must have led to a re-examination in particular of the course of the royal road. But this is the same No Man's quadrant which has already puzzled the universal geographers. They have a double inducement, therefore, to diminish both the length of the coast-line between the Tanais and the Phasis and the angle enclosed by these streams, so as (a) to efface the awkward Caucasian blank between their two nearest departmental maps, that of the Tanais-Ural route, and that of the Phasis-Caspian route, and (b) at the same time "to make Europe equal to Asia," as Herodotus says, by literally splitting the difference; a process which he rightly rejects as antiquated and absurd (A. 36).

So much for the Greek view of the trend of the Royal Road, and for the influence of this upon the Ionian universal map. We have now to point out that the great meridian of what we have called the Persian Map is plotted out in the same way along the Euphrates-Susa half of the Royal Road, but that here the road is slewed round in the opposite direction, from north-east—south-east to north—south, so as to correspond with the "column of nations" which we detected to begin with. The result is that in the Persian map the line of the Euphrates-Susa road is meridional, whereas in the Ionian map it is equatorial. The Persian map, however, is so far superior to the Greek map, that it keeps Asia Minor as a projection westwards from that "column," and consequently exhibits the great bend in the road, but sums it up as a single right angle at the Euphrates ford, and exaggerates it in consequence of the southward slew just mentioned. This retention of Asia Minor as an eastward *ἀκρῆ* is itself an important point; for it indicates that the editor of the map used an Ionian symmetrical map to fill in this section of his compilation, and increases the probability that this editor may have been Skylax of Karyanda.

The southward slew of the royal road has a further consequence, which is important as regards Herodotus himself and his sources. The parts of Asia north-east and east of the road are exaggerated by this slew, in proportion as Arabia and the parts west of it are thrust from south-west to west. Consequently, the No Man's land north of the Phasis becomes of less importance, so to speak, to Asia, and the Phasis frontier gains in acceptability as against the Tanais. We may, therefore, probably refer the preference of Herodotus for the Phasis frontier to his peculiar acquaintance with the Persian map, and obvious preference for it over the Ionian, in matters of further Asiatic geography. It is a further question whether we ought to see in this an additional reason for inferring communication between the historian of Halikarnassos and the geographer of Karyanda.

After the reading of the paper, the following discussion took place:—

The PRESIDENT said: I think the interest of Mr. Myres' paper arises in the first place, from its originality, for I never before remember an attempt to draw

the maps which Herodotus used from his text; and, in the second place, its suggestiveness. I have no doubt several gentlemen would like to discuss some of the points raised. I will call on Mr. Beazley, who is the best authority here.

Mr. RAYMOND BRAZLEY: I have not sufficient acquaintance with the technical construction of maps to speak about them in connection with this paper, which has been extremely interesting to me. The only remark which it occurs to me to make is about the symmetry, which is so characteristic of the maps described, and which is extremely noticeable in all maps which follow the classical period, and in the speculations of classical geographers. As Sir Edward Bunbury has pointed out, Ptolemy himself is governed by ideas of symmetrical geography—ideas, indeed, which are partially corrected by his extensive and detailed knowledge of countries; but which had more disastrous effects upon his successors. For they, following their master with less knowledge, and even more rigid symmetry, and relying far more on their imagination, planned out the world rather as they thought it should be than as even they might have thought it was. This superstition affects even some of the best Arabic geographers, who exhibit the march of Alexander to the East, and that of Hercules to the West, so as to show an equal distance from a common centre in Greece.

Mr. W. G. THORPE: So important and original a paper comes on one rather as a surprise. I must congratulate the learned author very much indeed upon the pains he has taken. I think everything is being found out now: we were told one day that a stelé, which gave writing a thousand years older than we have at present, had been found. I think that our ancestors did know a great deal more than we give them credit for. In the first place, with reference to map-making, it is impossible to doubt that there must have been a knowledge of drawing to scale, and of this I propose, in a book I am about to publish, to give my own ideas; but there can be no doubt, in the case of the Pyramids, where all the blocks had to be put together, there must have been a knowledge of drawing to scale, and of machinery, that is, the putting of power to work. Now, the point I am going to work is this: the expeditions of these earliest voyagers were made by creeping along the coast, and putting in to shore every night. They got beyond that in time, and whatever may be said of the Phœnician question in which I am a strong believer, there is no doubt that Cato held up in the senate-house at Rome a fig ripened in Carthage three days before, showing that their galleons were as quick as the present Messageries steamers, and that, at that time, they could lose sight of land and not be afraid. They *must* have had some kind of map. On this point I will mention that I have had most suggestive ideas from a gentleman named Daux, who deals at length with these points. He maintains that they had, and that there still exist, in the ruins of Carthage, some tablets which were used to communicate with ships at sea, and this seems to presume the use of the telescope. But the point I am going to put to you is this: does the author think that any maps existed before the time of Cato, which would justify a man sailing out of sight of land? I am going to put a question on one of the maps. We all know that Marseilles was colonized by Phœnicia, and it is said that they had a look-out station called Hemeroskopion, or Cape St. Martin, and I don't find any mention of this at all. The red lines are not taken to Marseilles, but seem to be taken through the Straits of Bonifacio, and not to make Hemeroskopion.

The PRESIDENT: What you ask Mr. Myres is, whether he conceives of one Ionian map, or whether of the characteristics of a group of maps. We have the map of Aristagoras, and the map apparently that Herodotus knew of. We have a Samian map, and the Hekataios map. When you speak of an Ionian map you refer to the characteristics of the group.

Mr. MYRES: I refer to the school of maps. They vary in detail, because the prime equator is slightly different in the case of different towns. There are slight deviations, but in the main body the Royal Road is the same, and the course across to Sicily is the same. Probably all used the Phocæan map to the west; I only showed Massalia as shorthand for the point touched. Of course, the point made for, and which is still made for, is beyond Toulon. Hemeroskopion is Cabo de la Nao in Spain, opposite Iviza.

Mr. THORPE: We know they had maps, or, at least, something to steer by.

Mr. MYRES: I think the maps I have been trying to reconstruct show that they had got as far as that. I think it is probable they steered by the stars. In the *Odyssey*, v. 277, Odysseus when trying to get back to Ithaka, is instructed to steer by the Great Bear for fourteen days.

Mr. BEAZLEY: Might I ask one question? Do I understand that Mr. Myres bases his Persian maps on Skylax, or what else?

Mr. MYRES: The map is Skylax's edition of the Persian maps, *plus* the Ionic map for Asia Minor, *plus* the Egyptian maps for Egypt and Libya, *plus* his own explorations east of the great Persian map; but not including any survey of Central Europe, Scythia, or the south shore of the Caspian.

The PRESIDENT: This has been a most interesting paper, and the interest began at the very commencement of the paper, when Mr. Myres explained to us the habit of drawing the roads in a straight line, so that the map of Aristagoras must have been like Paterson's Roads. I am old enough to remember travelling from York to London by coach. We always had Paterson's road-map, and I used to wonder how it was that they were so perfectly straight, because I found it so very different when we got out to walk up the hills. The most striking point, I think, is when he proceeded to point out the route to Susa from Miletus, a straight line. He afterwards explained to us exactly what must have been Aristagoras' conversation with the king of Sparta about the map he had drawn, and he has even drawn the map for us in a way that is, I think, very probably like the bronze plate Aristagoras took with him to try to persuade the king of Sparta to go to Susa, but the king replied that the distance was too great. The interest of the paper was very great at the commencement, and increased. He explained the symmetrical habit of mind of these people, which probably drew them into many errors, but also in various ways got things on a parallel, and so got some verisimilitude in their maps. It had advantages as well as disadvantages. You will all, I am confident, wish me to return a very hearty vote of thanks to Mr. Myres for his very interesting and suggestive paper.

THE SURFACE OF THE SEA AND THE WEATHER.

By H. N. DICKSON.

PROF. OTTO PETTERSSON contributes to the August number of the *Meteorologische Zeitschrift* a further and important instalment of results obtained by the joint labours of Swedish, Norwegian, German, Danish, and British oceanographers in the North Sea and its branches, and in the North Atlantic. Prof. Pettersson deals in this paper chiefly with the meteorological aspect of the question, and discusses more fully than has been possible hitherto the points raised at an early stage of the work, and given in outline by the writer in the *Geographical Journal* for March of the present year. It is clearly shown at the outset how a comparatively small change of temperature in the surface waters of the sea necessarily means a vast quantity of heat imparted to the atmosphere, partly on account of the great specific heat of the water, and partly because cooled particles of water are instantly

removed and made to give place to lighter particles of warmer water. There is thus a double reason why, under normal conditions, the surface of the sea should in winter be maintained at a higher temperature than the land, and so tend to become the home of systems of low barometric pressure, and this altogether apart from its power of supplying these systems with aqueous vapour.

A great deal of evidence is produced to show that in general the regions of relatively warm surface water are indeed regions of relatively low barometric pressure, and the further question then arises as to the relation between the conditions of the surface of the sea and the weather, dependent on the barometric pressure, at different seasons and in different years. From a large number of particular cases where abundant material has been collected by international co-operation, and from long-period averages of observations made at Danish, Norwegian, and Swedish stations, and at the British coastguard stations under the Meteorological Council, it is established almost beyond dispute that where warm oceanic water has from any cause been brought into the North Sea or the Baltic in unusually large quantities in autumn, the weather of the following winter is marked by an unusually large number of cyclones with accompanying mild weather. If, on the other hand, the land streams are stronger than usual, bringing down large quantities of cold fresh water and spreading them widely over the sea-surface, then pressure tends to remain above the average, the cyclones are deflected further to the westward, and the hard cold winter characteristic of steady anticyclonic conditions is the result. The strong contrasts of recent winters, during which the international system of observations was in full swing, afforded exceptionally good opportunities of bringing out this point. The warm winter of 1894 was preceded and accompanied by the presence of vast quantities of warm oceanic water in the North Sea; while in 1895, a winter of intense cold, the southern part of the North Sea was entirely filled with fresh cold waters chiefly derived from the land.

Prof. Pettersson admits that much remains to be done before complete proof of the hypotheses advanced can be obtained. The facts, as at present known to us, will indeed bear no other reasonable interpretation, but in most cases the interaction of cause and effect is so complex that it is often difficult to tell which is which. Every step in the investigation drives one further and further out to sea, where observations become always more and more widely separated; for not until we have a really fairly complete knowledge of the surface currents of the North Atlantic and the Norwegian Sea can we hope to find the cause of the great differences in the distribution of waters nearer home. When the influences controlling these currents are once fully understood, it seems almost certain that a limited number of observations judiciously selected as to time and place, will enable us to forecast with confidence, not the weather for a day or a few days, but the general character of a season, whether the winter is to be mild or severe, and possibly also whether the summer is to be wet or warm.

At the close of the paper published in the March number of the *Geographical Journal*, I was able to state that arrangements had been made for making observations on an extended scale in different parts of the North Atlantic during the years 1896 and 1897. Thanks to the energy and care of the captains and officers of the large number of vessels engaged in the work, more than 1600 samples of surface water have been collected during the first ten months of the period. The greater part of the material thus brought together gratuitously has already been subjected to careful if partial analysis, and if, as seems certain, a similar number of samples can be collected next year, the deficiencies so emphatically pointed out by Prof. Pettersson will have been to some extent made good.

