

rocks are also largely developed, extending from Morocco to Egypt, and including a fair area of the plateau limestones of Somaliland. In fact, the palæontological evidence seems to prove that the greater part of the country above the equator was covered by this ancient sea during the Eocene period of its history.

Besides the occurrence of this Eocene fauna, it may be of interest to mention that there is palæontological proof of the former existence of a still more ancient sea, marine Cretaceous fossils being also known in the Sudan area of Africa. Prof. A. de Lapparent* has published a notice of an echinoid which had been collected by Colonel Monteil between Chad and Bilma. This specimen was identified and described by M. Victor Gauthier as *Noetlingia Monteili*, a form showing affinities with *N. paucituberculata* from India, and therefore considered to be of Maestrichtian or Upper Aturian age. Further, Captain Gaden, on the authority of Prof. A. de Lapparent,† was fortunate in finding an Ammonite and an *Exogyra* in Upper Cretaceous beds at Damergou, between Zinder and Air. This Ammonite, according to Munier-Chalmas, shared characters with the Turonian genera *Mammites* and *Vasoceras*, both of which are found in the rocks of Tunis, Algeria, Portugal, and Spain. Ammonite impressions had been previously referred to by Rohlfs‡ as occurring in a sandy matrix between Aghadem and Bilma, but without a definite statement as to their geological horizon.

THE SCIENTIFIC RESULTS OF DR. SVEN HEDIN'S LAST JOURNEY.§

By Dr. SVEN HEDIN.

THE four final decades of the nineteenth century may with justice be called the last phase of the great age of geographical discovery, for the only parts of the Earth's surface that remained unexplored at the dawn of the twentieth century were the poles and the circumjacent oceans. As for the continents, they are now well known, even in their interior parts, and all that remains to be done is to fill in details. Asia was, however, the most difficult to be subdued, and I account it an honour to have been allowed to lift the veil off some of its geographical secrets, and to have been one of the latest pioneers in Asiatic discovery. That continent is being made known at a rapid rate. A country like Tibet, which has slumbered for thousands of years in the arms of the highest mountain ranges on the Earth, was even yesterday a *terra incognita*, while to-day it is traversed by armies trained and led by Europeans.

My last journey occupied me from June, 1899, to June, 1902. The first year after my return home was spent in preparing a popular

* A. de Lapparent, "Sur la découverte d'un Oursin d'âge Crétacé dans le Sahara oriental," *Comptes Rendus*, 1901, vol. 132, pp. 388-392.

† A. de Lapparent, "Sur de nouveaux fossiles du Sudan," *Comptes Rendus*, 1903, vol. 136, p. 1297.

‡ G. Rohlfs, "Reise durch nord-Afrika," etc., *Petermanns Geogr. Mittheilungen*, 1868, supplementary part, No. 25, p. 40.

§ Map, p. 616. This map is given as a specimen of the atlas, and the spelling adopted by Dr. Hedin has been allowed to remain unaltered.

account of my travels, which appeared in several languages, as well as in delivering addresses before the most distinguished geographical societies in Europe. But as early as October, 1902, I petitioned His Majesty, Oscar II. of Sweden, for a public grant of money to enable me to publish the scientific results of my expedition. My request was referred by the Government to the Academy of Science in Stockholm, and the Academy appointed a committee of three members, consisting of Dr. E. W. Dahlgren, Prof. A. G. Nathorst, and Prof. Hj. Sjögren, who supported my petition, and in April, 1903, my request was granted by the Swedish Parliament. It is to the Parliament, therefore, that I in the first place owe my sincerest thanks, for having rendered it possible for me to publish the work in question; and I would also take this opportunity of expressing my thanks to the Swedish Minister of Ecclesiastical Affairs, Dr. Carl von Friesen, to Prof. Baron G. De Geer, as well as to Dr. E. W. Dahlgren, librarian-in-chief, whose counsel and assistance, coupled with their great experience, have been of the greatest possible value to me.