THE MONTHLY RECORD.

THE SOCIETY.

Medals for the Nansen Expedition.—As was announced in the November number of the *Journal*, the Council have decided to award to Dr. Nansen a Special Gold Medal for his recent Arctic expedition. It has also been decided to award silver replicas of the medal to Captain Otto Sverdrup, Lieut. Sigurd Scott Hansen, Lieut. Hjalmar Johannesen, and Dr. Henrik Blessing; and replicas in bronze to the other members of the expedition, viz. Claudius Theodor Jacobsen, Peder Henriksen, Anton Amundsen, Lars Pettersen, Bernhard Nordahl, Ivar Mogstad, Adolf Juell, and Bernt Bentsen.

EUROPE.

Ordnance Survey Maps.—The Departmental Committee on the sale of Ordnance Survey maps has published its report, together with minutes of the evidence given by thirteen witnesses, including Sir Clements Markham, Colonel Farquharson (Director-General of the Ordnance Survey), Mr. H. O. Arnold-Forster, M.P., and a number of map-salesmen and officials. The decision arrived at by the Committee was that the principle of appointing sole agents for England, Scotland, and Ireland, through whom alone maps of the respective countries could be obtained, should be abandoned. The Committee recommends for the future that a single agent should be appointed for the sale of Ordnance Survey maps in London; that a separate agent be appointed for Edinburgh, Dublin, and each of the larger provincial towns, to keep a credit stock of maps, which will be supplied to him at a discount of 25 per cent. off the published price. In addition to this, any book or map seller may order maps direct from Southampton or Dublin, and will be supplied on the same terms as the appointed agents, except that prepayment for orders should be necessary. The Committee further makes the very important recommendation that the Postmaster-General be invited to sanction arrangements for the exhibition of index sheets and specimens of local maps at about a thousand post-offices in small towns and rural districts, so that maps may be ordered through the post-office. It is eminently satisfactory to find that at last there seems a likelihood of the splendid maps of the Ordnance Survey being made easily accessible to the public in all parts of the country.

Bibliography of Germany.*—This is a work of enormous labour, involving an amount of research and compilation out of proportion, we fear, to the utility of the completed scheme—to geographers at least. The bibliography is limited, in the first case, to the titles of books and maps separately published, and the whole class of memoirs published in journals is excluded. Thus almost all the detailed geographical studies of small regions, which form so characteristic and admirable a feature of German geographical work, are left unnoticed. The arrangement also is very unsatisfactory from the standpoint of a geographical student, not comparable for a moment with the admirable clearness of the ‘*Bibliotheca Geographica*,’ with which the present work must not be confounded. The five main heads are—Bibliography of the literature of German geography; Land-surveys, maps, and plans; General works on regional geography (*Landeskundliche Gesamtdarstellungen*) and guide-books; Features of the country (including surface forms, waters,

* ‘*Bibliotheca Geographica Germaniæ. Litteratur der Landes- und Volkskunde des Deutschen Reichs, bearbeitet durch Paul Emil Richter.*’ Leipzig: Engelmann, 1896. Pp. 842.

climate, vegetation, animal distribution); and Inhabitants. The main subdivisions are also non-geographical, and the regional classification takes quite a minor place in the arrangement. The index, which might, if well done, atone for a confusing classification, is also unsatisfactory, the names of authors not appearing, and very few place-names being recorded in it.

Canton Zurich: Surface Changes since the Middle of the Seventeenth Century.—In the October number of *Petermanns Mitteilungen*, Dr. Edward Brückner has a note on this subject based on a comparison, made at his instigation by Mr. H. Walser, of the maps of the present day with an excellent map by J. C. Gyger, on the scale of 1:32,000, belonging to the year 1667. The chief results ascertained by this comparison are a great reduction during the period of the area occupied by lakes, many of those existing in 1667 being now extinct, others contracted in dimensions, a diminution of about 10 per cent. in the forest area, and an increase of the area under vineyards by about 25 per cent. Of the 149 lakes on Gyger's map (most of them, it is true, under 25 acres in extent), 73 have altogether disappeared from various causes.

The Arendsee in the Altmark.—Dr. W. Halbfass, whose observations on the lakes in the basin of the Lech are noticed on pp. 198-9 of vol. vii. of the *Journal*, has contributed to the eighth number of *Petermanns Mitteilungen*, 1896, a monograph on the Arendsee, which lies in the northernmost corner of the Prussian province of Saxony. It lies quite isolated 50 miles from Lake Schwerin, the nearest lake of considerable size east of the Elbe. It has neither inlet nor constant outlet, the artificial channel connecting it with the Jeeze, and through it with the Elbe, only occasionally serving as a means of discharge for surplus water. Sometimes the water flows the other way. The lake has an area of 2.3 square miles, and lies at the height of 77 feet above the level of the Baltic, in a district which is for the most part a nearly level sandy heath; but the contours of its bed (which are shown on a map accompanying the monograph) are quite out of correspondence with such surroundings, the depth being very variable at different parts, and unusually great (maximum 162 feet) in proportion to the size of the lake. This is explained by the history of the lake. It is generally stated that the lake owed its origin to a subsidence of the ground in 822, and was extended by another subsidence in 1685, but Dr. Halbfass points out that the documents from which we obtain the information as to the former subsidence speak of a lake already existing at the spot, and this original lake he believes to date back to the diluvial period, and to be one of those formed by the water derived from the melting of the retreating ice. The monograph also gives the results of numerous observations on the temperature of the water, its transparency, and other matters.

The Occurrence of Yews in North-West Germany.—At present firs and yews are regarded as absent throughout the whole of North-West Germany, but on this subject Dr. Oskar Drude has an interesting note in the September number of *Petermanns Mitteilungen* with reference to two recent discoveries there due to Mr. H. Conwentz, director of the Museum of Natural History at Danzig. One of these is that of the remains of a wood composed of firs, yews, oaks, birches, and alders, in a bog between Hanover and Burgdorf, near the small village of Stelle. Among about fifty stems of yews, some lying, some upright, specimens were seen measuring more than a metre round. The other discovery, or rather re-discovery, was that of a clump of living yews in the Krehlinger Bruch, near Walsrode, north of Hanover, the existence of which was mentioned in the literature of forestry as far back as 1865. These discoveries, says Dr. Drude, show that the hard and fast lines that have been drawn as the limits of individual trees in North-West Germany are of very little value, and the method of determining such lines merely by researches in documents, of still less.

ASIA.

British Travellers in Tibet.—A Reuter's telegram from Simla, on November 11, announced the return to Leh of Captain Deasy, who set out last April on a journey across Tibet for the purpose of exploring the upper courses of the rivers of Indo-China (*supra*, p. 296). Deficiency of means of transport is assigned as the cause. The same telegram reported the arrival at Lan-chau of Captain Welby and Lieut. Malcolm, who also left Kashmir in April, but from a private letter we learn that they had by that time already reached Shanghai in safety. Details of their journey are not given, but as it had been their intention to avoid routes already used by Europeans, whilst they had with them a trained Indian topographer, it is to be hoped that some good exploring work has been accomplished.

The Khangai Mountains in North-West Mongolia.—M. D. Klements, who has been sent out by the Siberian Geographical Society for the exploration of the region between Urga and Ulyasutai, and especially of the great Khangai mountains, which run, as is known, west-north-west to east-south-east, in the latitude of 47° and 48° N., made two attempts to ascend the Otkhon-tengri peak (situated 35 miles east of Ulyasutai, and also named Ochir-vani). Both attempts proved unsuccessful, but M. Klements could approximately estimate the height of that mountain at between 13,000 and 14,000 feet. He found also a great glacier on the western slope of the Otkhon-tengri, and discovered many traces of former volcanic activity. Wide spaces in this part of the Khangai range are covered with basaltic lavas, and two small volcanoes, long since inactive, were discovered.

Sven Hedin's Discovery of Northern Lob-nor.—The last news from Dr. Sven Hedin was from Khotan. After having left Kashgar on December 14, 1895, he went to Khotan, *viâ* Yarkand and Kargalik, and from Khotan he made a very interesting excursion into that part of the Gobi which lies near to Khotan, and is known as the Takla Makan. An account of an earlier journey appeared in the *Journal* for September and October. Ruins of ancient towns were said to exist in that desert, and Sven Hedin really found the ruins of two towns, one of which is remarkable for its big size and the purely Indian style of its architecture. Reaching next the shores of the Keria river, the expedition followed its banks northwards, and came across a small nomad stem, so devoid of all communication with the outer world, that they did not know whether Yakub Beg is still their ruler, or whether they belonged to China. Large herds of the wild camel were met with, and three specimens secured. After a further eight days' march, Sven Hedin reached the other end of the desert. Therefrom he went to the region where the Chinese geographers place Lake Lob-nor, which lies to the north of Lob-nor which was first visited by Prjevalsky, and has since gone under that name. A series of lakes and traces of an immense now dessicated lacustrine basin were really found, as well as extensive forests and thickets, which continue to grow round the bottom of the old lake, while no forests are found around the southern lake, or Prjevalsky's Lob-nor. The lakes discovered by Sven Hedin on the spot which is marked as the position of Lob-nor on the Chinese maps, were, however, refilled with water no more than nine years ago, the water coming from the Tarim. Its bed was obstructed some time ago by sand, and consequently the river began to discharge its water further northwards. The two groups of lakes—the one discovered by Prjevaisky and the one now discovered by Hedin—are thus in mutual dependency, and the one dries up when the other is filled with water.

The Variations in the Lacustrine District of Lob-nor.—In connection with the above note, it may be stated that Dr. Sven Hedin contributes to the ninth number of *Petermanns Mitteilungen*, 1896, a series of nine maps, illustrating changes that have taken place, or may be inferred to have taken place,

mainly in recent years, in the lakes that form the ultimate receptacles of the waters of the Tarim, the Konche-daria, and the Cherchen-daria. Two of the maps, representing the probable state of things about 175 years ago, are based on information obtained from an aged chief whom the explorer met at Abdal. The changes are not difficult to account for. The basin of the Tarim is likened by Dr. Hedin to a spoon, the deeper end of which is in the east. This is due to the fact that that basin is surrounded on all sides except the east by mountain chains, from which flow a number of streams, most of which on the north and south sides are not powerful enough to reach the main river, but dry up in the sands. The result is the accumulation of cones of deposit round the basin. The (Yarkand) Tarim, however, reinforced chiefly by the Aksu-daria, the Khotan-daria, and the Konche-daria, carries a sufficient amount of matter in suspension to deposit considerable quantities of mud at its terminus, and consequently the eastern end of its basin is gradually being brought to a nearly dead level, so that it is not at all surprising that changes should take place there in the ultimate distribution of its water. These changes are assisted by the dust-storms that prevail in the region. Throughout the basin the prevailing winds are from the east or north of east, east-north-east winds being the most frequent, especially in the spring, when they commonly blow with great violence. They are then known as *kara-buran*, or "black storms." During Dr. Hedin's visit one such storm raged from the 9th to the 21st of April, with only two days' interval, and another from the 25th to the 28th without the slightest intermission. This wind carries not merely atmospheric dust, but also drift-sand, thus causing the sand-dunes to move westwards. The maps show that the main receptacle of the waters of this basin appears to oscillate from north to south and back again. The Lob-nor of Prjevalsky (1876-1885) represents two minor lakes, shown in a Chinese map of 1863, the main body of water being then further north. At the time of Dr. Hedin's visit (April, 1896) the two large lakes forming the Lob-nor of Prjevalsky were represented only by a shrivelled and shallow basin (about 8 inches deep) and a considerable extent of marsh, with occasional sheets of open water, while a larger body of water was being formed in a more northerly part of the course of the Tarim above the confluence of the Cherchen-daria. At low water these lakes are slightly brackish, the shore lagoons, on the other hand, very salt; but it need not surprise us that at high water (September-October) the water of the lakes is quite fresh, seeing that these lakes are constantly being re-formed in different situations.

The Rainfall of China and Korea.—To the ninth number of *Petermanns Mitteilungen*, 1896, the editor, Dr. Supan, contributes three tables with explanatory notes relating to the rainfall of China and Korea. In the first table all the available material has been made use of, but in the other two only those stations have been included for which returns were available for the same period of six years (1887-92). The principal result of the examination of these tables, according to Dr. Supan, is that while in north and south China the markedly monsoon character of the rainfall is exhibited in the great preponderance of summer over winter rains, at the stations of middle China (from the lower Yangtse-kiang to Amoy) the winter rainfall is more considerable, though even there not amounting to half that of the summer half-year. On this ground Dr. Supan feels compelled to dissociate the eastern from the southern Asiatic monsoon region, which he has represented as one in the rainfall map in the second edition of his *Physische Erdkunde*.

AFRICA.

Mr. C. W. Hobley's Journey around Mount Elgon.—Mr. C. W. Hobley, in January last, succeeded in encircling the whole of Mount Elgon, named after a

tribe, the Elgonyi, on its southern slope, but known to the Walako as Masawa Tukul. Leaving Mongichi's on January 9, he first crossed the fine open country of the Wakamuni, and then entered the thickly peopled valleys of the Wavoto and Wakoko. This district is a succession of precipitous hills, all clothed from foot to summit with luxuriant banana plantations, intersected by numerous deep valleys of exceptional fertility. Crossing the Busano mountain by a pass at a height of 8700 feet, he descended into a tract of fertile rolling valleys, in which bananas grow with such profusion that large quantities ripen and rot in the shambas ungathered. The small tribes inhabiting this favoured land had never seen any coast people, and are entirely unacquainted with cloth or beads; a few cowries, however, are imported from Unyoro. On reaching the north-west corner of Elgon, the vast level plain to the north and the chain of lakes became distinctly visible. The Wakumama, on these lakes, constantly raid the inhabitants of the mountain. The northern slope is inhabited by Mbai, Sor and Savei, who are Masai. The Savei are frequently visited by Swahili caravans, on their way north to Ngaboto and Turkana, and are consequently more civilized than their neighbours. The east side of the mountain is thickly wooded above 7000 feet, and entirely uninhabited. Before again reaching Mongichi's, Mr. Hobley traversed the district of the Elgonyi, who are closely allied to the Walako.

The East Africa Protectorate.—In the August number of the *Journal* (p. 174) we alluded to the extension of the limits of the Uganda Protectorate in the direction of the upper Nile. This has been followed by an official notice published in the *London Gazette* of September 1, by which it is announced that all the territory in East Africa now under the protectorate of her Majesty, except the islands of Zanzibar and Pemba and the Uganda Protectorate, are included in one administration, known as the "East Africa Protectorate." It includes all the islands adjacent to the coast between the Jub and Umb rivers.

The Italians in Abyssinia.—The treaty of peace signed at Adis Abeba, the Emperor Menelik's Shoa capital, on October 26, is far more favourable to Italy than could have been expected. The treaty of Uchelli (May 2, 1889, with a supplementary convention of February 6, 1891) is abrogated, and the absolute independence of Ethiopia recognized; but Italy, far from losing territory, actually receives an accession. The boundary of 1889-1891 commenced at Mount Mungabo, near Annesley bay, and passed to the south of Halai, Saganaiti, and Debaroa. That of the recent treaty lies about 35 miles further south, being formed by the rivers Mareb, Belesa, and Muna. The exact line is to be demarcated on the spot by delegates of both governments, one year from the date of this treaty. Italy, until this definite delimitation of the frontier, engages not to cede territory to any other power. A commercial treaty is also to be concluded. By a convention signed at the same time, the Italian prisoners now in Shoa, about 1500 in number, will be forwarded to Harar and Zeila, the Italian government paying an equitable sum for the expenses incurred on their behalf. By this treaty Italy retains her colony of Eritrea and the Somal coast, but Abyssinia can no longer be looked upon as an Italian Protectorate, nor even as lying within an "Italian sphere."



Lieut. Hourst's Voyage down the Niger.—News has been received that Lieut. Hourst and his companions, who set out from Timbuktu on a voyage down the Niger in January last (*supra*, p. 72), have descended the whole course of the river to the sea, at which they have arrived by the Forcados mouth.

The Lakes in the Timbuktu Region.—In our July number (p. 72) we alluded to the survey by Commandant Réjou of a new lake (Dauna) south of Lake Faguibine. From a sketch-map published in the *Comptes Rendus* of the Paris Geographical Society (1896, p. 177), it appears that it is (at low water) a narrow lake about 12 miles long, connected with Lake Faguibine by a channel which issues near its eastern extremity. At high water the lake overflows for a long distance towards the west and south, becoming 26 miles long by $4\frac{1}{2}$ wide. North of Lake Faguibine (and connected with it by a channel) still another lake (that of Bonkor) has been discovered, measuring about 10 miles by 3, while further still in that direction another lacustrine depression has been reported by the natives.

The French Sudan Railway.—It has been decided to continue the construction of this railway from the Senegal to the Niger in accordance with the original design. The line reached Bafulabe near the confluence of the two upper branches of the Senegal in 1888, though the hasty manner of its construction necessitated subsequent improvement. It has, till the present, remained stationary at that point; but work has now been recommenced, and a bridge over the Bafing near its junction with the Bakhoi has already been built. A useful sketch of the history of the enterprise appears in the November number of the *Bulletin du Comité de l'Afrique Française*.

A Port and Railway for German South-West Africa.—Attempts have lately been made to establish a port in German territory as the outlet for Damaraland, and, according to recent accounts, Walfish Bay seems threatened with a serious loss of trade (*Deutsche Kolonialzeitung*, November 7, 1896). The new station is at the mouth of the Swakop, or Tsoakaub, and goes by the name Swakopmund. It already numbers twenty European houses, besides many native huts. The route thence to the interior is said to be much easier than from Walfish Bay, being less obstructed by shifting sand-dunes. For this reason the waggons from the interior have begun to take this route, and the trade of Swakopmund is now double that of Walfish Bay in 1893. The facilities for landing at the mouth of the Swakop are discussed in the *Kolonialblatt* of August 1, and though it is allowed that at present it is far behind the Bay in the security it affords to shipping, the opinion is expressed that a mole or iron pier, at which ships could load or unload cargo, could be constructed at a comparatively small cost. Granite for the building of a mole is present on the spot, while other advantages of the site are the good supplies of water and fodder for cattle. A railway from Swakopmund to Otjimbingue and Windhoek is said to be urgently needed in the interests of the colony.

AMERICA.

Venezuela: Vegetation and Cultivation.—The ninth number of *Petermanns Mitteilungen*, 1896, contains the third and apparently the last of the series of maps relating to Venezuela compiled by Dr. W. Sievers, this one showing by seventeen signs the distribution of the natural vegetation and the leading cultivated products. The map thus sheds interesting light on the distribution, and the opportunity presented for the further spread of population. Among the more noteworthy features of the map in this respect are the coloured signs showing the extent of sandy steppes and of scrub (*monte*), including the prickly vegetation characteristic of arid regions in tropical countries, neither of these features having been represented in Codazzi's

map. The sandy steppes are met with over a large area in the east of the republic north of the Orinoco, between about 63° and 66° W., and mainly south of 90° N., though this limit is exceeded about 61° W., and possibly elsewhere, since the data are insufficient for determining its north-western limit towards La Pascua. The scrub and prickly vegetation is very extensive in the north, especially on the southern and western sides of the mountains, and embraces nearly all the peninsula of Paraguana, as well as the Colombian peninsula of Goajira and the islands (including the Dutch West Indies) off the Venezuelan coast.

Prof. Sievers's Work on Venezuela.—Prof. Sievers calls our attention to the notice of his work on Venezuela inserted in the September number of the *Journal*. In the first place, it appears that a slip was inserted in the work, stating that a map would shortly follow—a statement which, it is unnecessary to say, had escaped the notice of the reviewer when commenting unfavourably on the absence of a map.* The second point is the statement that no indication is given as to the source whence the population statistics are derived, whereas Prof. Sievers has mentioned, at p. 106, that they are based on the census of 1891.

Population of the Argentine Republic.—The October number of *Petermanns Mitteilungen* contains some of the preliminary results of the second census of the Argentine Republic, held on May 20, 1895, from which it appears that the population of the provinces and territories was then as given below:—

Provinces, etc.	Population.	Increase per cent. per annum since the first census (Sep. 16, 1869).	Provinces, etc.	Population.	Increase per cent. per annum since the first census (Sept. 16, 1869).
Buenos Aires			Prov. Jujuy ...	49,543	0·9
Capital ...	663,854	9·9	" Salta ...	118,198	1·3
Province ...	921,225	7·8	" Tucuman ...	215,693	3·8
Terr. Misiones ...	33,005	—	" Catamarca ...	90,187	0·5
Prov. Corrientes ...	239,570	3·3	" La Rioja ...	69,228	1·6
" Entre Rios ...	290,994	4·5	" San Juan ...	84,251	1·5
Terr. Formosa ...	4,829	—	" Mendoza ...	116,695	3·1
" Chaco ...	10,280	—	Terr. Neuguen ...	14,517	—
Prov. Santa Fé ...	397,285	13·4	" Rio Negro ...	9,300	—
" Santiago ...	160,445	0·8	" Chubut ...	3,748	—
" Córdoba ...	351,745	2·6	" Santa Cruz ...	1,058	—
" San Luis ...	81,155	2·0	" Tierra del Fuego	477	—
Terr. Pampa ...	25,765	—			

The total population, including 60,000 estimated to be unenumerated, and, say, 30,000 Indians, is returned at 4,043,000. The very rapid rate of increase of population in the province of Santa Fé, much higher than that of any of the provinces of the Dominion of Canada between 1881 and 1891 (highest Manitoba, 9·5), or any of the provincial districts of the North-West Territories of Canada between the censuses of 1885 and 1891 (highest Alberta, 6·9), and among the United States exceeded only by North Dakota (17·37), and Washington (16·62) in the period 1880–90, is a striking indication of the recent extension of wheat-cultivation in that province. Besides the capital, there were in Argentina in May, 1895, fifteen towns with a

* The map has since been received, and shows clearly, on the scale of 1 : 1,000,000, the physical features of the mountainous districts of North Venezuela, between Coro and the peninsula of Paria. It is based on Prof. Sievers's own surveys, his routes being shown in red.

population of upwards of 10,000, viz., Rosario, 92,442; La Plata, 43,566; Córdoba, 42,783; Tucuman, 34,297; Mendoza, 28,803; Parana, 23,922; Santa Fé, 23,818; Salta, 16,672; Corrientes, 16,058; Chivilcoy, 14,632; Gualeguayobu, 13,003; Concordia, 12,449; San Nicolás, 12,281; San Juan, 10,410; Barracas ad Sud, 10,185.

The New Boundary Treaties between Chile and Bolivia and Argentina.—Dr. Polakowsky communicates to *Petermanns Mittheilungen*, No. 9, 1896, the main particulars of these two treaties, the former signed on the 1st, and the latter on the 7th of May, 1896. The treaty with Bolivia converts the truce of 1884 into a definitive peace, and accordingly finally cedes to Chile the whole of the present province of Antofagasta. That with Argentina hardly provides for a final settlement of the matters in dispute. The first article declares that the operations of demarcating the boundary between the republics of Chile and Argentina in accordance with the treaties of 1881 and 1893 are to be continued in the Cordillera de los Andes as far as 23° S., and the frontier line from that parallel to 26° 52' S. is to be settled by both governments and that of Bolivia, which is invited to take part in the settlement. But the new treaty does not state whether the line to be taken as the Cordillera de los Andes is that of the Cordillera Real running east of the Puna of Atacama, where the frontier is now usually drawn (as, for example, in the map of South America in Stieler's Handatlas), or along the crest of the chain running south from the volcano of Licancourt to the west of that Puna, so as to transfer the Puna to Argentina. With regard to the boundary south of 26° 52' S., it is provided that any disputes that may arise between the members of the commissions appointed to set up the boundary-stones, and cannot be settled by a friendly agreement between the governments of Chile and Argentina, are to be decided by the Government of her Britannic Majesty.

The Swedish Expedition to Tierra del Fuego.—The scientific expedition despatched in 1896 to Tierra del Fuego under Dr. O. Nordenfjöld, mainly at the expense of Baron Oscar Dickson, completed the work during the first half of 1896. Some account of the geographical, geological, and botanical results was laid before the "Deutschen Wissenschaftliche Verein" at Santiago (Chili) in July and August, by the leader and Herr F. Düren respectively, and a short report appears in *Globus* (ix. No. 18), while Dr. Axel Ohlin, zoologist to the expedition, briefly describes his own special work in the September number of *Natural Science*. The main island of Tierra del Fuego, to which the observers devoted special attention, is divided by Dr. Nordenfjöld into three zones, viz. (1) the southern mountainous region, covered in its lower part by dense forests; (2) a lower and more level zone in the centre, in which only the tops of the hills are forest-clad; and (3) the northern treeless zone. The three main lines of heights (of which the two southern, formed of crystalline schists, are divided by the longitudinal depression of Admiralty sound, and the lately discovered Lake Fagnano) have, individually, the character of plateaux, cut up by the deeply eroded valleys of the streams. The two northern zones are composed of tertiary formations covered with quarternary deposits, identical with the ground moraine of the old glacial region of North Europe. The vegetation of the eastern dry, and the western moist, regions is sharply contrasted, and between them occurs a zone, marked in part by a peculiar flora, and in part by plants common to the two main divisions. The zoological work of Dr. Ohlin has thrown new light on questions of distribution relating to those regions. Puna Argona on the northern shore of the Strait of Magellan is placed just on the meeting-line of the eastern and western fauna. The strait does not, as was thought by Darwin, form a boundary between two distinct regions, for many eastern Patagonian

forms were found in the eastern part of Tierra del Fuego. A small lizard was found as far south as Rio Grande, in 53° 50' S., which is the most southerly spot where reptiles have yet been discovered. The ostrich (*Rhea*) and puma, however, do not pass south of the strait. In the western moist region the great southward extension of originally sub-tropical forms is remarkable.

AUSTRALASIA.

The Calvert Expedition in Western Australia.—Telegraphic news was received early in November of the arrival at the Fitzroy river, in the north of Western Australia, of the expedition fitted out early in the present year by Mr. A. F. Calvert, for the purpose of exploring the principal unknown areas in the western half of Australia. Unfortunately, the party only got through after experiencing great hardships and abandoning the scientific collections made *en route*. Two members of the expedition (Messrs. C. A. Wells and J. W. Jones) are also reported missing, but hopes are entertained of their rescue. From information communicated by Mr. Calvert, we obtain the following details regarding the general plan and early stages of the expedition. The leader is Mr. L. A. Wells, who had previously done good work on the government survey of the boundary between Queensland and South Australia. His cousin, Mr. Charles A. Wells, a good surveyor, is second in command, while the scientific work and photography is entrusted to Messrs. G. A. Keartland and J. W. Jones. The party left the coast at Geraldton, a little south of the Murchison river, the main objective being the unknown tract lying between the routes of Giles and Warburton, which it was proposed to cross in a northerly direction towards the north-west coast. From Derby, near the mouth of the Fitzroy, it was proposed to start eastwards for Powell's Creek on the trans-continental telegraph line, whence the more eastern portions of the unexplored areas would be traversed by a south-westerly route to the West Australian goldfields. It is, therefore, only the first section of the proposed exploration which has yet been accomplished. The last previous news which had been received was dated July 15, from the neighbourhood of Lake Way, whence a start was to be made the following day for Lake Augusta (25° 50' S., 122° 28' E.). The rains had been very heavy in that region early in the year, and there were several miles of shallow lagoons of fresh water. Further details will be awaited with interest.

The German Expedition in New Guinea.—Letters from Dr. Lauterbach, the leader of this expedition, are published in the *Verhandlungen* of the Berlin Geographical Society (1896, p. 360), giving details respecting its progress down to June 26. After a preliminary trip to the Oertzen mountains, during which the highest peak (about 3600 feet above the sea) was climbed by Dr. Kersting, the final start was made from Stephansort, at the head of Astrolabe bay, on May 30. Besides the three Europeans, the expedition consisted of four Malays and forty Melanesians. Four horses and fifty goats were also taken. The route at first led again in the direction of the Oertzen mountains, but, a good sized river (the Gogol, known near the sea as the Elizabeth) having been reached, its course was followed in a south-west direction through a gap in the mountains. The country was well peopled, and provisions were easily obtained. The path became very rough, and the horses' hoofs suffered severely. After reaching the source of the river, Lieut. Tappenbeck and Dr. Kersting returned to the coast for a further supply of provisions, whilst the leader climbed a peak, which gave him some view towards the interior. Many forest-clad ridges rose one behind the other, an important range bounding the view to the west, whilst a high mountain was also visible in the north, and another bearing west-south-west by west. The latter seemed between

13,000 and 16,000 feet high. A river was discovered flowing south-west and west, which rapidly increased in size from the junction of other streams. In its neighbourhood a station was erected, 60 miles from the coast, and on the receipt of the last instalment of supplies, it was intended to push on in a southerly direction, and attempt the ascent of one of the highest peaks. According to a telegram from Scerabaya received at Berlin early in November, the substance of which has been communicated to us by the Foreign Office, the expedition has returned in safety to the coast, having accomplished a satisfactory piece of exploration. The river above alluded to was followed for 200 miles, and proved to be navigable, and to flow through a well-peopled, fertile plain. The question of its termination will be of much interest. This is the first time that a well-peopled tract has been discovered in the interior.

Murder of an Austrian Geologist on Guadalcanar.—Baron von Foulton-Norbeck, geologist attached to the staff of the gunboat *Albatross*, which left Austrian waters in 1895 for a scientific voyage round the world, was murdered by the natives of Guadalcanar, in the Solomon group, in August last (*Petermanns Mitteilungen*, p. 243).

The Ellice Islands.—An account of these islands, which were annexed along with the Gilbert islands by the British in 1892, is contributed by a correspondent to the *Sydney Evening News*. The group lies to the north of the Fiji islands, between 5½° and 11½° S. The inhabitants are a quiet, peaceable race, very different from the proud, restless, quarrelsome, and warlike Gilbert islanders. The southernmost member of the group, Sophia island, or Rocky Independence, called by the natives Ulakits, is the only one high enough to be seen from a ship at the distance of 20 miles. A few years ago it was uninhabited, but it now contains the labourers on a guano deposit worked by an American. About 80 or 90 miles further north lies Nukulailai, or Mitchell island, a perfect atoll, composed of thirteen low islets, with an impassable reef enclosing a lagoon 5 miles long by 3 miles broad. Thirty years ago this atoll, which is thickly covered with coconut palms, had four hundred inhabitants, but nearly three hundred of them were carried away by kidnappers from Peru to work on the guano-fields of the Chinch Islands, where nearly all of them perished. Now the inhabitants number about 120, all Christians. A few leagues to the north-west lies Funafuti (Ellio), a chain of thirty-five islands, enclosing a large lagoon, to which there are two good entrances, one in the south-west, the other in the north-west. The total number of the inhabitants is about 400, all on the main island, Funafuti. On this and the other members of the atoll, millions of coconut palms ripen their fruit, only to rot, owing to the refusal of the natives to allow Europeans to settle on one of the islands and prepare copra. The total value of the imports and exports of all the Ellice islands in 1894 was nearly £4900. It was on the atoll of Funafuti that the boring experiments described in the following note were made.—*Petermanns Mitteilungen*, 1896, No. 9.

The Coral Reef Boring Expedition.—Letters received by the Royal Society from Prof. Sollas announce the failure of the boring operations attempted by the staff of the *Penguin* on Funafuti island, one of the Ellice group in the Western Pacific. On two separate attempts, it seems, the apparatus was choked by a kind of quicksand. The sand apparently contained boulders of coral, which does not form solid rock, but seems to resemble a coarse sponge with wide interstices. Valuable observations were, however, made regarding the fauna, flora, and ethnology of the group, while the complete series of soundings obtained by Captain Field is expected to throw new light on the nature of coral reefs (*Nature*, September 24).

POLAR REGIONS.

The Cornell Expedition to Greenland.—A recent number of *Science* contains some particulars relative to the Cornell Expedition to Greenland, by Mr. Ralph S. Tarr. The Cornell party accompanied Lieut. Peary on the steamer *Hope*, the main object of the expedition being to study the geology of a small area in some detail; but collections of plants, insects, marine invertebrates, and birds were also made. The principal place of observation was the Nugsnak peninsula, Western Greenland, where the party remained from August 7 to September 7. The main geological results of the expedition may be briefly summarized as follows: At the island of Turnavik, on the Labrador coast, there is abundant evidence of recent glaciation. That part of Baffin Land bordering Hudson Strait, in longitude 76° – 71° , has all been glaciated up to an elevation of 600 feet. Both at Big island and on the main Baffin Land evidence of very recent elevation is found to a height of 270 feet above the sea. The Nugsnak peninsula referred to is situated in lat. 74° 7', about 80 miles north of Upernavik. Its highest point is 2500 feet, and in many places its elevation is over 1000 feet. Wilcox head, at the end of the peninsula, has an elevation of 1400 feet, and the sea near by is more than 100 fathoms in depth. At the south-eastern base of the peninsula is a large glacier, named the Cornell glacier, and on the northern side is the Wyckoff glacier. The latter is nearly stagnant. Proofs were afforded of a retreat and advance of the Cornell glacier at some recent time, although there was evidence that the glacier is now engaged in a rapid withdrawal. This very recent retreat, the author points out, is a part of a general withdrawal of a vast ice-sheet, which extended outward beyond the Duck islands, a distance of no less than 32 miles from the front of the Cornell glacier. He is of opinion that, in this part of Greenland at least, the present glaciation is a shrunken remnant of a former greater sheet, the western limits of which cannot be drawn.

GENERAL.

Acclimatization.—In a pamphlet reprinted from *Appleton's Popular Science Monthly* (March to April, 1896), Mr. William Z. Ripley discusses the question of acclimatization, both from the point of view of the possibility of adaptation to changed climatic conditions on the part of the human race generally, and from the more special standpoint of the possibility of the colonization of the tropics by the races of Europe. The article is evidently the outcome of much careful study, and the very copious references to authorities will be most useful to all who wish to enter more deeply into the subject. In dealing with the more general side of the question, the writer points out the many factors which have to be taken into consideration before a conclusion can be arrived at. Among these are included such points as the tendency of a change of residence to upset the regular habits of the colonist; the predisposition of particular races to certain diseases (*e.g.* the Negro is especially subject to consumption and the affections of the lung); and the effects of intermarriage between races, which introduces a completely new element into the question. On the last head facts may be adduced both in support of and against the idea that half-breeds are better able to resist climatic changes than unmixed races. The chief elements of climate, in order of their importance, are humidity, heat, and lack of variety. Supposed instances of successful acclimatization, such as that of the French in Algeria, lose their force if the first and greatest obstacle, excessive humidity, is absent. Heat is chiefly important as indirectly causing and generally accompanying humidity. Variety of climate in the tropics always affords relief, as at Singapore, where malaria is completely unknown, owing to the effect of the land and sea breezes. Altitude is largely beneficial through the daily and

seasonal variations which accompany it. With regard to the acclimatization of Europeans in the tropics, the writer lays stress on the rise of temperature of the body which takes place on the first arrival of the new-comer, and which accentuates the difference which already exists between the European and some other races, notably the Negro. He thinks that with the subsequent fall of temperature, comparative immunity from tropical diseases may ensue. A decided lowering of temperature can be effected only after long ages, and though much may be done to mitigate the evils of change of climate, we cannot expect complete acclimatization to be possible within a limited period. A gradual adaptation on the part of the races which show most aptitude for thriving in the tropics—those of South Europe—might be possible; but, as this would involve a general southward shifting of population, political reasons would of course stand in the way. Nevertheless, the writer holds this to be the only course likely to produce a new immune type in the regions of the equator.

OBITUARY.

Friedrich Simony.

FRIEDRICH SIMONY, the *doyen* of Austrian geography, died on July 20 last at St. Gall, in Upper Styria, aged 83. Born at Hrochonsteinitz, in Bohemia, on November 30, 1813, he in 1835 deserted the pharmaceutical studies which had brought him to Vienna, and devoted himself to natural science. His scientific and artistic labours in the Alps, especially in the Dachstein region, began in 1840, and this work occupied much of his attention till the close of his life. He was appointed custodian of the museum at Klagenfurt in 1848, and in 1850 became geologist to the then newly established Geologische Reichsanstalt, making a geological survey of the Salzkammergut in that capacity, which was remarkable alike for its scientific insight and artistic skill.

Simony's untiring energy may be said to have indirectly brought about the creation of a special geographical department in the Vienna Hochschule, and in April, 1851, he was appointed first ordinary Professor of Geography in the University of Vienna, where his teaching was remarkable for the introduction of graphic methods which have since come into more or less general use. Simony now extended his activities in the field over a great part of the Eastern Alps, and effected numerous improvements in scientific map-drawing, some of which have been adopted in the publications of the American Geological Survey. At the same time, he began the collection of educational material at the Vienna Geographical Institute, which has gone on increasing in the hands of his successor, Prof. Penck. In 1885, in conformity with state regulation, he retired from his official position, receiving the title *Hofrath*, and devoted himself to the completion of his great work on the Dachstein. Simony was almost wholly self-taught, and his homely manner and almost impatient earnestness of purpose, together with his marked preference for the pencil rather than the pen in publication, prevented his early receiving the recognition he deserved, and it was only in later years that his personality became known outside his own immediate circle.

Lieut. Edward D. Young, R.N.

One of an earlier generation of African explorers has passed away in the person of Lieut. E. D. Young, whose name became known some thirty years ago in association with that of Dr. Livingstone during the early exploration of the region

of Lake Nyasa. Born in 1831, he entered the Navy at an early age, and gained his first experience of East Africa as gunner of the *Gorgon*, engaged in the repression of the slave-trade on that coast. In this capacity he did good service in connection with the capture of Arab dhows. During Dr. Livingstone's second expedition to the Zambesi, Mr. Young was in charge of the *Pioneer*, a small steamer sent out in 1861 to assist in the exploration of the Zambesi, Shire, and Rovuma. Reports of Dr. Livingstone's death having been brought to the coast by deserters from his party during his last expedition, Mr. Young was chosen (in 1867) to lead an expedition for the purpose of inquiring into the truth of the story, and by careful investigations in the neighbourhood of Lake Nyasa, he was able to prove it an entire fabrication. After Livingstone's death, Mr. Young again led an expedition to Lake Nyasa in behalf of the Free Church of Scotland, founding the station of Livingstonia on its shores, and for the first time revealing the northward extension of the lake beyond the point reached by Livingstone and Kirk. He also discovered the Livingstone mountains which bound its north-east shore. The account of this expedition was published in 1877 under the title 'Nyassa.' After his retirement from the service in 1891, Mr. Young had lived at Hastings, where he died on November 4. He became a Fellow of our Society in 1891.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-97.

First Ordinary Meeting, November 10, 1896.—Sir CLEMENTS MARKHAM, K.C.B.,
President, in the Chair.

The election of the Right Hon. the Marquess of Salisbury was announced.

Opening Address by the President (see p. 541).

The Paper read was:—

"The Jackson-Harmsworth Expedition and the story of the Last Year's Work."

By Arthur Montefiore Brice.

Second Ordinary Meeting, November 23, 1896.—Sir CLEMENTS MARKHAM,
K.C.B., President, in the Chair.

ELECTIONS.—*Rev. George Cantrell Allen; William Henry Ambrose; Victor De Costa Andrade; Jervoise Athelstane Baines, C.S.I., (I.C.S. retired); John William Bickle; Arthur Bignold; Captain Arthur Blewitt, 2nd Batt. King's Royal Rifles; Rev. Thomas George Bonney, Professor of Geology in University College, D.Sc., LL.D., F.R.S.; Captain Edmund Bourke, B.N. (retired); Major G. F. Browne, Northampton Regiment, D.S.O.; Major Maurice Alexander Cameron, R.E.; Alexander Campbell, F.G.S. of Victoria; Roderick Campbell; Lord Edward Cecil; John Kirk Child; William Algernon Churchill, H.M. Consul, Mozambique; Captain Ralph Patteson Cobbold, 7th Batt. King's Royal Rifles; Eyre Coote; Oswald Bruce Cuvilje; Richard Harding Davis; William Dawson; Richard Sidney Dendy; Fredrik Anton Dessen; Thos. Hoistendahl Dessen; Captain William Evans; Alfred Joseph Faulding; Colonel Charles A. Wynne Finch; Lieut.-Colonel Hy. Edward Gaulter (late 37th, the North Hampshire Regiment); Sir Gervus Powell Glyn, Bart.; Harrison Hodgson, M. Inst. C.E.; Lieut.-Colonel Leonard Howard L. Irby; Thomas Henry Ismay, J.P., D.L.; William James Johnston; John Joss; A. Colenso Kessell; Charles R. W. Lane; L. Lindley-Cowen; Major Wilford N. Lloyd, R.A. (retired); Hon. E. Douglas Loch; Lord Lovat; P. V. Luke; Lieut.-General Arthur Lyttelton Lyttelton-Annesley; Sir James Lyle Mackay,*

K.C.I.E.; James F. McDougall; Major-General St. Laurence McGuire; Hon. Bernard C. Maxwell; Frank Stanley Milward; Captain Philip Montagu, late 12th Lancers; Alexander Moring; M. Neustadt; Charles E. Pearson; Hugh Leybourne Popham; Howard Priestman; Frederick P. Pullar; William F. Regan; Baron Ferdinand Rothschild, M.P.; Edward Russell; John Shillito, J.P.; Hugh Smiley, J.P.; Captain P. B. Smithe, 17th Lancashire Regiment; Rev. Thomas Stephens; Harold Swithenbank; Thomas Michael Thackthwaite; Captain Franz K. Thimm; Rev. Joseph Llewelyn Thomas; Henry Vale Trapp; Aubyn Trevor-Battye; Francis Edward Vincent; William Slade Vincent; Arthur James Vogan; Lieut.-Colonel R. A. Wahab, R.E.; Major William Lewis White, R.A.; Ramon O. Williams; James M. Wilson; John Wilson; Thomas Hugh Davidson Wood; Major John Alfred Wyllie, Indian Staff Corps.

The Paper read was:—

“Two Years in Uganda, Unyoro, and the Upper Nile Region.” By Lieut. Seymour Vandeleur, D.S.O., Scots Guards.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., Librarian, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. Rd. = Comptes Rendus.	S. = Society, Société, Selskab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Gea. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
M. = Mitteilungen.	Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 x 6½.

EUROPE.

Austria-Hungary—Agram. *M.K. u. K. Militär-G.I.* 15, 1895 (1896): 47–118. **Lehrl.**
Untersuchungen über etwaige in Verbindung mit dem Erdbeben von Agram, am 9 November 1880, eingetretene Niveauänderungen. Von Franz Lehrl.

On the changes of level accompanying the Agram earthquake of November 9, 1880.

Austria-Hungary—Agram. *M.K. u. K. Militär-G.I.* 15, 1895 (1896): 119–202. **Weizler.**
Untersuchungen über die Wirkungen des Erdbebens vom 9 November 1880, auf die in und zunächst Agram gelegenen trigonometrischen Punkte. Bearbeitet von A. Weizler. *With Maps.*

A further study of the disturbances produced by the Agram earthquake.

Balkan Peninsula—Albania. *Jahresb. G. Ger. München*, 1894 u. 1895 (1896): 175–222. **Glück.**

Reisen in Albanien. Von Oberauditeur Ludwig Glück.

Belgium. **Cornet.**

A propos du récent tremblement de terre de la Belgique et du nord de la France. Par J. Cornet. Extrait du *Mouvement Géographique*, Nos. 38 et 39 de 1896. Bruxelles, P. Weissenbruch, 1896. Size 10 x 6½, pp. 16. *Illustrations. Presented by the Author.*

- Denmark—Old village plans.** Lauridsen.
Aarbog. Nordisk. Oldk. Historie (II.) 11 (1896): 97-170.
 Om gamle danske Landsbyformer. Et Omrids af P. Lauridsen. *With Plans.*
- France—Aquitane.** Sitzb. A. W. Berlin (1896): 429-456. Hirschfeld.
 Aquitanien in der Römerzeit. Von Otto Hirschfeld.
- France—Mont Blanc.** C. Rd. 123 (1896): 585-587. Janssen.
 Sur les travaux exécutés en 1896 à l'observatoire du mont Blanc. Note de M. J. Janssen.
- France—Pyrenees.** Piette.
 Hiatus et Lacune. Vestiges de la période de transition dans la grotte du Mas-d'Azil. Par Ed. Piette. (Extrait des Bulletins de la Société d'Anthropologie de Paris. Séance du 18 avril 1895.) Beaogenoy, 1895. Size 9 x 6, pp. 44. *Presented by the Author.*
- Germany.** Deutsche Rundschau G. 18 (1896): 353-356. Hofmann.
 Die Marschbewohner an der Weser und Elbe. Von Alfred Hofmann.
- Germany.** Richter.
 Bibliotheca Geographica Germaniae-Litteratur der Landes- und Volkskunde des Deutschen Reichs bearbeitet im Auftrage der Zentral-Kommission für wissenschaftliche Landeskunde von Deutschland durch Paul Emil Richter. Leipzig: W. Engelmann, 1896. Size 9 x 6, pp. x. and 842. *Presented by the Publisher.*
 This is specially noticed in the Monthly Record.
- Germany—Bavaria.** Jahrb. G. Ges. München, 1894 u. 1895 (1896): 289-309. Gruber.
 Die in den Jahren 1894 und 1895 zur Landeskunde Bayerns erschienene wichtigere Literatur. Von Dr. Christian Gruber.
 A bibliography of recent Bavarian geography.
- Germany—Plant distribution.** Naturw. Wochenschrift 11 (1896): 449-450. Conwentz.
 Neue Beobachtungen über urwüchsige Eiben im nordöstlichen Deutschland. Von H. Conwentz.
- Germany—Prussia.** Globus 70 (1896): 261-265. Krause.
 Gräberfeld bei Vitzke in der Altmark. (La Tène und Spättrömisch). Von Konservator Eduard Krause. *With Illustrations.*
- Germany—Rivers.** Jahrb. G. Ges. München, 1894 u. 1895 (1896): 1-50. Zimmerer.
 Hans Sachs und sein Gedicht von den 110 Flüssen des deutschen Landes (1559) mit einer zeitgenössischen Landkarte herausgegeben und erläutert von Dr. Heinrich Zimmerer.
 An account of the German Drayton, whose forerunner of the "Polyolbion" is here quoted and annotated.
- Germany—The Saale.** Ule.
 Zur Hydrographie der Saale. Von Dr. Willi Ule. Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirehloff. Zehnter Band. Heft 1. Stuttgart: J. Engelhorn, 1896. Size 9½ x 6½, pp. 56. *Map.*
 Dr. Ule describes the limits of the basin of the Saale with a map on the scale of 1:500,000 of all the ramifications of the river system, treats of the orographical and geological conditions, and finally in great detail of the rainfall and flow of water in the stream.
- Germany—Thuringia.** Regel.
 Thüringen. Ein geographisches Handbuch. Von Dr. Fritz Regel. Erster Teil: Das Land. Zweiter Teil: Biogeographie; Erstes Buch, Pflanzen- und Tierverbreitung; Zweites Buch, Die Bewohner. Dritter Teil: Kulturgeographie. Jena: G. Fischer, 1892-1896. Size 10½ x 7, pp. (Erster Teil) xvi. and 400; (Zweiter Teil) vi. and 840; (Dritter Teil) xvi. and 490. *Map and Illustrations.* Price 33s.
 This important work will be specially noticed. It is a specimen of the thorough geographical study of a region of considerable topographical variety and great historical interest.
- Holland.** Blackwood's Mag. 160 (1896): 626-642. ———
 Behind Dikes and Dunes.
 A bright record of a tour in Holland.

- Hungary.** Browning.
 A Girl's Wanderings in Hungary. By H. Ellen Browning. London: Longmans & Co., 1896. Size 8 x 5½, pp. xiv. and 332. *Map and Illustrations.* Price 7s. 6d. *Presented by the Publishers.*
 A book of a class now familiar, mingling clever observations of land and people with scraps of gossip of no special interest or value.
- Hungary.** *Abregé B.S. Hongroise G. 24* (1896): 16-20. György.
 Les Bohémiens en Hongrie. Par Aladár György.
- Hungary—Budapest.** *Abregé B.S. Hongroise G. 24* (1896): 9-15. Berecz.
 Population de la ville de Budapest. Par Antoine Berecz.
- Hungary—Lakes.** *Abregé B.S. Hongroise, G. 24* (1896): 1-9. Hanusz.
 Die stehenden Wasser unserer Landes von Stefan Hanusz.
- Italy.** *L'Universo 6* (1896): 212-214. Giordani.
 Geografia di Casa nostra: Il Turturone o Castagna primo affluente di sinistra dell' Assinaro del prof. Pasqualino Carlo Giordani.
- Italy.** *Riv. G. Italiana 3* (1896): 65-74, 177-187. Grasso.
 Gli "Strapellini" di Plinio, del prof. Gabriele Grasso.
 A discussion as to the situation of the town Strapellini mentioned by Pliny.
- Italy—Rome.** Kiepert and Hvelsen.
 Formæ urbis Romæ Antiquæ. Delineaverunt H. Kiepert et Ch. Hvelsen. Accedit Nomenclator Topographicus A. Ch. Hvelsen compositus. Berolini: D. Reimer, 1896. Size 11½ x 8, pp. xii. and 110. *Plans.* Price 12 mark. *Presented by the Publisher.*
 This consists of a map in three sheets of ancient Rome printed in black over a map of modern Rome in pale red. A topographical index, with copious references to classical writers, and a preface in Latin, form the letterpress. The work should prove of the utmost service to the student.
- Italy—Sardinia.** *Jahresb. G. Ges. München, 1894 u. 1895* (1896): 68-87. Knoll.
 Eine Reise durch Sardinien. Von Dr. Ernst Knoll.
- Italy—Venetian lagoons.** *Riv. G. Italiana 3* (1896): 200-211. Marinelli.
 Intorno alla origine della profonda cavità esistente nel porto di Malamocco. Osservazioni di Olinto Marinelli.
- Mediterranean.** Cavan.
 With the Yacht and Camera in Eastern Waters. By the Earl of Cavan, K.P. London: Low & Co., 1897 (1896): Size 8 x 5½, pp. xvi. and 28. *Map and Illustrations.* Price 12s. 6d. *Presented by the Publishers.*
 A continuation of Lord Cavan's practical yachtsman's guide to the Mediterranean, worthy of all the praise bestowed on the previous volume. The harbours described and photographed are those in the north-east of the Mediterranean, including the Greek Archipelago and the coast of Asia Minor. The photographs are from well-chosen standpoints; but we regret to find that the unscientific plan of printing in clouds which did not form part of the original picture is still adopted. In one illustration a grotesque effect of distorted perspective is given by fleecy clouds floating across the sail of a boat as if it were a suowy mountain summit.
- Portugal—Lisbon.** Pereira.
 Miscellanea historica. No. 1. A inscripção lapidar na Rua do Salvador (Monographia). Por J. M. Esteves Pereira. Lisboa: Empreza do "Occidente," 1896. Size 6½ x 4½, pp. 16.
 The inscription referred to speaks of the arrangement of the streets of Lisbon before the great earthquake.
- Russia—Caucasus.** *Aus allen Weltteilen 27* (1896): 467-472. Beandorf.
 Durch den Kaukasus. Von Paul Beandorf.
- Russia—Caucasus.** *Scottish G. Mag. 12* (1896): 458-470. Dingelstedt.
 The igneous rocks of the Caucasus. By V. Dingelstedt.
- Russia—Finland.** Berghell.
 Bidrog till Rännedomen om Södra Finlands Rvartära nivåförändringar. Akademisk afhandling af Hug Berghell. Helsingfors, 1896. Size 10 x 7, pp. 60. *Map and Illustrations.*
 On quaternary changes of level in southern Finland.

- Russia—Moscow.** *Deutsche Rundschau G.* 18 (1896): 342-350. **Müller-Bohn.**
Ein Besuch im Kloster Tróitzky bei Moakau. Von Hermann Müller-Bohn.
With Illustration.
- Russia—Novaya Zemlya.** *Ymer* 16 (1896): 129-149. **Tschernyschew.**
Den ryka expeditionen till Novaja Semlja 1895. Af Th. Tschernyschew.
With Map.
- Russia—Novaya Zemlya.** *Aus allen Weltteilen* 27 (1896): 457-466. **Noeslöff.**
Ein winterlicher Schneesturm auf Nowaja Semlja. Anzuzug aus einem Briefe von
R. Noeslöff.
- United Kingdom—England—Yorkshire.** **Fox-Strangways.**
P. Yorkshire Geolog. and Polytechnic S. (n.s.) 13 (1895): 15-20.
Glacial Phenomena near York. By C. Fox-Strangways. *With Map.*
- United Kingdom—England—Yorkshire.** **Tate.**
P. Yorkshire Geolog. and Polytechnic S. (n.s.) 13 (1895): 58-63.
The Malham Dry River Bed. By Thomas Tate. *With Map and Plates.*
- United Kingdom—Scotland.** *Scottish G. Mag.* 12 (1896): 513-522. **Mackay.**
Sutherland Place-Names. By John Mackay.

ASIA.

- Armenia and Persia.** **Harris.**
From Batum to Baghdad via Tiflis, Tabriz, and Persian Kurdistan. By Walter B.
Harris. Edinburgh and London: W. Blackwood & Sons, 1896. Size 8½ × 6, pp.
xii and 336. *Map and Illustrations.* Price 12s. *Presented by the Publishers.*
Mr. Harris, who is well known from his travels in Morocco and Arabia, travelled
in 1895 from Batum to Baghdad, passing Tiflis, Lake Gokcha, Erivan, Tabriz, Lake
Urumia, and southward through Persian Kurdistan to Kermanshah, turning then west-
ward to Baghdad. Mr. Harris gives the narrative of his journey in a lively manner,
wisely avoids the vexed political questions of which the scene of his travels is the
centre, and illustrates the country passed through by means of some good sketches and
excellent photographs.
- Asia—Russian Colonization.** *B.S.G. Lyon* 14 (1896): 30-41. **Blanc.**
La colonisation russe en Asie. Par Edouard Blanc.
- Asia—Minor.** *J.R. Asiatic S.* (1896): 733-741. **Le Strange.**
Al-Abrik, Tephrikè, the capital of the Paulicians; a correction corrected. By Guy
le Strange.
- British Borneo.** **Roth.**
The Natives of Sarawak and British North Borneo, based chiefly on the MSS. of
the late Hugh Brooke Low, Sarawak Government Service. By Henry Ling Roth.
With a Preface by Andrew Lang. 2 vols. London: Truslove & Hanson, 1896.
Size 10½ × 7, pp. (vol. i.) xxxii. and 464; (vol. ii.) iv., 302, and cxxl. *Map and
Illustrations.* Price 50s.
Mr. Ling Roth's important book has been already referred to in the Monthly
Record, where attention was called to his definition of the name Dayak. The plan
of these volumes is to give the fullest account of the habitat, physique, manners,
customs, beliefs, and possessions of the Bornean natives, almost always in the language
of the authorities responsible for the observations. The advantage of the plan is that
it allows the reader to compare the various descriptions directly; the disadvantage is
that the special knowledge of the compiler is not brought forward so prominently as it
deserves to be.
- Central Asia.** *Deutsche Rundschau G.* 19 (1896): 10-18. **Stenin.**
Ein Blatt aus der Geschichte Mittel-Asiens. Von Peter v. Stenin. *With Illus-
trations.*
- Central Asia—Lob Nor.** *Petermanns M.* 42 (1896): 201-205. **Hedin.**
Ein Versuch zur Darstellung der Wanderung des Lop-nor-Beckens in neuerer
Zeit. Von Dr. Sven Hedin. *With Map.*
- Ceylon.** **Cave.**
The Ruined Cities of Ceylon. By Henry W. Cave. A Paper read before the
British Association for the Advancement of Science, at the Liverpool Meeting in
September, 1896. Oxford: Upstone and Son. Size 8½ × 6, pp. 28. *Presented by
the Author.*

- China and Korea.** *Petermanns M.* 43 (1896): 205-209. **Supan**
Regentafeln von China und Korea. Von A. Supan. *With Map.*
- China—Hainan.** **Hirth.**
Friedrich Hirth. Die Insel Hainan nach Chao Ju-kua (Sonder-Abdruck aus der Bastian-Festschrift). Berlin: D. Reimer, 1896. Size 11 × 7½, pp. 30.
- Chinese Art.** **Hirth.**
Ueber fremde Einflüsse in der chinesischen Kunst. Von Friedrich Hirth. München und Leipzig: G. Hirth, 1896. Size 9 × 6, pp. xviii. and 81. *Illustrations. Presented by the Publisher.*
This memoir finds evidence in old Chinese ornamental mirrors and other artistic work of the influence of Greek art, coming through Bactria, in the first century B.C., and also of Buddhist art from India. A number of the designs on which these views were founded are reproduced.
- Egypto-Assyrian Railway.** *J.S. Arts* 44 (1896): 793-796. **Fraser.**
The Egypto-Assyrian Railway as the New Overland Route to India. By Colonel A. T. Fraser. *With Map.*
The proposed railway would run from Alexandria to the head of the Gulf of Akaba, thence across Northern Arabia to Baara, along the east side of the Persian Gulf, and following the coast of Baluchistan to Karachi.
- Formosa.** **Campbell.**
Past and Future of Formosa, with a new Map of the Island. By Rev. W. Campbell. (Reprinted from the *Scottish Geographical Magazine* for August, 1896.) Size 10 × 6½, pp. 16. *Presented by the Author.*
- India—Burma.** **Carey and Tuck.**
The Chin Hills: a History of the People, our Dealings with them, their Customs and Manners, and a Gazetteer of their Country. By Bertram S. Carey and H. N. Tuck. Volume i. Rangoon, 1896. Size 10½ × 7½, pp. vi. and 236. *Photographs. Presented by the Chief Commissioner, Burma.*
This will be specially noticed.
- India—Burma—Census.**
Government of India. Census of 1891. Provincial Tables. Burma Report. Volume iii., containing District, Township, Circle, and Village tables of Lower Burma (pp. xii. and 684); volume iv., containing District, Township, Circle, and Village tables of Upper Burma (pp. xviii. and 702). Rangoon, 1892-93. Size 13½ × 8½.
- India—Chitral.** *J.R. United Service I.* 40 (1896): 1235-1267. **Hamilton.**
The 2nd Brigade in the Chitral Relief Expedition, 1895. By Major W. H. Hamilton. *With Maps.*
- India—Sikhim.** *B.S.G. Commerc. Bordeaux* 19 (1896): 486-497. **Jambon.**
Le Sikkin. Par Ch. Jambon. *With Map.*
An account of Sikhim based on a journey in 1893 in company with Mr. J. Louis, and already described by him in his important book 'The Gates of Tibet.'
- India—Sikhim.** **Paul.**
The Himalayan State of Sikhim. By Hon. A. W. Paul. Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9 × 6, pp. 552-557. *Diagrams.*
- India—Transport.** *J. United Service I. India* 25 (1896): 1-54. **Bingley and Moberly.**
The Improvement of the Present Organization of Transport in India. Prize Essay. By Captain A. H. Bingley.
Ditto. By Captain F. J. Moberly. *With Illustrations.*
- Indo-China.** *J. Asiatique* (9) 8 (1896): 129-151. **Lefèvre-Pontalis.**
Notes sur quelques populations du nord de l'Indo-Chine. (2^e série.) Par M. Pierre Lefèvre-Pontalis.
- Japan.** *National G. Mag.* 7 (1896): 285-289. **Soidmore.**
The recent Earthquake Wave on the Coast of Japan. By Eliza Ruhamah Soidmore. *With Map and Illustrations.*
- Korea.** **Gardner.**
Korea. By Christopher Thomas Gardner, a.m.g., et al. Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at

NORTH AMERICA.

British Columbia and Alaska.

Pike.

Through the Subarctic Forest. A Record of a Canoe Journey from Fort Wrangel to the Pelly Lakes and down the Yukon River to the Behring Sea. By Warburton Pike. London: E. Arnold, 1896. Size 9 × 6, pp. xvi. and 296. *Maps and Illustrations. Price 16s. Presented by the Publisher.*

Mr. Warburton Pike writes with the same modesty regarding his scientific merits and the same enthusiasm for sport and adventurous travel which characterized his earlier book on the Barren Grounds. The route of the journey now described lay up the Dease river from its mouth opposite Prince of Wales island, and then down the Pelly and Yukon rivers. A special note will be given in the Monthly Record on the geographical results. The want of an index may be noted—a want more noticeable on account of the racy originality of Mr. Pike's index to his 'Barren Grounds.'

Canada.*Nautical Mag.* 65 (1896); 896-905.

Colmer.

The New North-West Passage. By J. G. Colmer, c.m.g. *With Illustration.*

On the composite land and sea route to Eastern Asia across Canada.

United States—Census.

Abstract of the Eleventh Census: 1890. Second Edition. Washington, 1896. Size 9½ × 6, pp. x. and 300.

United States—Geographic Positions.

Gannett.

A Dictionary of Geographic Positions in the United States. Compiled by Henry Gannett. Bulletin of the United States Geological Survey. No. 123. Washington, 1895. Size 9 × 6, pp. 184. *Presented by the U.S. Geological Survey.*

This will be specially noticed.

United States—Great Plains.

Hay.

Water Resources of a Portion of the Great Plains. By Robert Hay.—Sixteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1894-95. Part ii. Pp. 541-588. Washington, 1895. Size 12 × 8. *Maps, Sections, and Illustrations.*

The district considered in the report is a strip extending south from the North Platte river, a little north of 41° to 38° 30' N. along the meridian of 102° W., an area of over 5000 square miles, embracing parts of the states of Kansas, Nebraska, and Colorado in the upper basin of the Kansas river, with an average elevation of about 4000 feet.

United States—Hydrography.

Newell.

Report of Progress of the Division of Hydrography for the Calendar Years 1893 and 1894. By Frederick Haynes Newell.—Bulletin of the United States Geological Survey. No. 131. Washington, 1895. Size 9 × 6, pp. 126. *Presented by the United States Geological Survey.*

United States—Missouri.

Winslow.

The Disseminated Lead Ores of South-eastern Missouri. By Arthur Winslow. Bulletin of the United States Geological Survey. No. 132. Washington, 1896. Size 9½ × 6, pp. 32. *Maps and Sections. Presented by the U.S. Geological Survey.*

United States—Montana.

Weed and Pirsson.

American J. Science (4) 2 (1896): 188-199.

The Bearpaw Mountains of Montana. Second Paper (Part ii.). By Walter Harvey Weed and Louis V. Pirsson. *With Illustrations.*

United States—New York.

Silvercruys.

B. Union G. Nord de la France 16 (1895): 289-352.

New-York, ses faubourgs et ses habitants. Par Edouard Silvercruys.

United States—Pennsylvania.

Walcott.

The Cambrian Rocks of Pennsylvania. By Charles Doolittle Walcott.—Bulletin of the United States Geological Survey. No. 134. Washington, 1896. Size 9½ × 6, pp. 44. *Map and Plates. Presented by the U.S. Geological Survey.*

United States—Public Lands.

Newell.

The Public Lands and their Water Supply. By Frederick H. Newell.—Sixteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1894-95. Part ii. Pp. 463-533. Washington, 1895. Size 12 × 8. *Maps and Illustrations.*

A map of the United States shows by appropriate colours the area of vacant public
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lands, Indian lands, forest reservations, and lands disposed of, indicating by special shading the "wagon and railroad grants," and the lands never owned by the national government.

United States—Rhode Island.

Davis.

The State Map of Rhode Island as an aid to the study of Geography in Grammar and High Schools. By William Morris Davis. 1896. Size $9\frac{1}{2} \times 6$, pp. 16.

United States—Rhode Island. *J. Geology* 4 (1896): 691-703. Woodworth and Marbut.

The Queen's River Moraine in Rhode Island. By J. B. Woodworth and C. F. Marbut. *With Illustrations.*

United States—Roads.

Shaler.

Preliminary Report on the Geology of the Common Roads of the United States. By Nathaniel Southgate Shaler.—Fifteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1893-94. By J. W. Powell, Director. Pp. 259-306. Washington, 1895. Size 12×8 .

United States—Weather Service. *National G. Mag.* 7 (1896): 302-307.

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The Weather Bureau River and Flood System. By Prof. Willis L. Moore.

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England.

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Historical Atlas of Modern Europe from the Decline of the Roman Empire. Comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Lecturer in Diplomatic in the University of Oxford. Oxford: at the Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston, 1896. Part I. Price 3s. 6d. Presented by the Clarendon Press.

In this atlas it is intended to follow the same system as that adopted in Spruner and Menke's well-known historical atlas. The work of editing has been entrusted to Mr. Reginald Poole, M.A., PH.D., and the services of persons of recognized authority have been engaged to write the explanatory letterpress. When complete the atlas will contain about ninety maps, which will be issued in thirty monthly parts. This is the first issue, and contains the following maps: Map 2, Europe from 395 to 527 A.D., by Professor J. B. Bury; Map 15, Roman Britain, by F. Haverfield; Map 44, The Swiss Confederation, by Rev. W. A. B. Coolidge.

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Italy.

Instituto Geografico Militare, Firenze.

Carta d'Italia. Scale 1: 100,000 or 1.5 miles to an inch: F° 50, Padova; 52, S'Dona di Piave; 53, Foce del Tagliamento; 63, Legnago; 64, Rovigo; 65, Adria; 75, Mirandola; 76, Ferrara; 77, Comacchio; 89, Ravenna; 121, Montepulciano; 137, Viterbo; 138, Terni. Instituto geografico militare, Firenze. Price 1 li 50 centimes each sheet.

Norway.

Cammermeyer.

Cammermeyers Kart over Det Sydlige Norge med Oversigtskart over det nordlige Norge, i 2 Blade, udarbejdet efter officielle Karter og Opgaver ved Per Niasen. Scale 1: 800,000 or 12.6 stat. miles to an inch. Alb. Cammermeyers Forlag (Lars Swanstrom). Kristiania, 1895.

This map is well suited for the use of tourists. It is orographically coloured, showing contours of 500 metres apart from 500 to 2500 metres. All means of communication are laid down, and tables showing the distances of places from Christiania and Trondhjem are given, as well as an explanation of the symbols employed to denote the character of the roads and the comparative importance of places.

Roumania.

Michăilescu.

România Harta-Murală executată în Stabilimentul grafic. J. V. Sococă și întocmită pentru uzul scolare de Nicolae Michăilescu professor. Scale 1: 428,000 or 6.7 stat. miles to an inch. Editura librăriei Sococă & Comp. București.

This is a good wall-map of Roumania, and gives a large amount of general information about the country, which will be useful to students.

Scotland.

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Bartholomew's Reduced Ordnance Survey of Scotland. Sheet 2, Dumfries and Solway. Scale 1: 126,720 or 2 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. Price 2s., mounted on cloth. Presented by Messrs. J. Bartholomew & Co.

Switzerland.

Schmid, Francke & Cie.

Distanzenkarte des Berner Oberlandes. Scale 1: 200,000 or 3.15 stat. miles to an inch. Verlag von Schmid, Francke & Cie. Bern, 1896.

The distances, in hours, between the principal places on this map are marked in figures, and the nature of the roads are also indicated. Other information with regard to the positions of hotels, etc., which will be useful to tourists, is also given.

AFRICA.

Africa.

Service Geographique de l'Armée.

Carte de l'Afrique. Scale 1: 2,000,000 or 31.5 stat. miles to an inch. No. 11, In Salah; No. 12, Mourzouk; No. 16, St. Louis; No. 27, El Facher; No. 40,

Loulouabourg; No. 44, Kabébé. Service Geographique de l'Armée, Paris. *Price 1 franc each sheet.*

Africa.**Bacon & Co.**

The Excelsior Atlas of Africa, containing twenty-four maps and index to two thousand names. G. W. Bacon & Co., London. *Presented by Messrs. G. W. Bacon & Co. Price 1s.*

This little atlas is published at a price that will put it within the reach of all. It contains physical, ethnographical, and political maps.

East Africa.**Kolb.**

Originalkarte von Ukambani und dem Kenia-Gebiet. Nach eigenen Aufnahmen von 1894-1896 gezeichnet von Joh. George Kolb. Scale 1: 1,000,000 or 15.8 stat. miles to an inch. Petermann's 'Geogr. Mitteilungen,' Jahrgang 1896, Tafel 17. Gotha: Justus Perthes, 1896. *Presented by the Publisher.*

AMERICA.**Brazil.****Rio-Branco.**

Estados Unidos do Brazil. Scale 1: 5,000,000 or 78.8 stat. miles to an inch. Mappa desenhado e gravado sob a direcção do Sr. Barão de Rio-Branco. Guillard, Aillaud & C^{ie}. Paris-Lisboa, 1894.

Though this professes to be a map of Brazil, it includes the whole of Bolivia, Paraguay, Uruguay, and parts of Peru and the Argentine Republic.

GENERAL.**General.****Saint-Martin.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents cartes, voyages, mémoires, travaux géodésiques, etc. Avec un teste analytique ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader 84 cartes gravées sur cuivre sous la direction de MM. E. Collin et Delaune. No. 34, Europe Centrale, Feuille n.º. Librairie Hachette et Cie. Paris, 1896. *Price 2 francs.*

This issue contains the North-East sheet of a map of Central Europe. With the appearance of this map, 35 sheets of this atlas, which when finished will contain 84 maps, have been published.

CHARTS.**United States Charts.****U.S. Hydrographic Office.**

No. 1547, Lake Erie, Cleveland Harbor, and Cuyahoga R.; No. 1549, Mersina Roadstead, Mediterranean Sea. Pilot Charts of the North Atlantic and North Pacific Oceans, October, 1896 (with Graphical Solution of Spherical Triangles by Commander C. D. Sigsbee, U.S. Navy). U.S. Hydrographic Office, Washington, D.C. *Presented by U.S. Hydrographer.*

PHOTOGRAPHS.**Chitral.****Chitral Expedition.**

48 Photographs taken during the late Chitral Expedition by the Photographic Section of the Bengal Sappers. *Presented by Captain F. E. G. Skey, R.E.*

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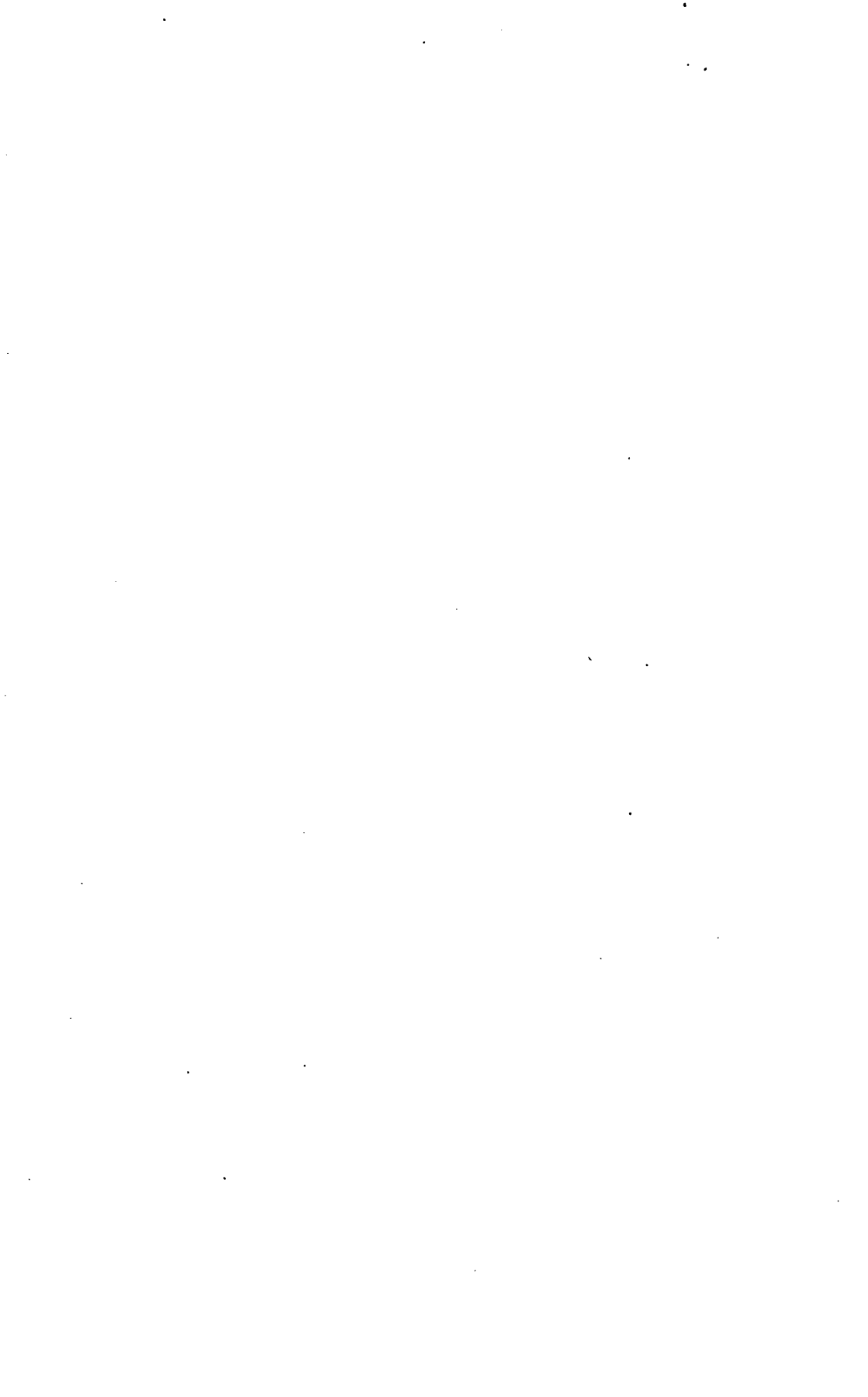
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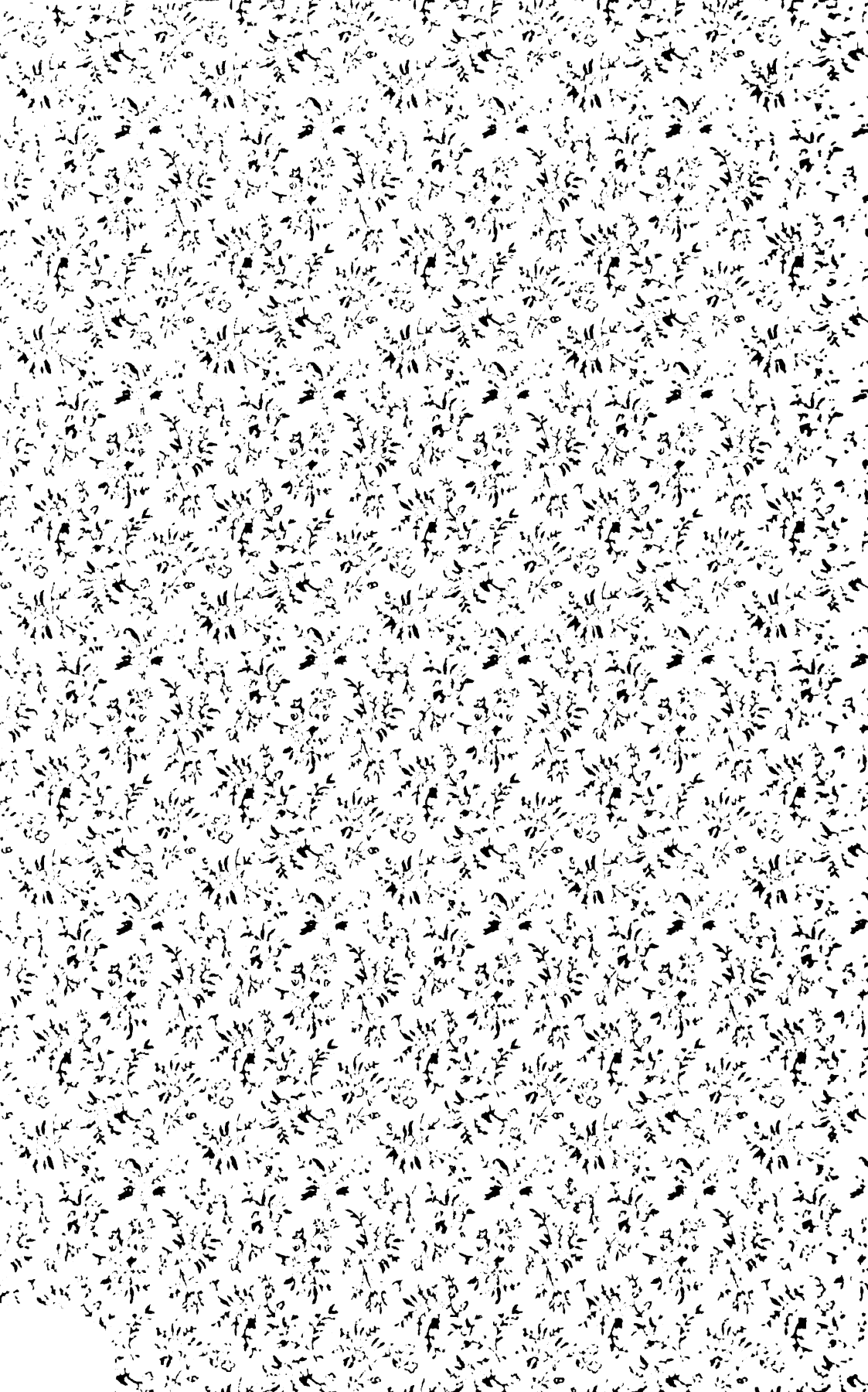
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