My object in the present paper is to give an account of the plan of this work, the manner in which it has been prepared and published, and especially of my own personal share in it—namely, the topographical map and the text dealing with the physical geography, which is so intimately connected with the map. I might, perhaps, call this paper, at one and the same time, a preface to the work and a criticism of it. I have thought it expedient to publish a preface in this way, because the preface proper cannot be printed until the entire work is completed and I am in a position to command a general view of the whole. My reason for printing this provisional preface—the final preface will be issued later on in a somewhat different form—is that students of geography may not be kept waiting for two years until the work is completed. With regard to the criticism, I am only too conscious of the defects in my work, and wish, therefore, to give here an idea of the *way in which* I worked in the field, and how, since my return, I have brought together and digested the material I collected. It is, however, a difficult task to write a criticism of one's own work; nevertheless, I will endeavour to be as just as I can.

The 'Scientific Results of a Journey in Central Asia, 1899–1902,' was planned to appear in complete form before the end of the year 1906. As far as my own purely geographical text is concerned, it will be ready to publish by the autumn of 1905; indeed, at the moment of writing, fully three-fifths of the whole is already in manuscript. In the prospectus which I printed in the beginning of 1903, a flyleaf of which was distributed with one of the numbers of the *Geographical Journal*, I undertook to prepare a map of my journey on the scale of 1:100,000 and 1:200,000, in a hundred sheets, making an atlas of two folio volumes, and this was to be accompanied by 800

pages of text, illustrated by 500 cuts and various smaller maps. The other scientific results, collections, and different series of observations were to be dealt with by specialists. The text altogether was estimated to fill four or five volumes, and the edition was to consist of 250 copies at the price of £15 sterling.

Before very long, however, I perceived that the limits appointed were insufficient. No change will, however, be made with regard to the dissertations of my colleagues; but in the case of my own purely geographical work, I am driven to the necessity of making a very appreciable addition: instead of one volume of 800 pages, it will extend to four volumes of about 2000 pages in all. The first volume, now published, contains alone the 500 illustrations promised, and each of the three succeeding volumes will be just as profusely illustrated, with the possible exception of the second. Similarly, the atlas will in all probability extend to 120 sheets instead of 100. Nevertheless, after consultation with Dr. Dahlgren and my publisher, Mr. A. Lagrelius, I have resolved not to raise the price, despite the fact that the cost of the entire work will be very materially increased; indeed, the 75,000 kronor granted by the Swedish Parliament will be insufficient to cover it. The price, therefore (£15), is unusually cheap for a publication of this character. In view of the smallness of the issue and the low price, I would recommend those who are interested, and desire to have a copy of the work, to subscribe without delay. My reason for mentioning this is that even before the preliminary announcement of the work, a great number of copies were already ordered. And it may not be altogether without interest just now, that the first two subscribers to be enrolled hailed from Japan, namely Count Otani and the Geographical Society of Tokio.

I will say but a few words with regard to the treatises of my colleagues, for the purpose of this paper is to deal more particularly with the geographical side of the work. Volume v. will consist of two parts, one containing the meteorological observations, the other the astronomical. The former is dealt with by Dr. Nils Ekholm, and will embrace two divisions—the first, the series of actual observations themselves, will be published at the end of the present year; the second, the scientific discussion, in the spring of 1905. This part of the work promises to be rather voluminous, for it embraces observations made three times a day over a period of six years, for the meteorological results of my 1894–97 journey are also included. Moreover, for a period of more than one year the observations are double; that is to say, one series was taken by myself whilst on excursions, and another series at my fixed headquarters. The tables will also give the latitudes and longitudes of the several places of observation, with the possible exception of those in the Eastern Pamirs, this exception being due to the fact that the cartographical material which I brought home with me

from those regions on the occasion of my last journey have not yet been reduced. Dr. B. Hassenstein had already made a beginning and drawn the outline of the map when, to the sincere sorrow of all who appreciate the cartographical work of the great Perthes firm, death put a sudden end to his labours. I have, however, reason to hope that the map in question, the Eastern Pamirs, will shortly be published in *Petermanns Mitteilungen*, possibly in time to allow of the requisite co ordinates being obtained to complete Dr. Ekholm's work.

I trust it will not appear presumptuous if I venture to hope that the meteorological material which I have brought home with me, extending as it does over such a relatively long period, and gathered as it is from parts of the world that are little known or, indeed, are absolutely unknown—that it may possess some real value, and fill a gap in our meteorological and climatological knowledge of the interior of the Earth's greatest continent. Dr. Ekholm's discussion may be expected to throw light upon several phenomena connected therewith; for instance, the occasion of the inconceivable violence and remarkable constancy of the east-north-east winds that blow in spring in the Lop-nor country and adjacent desert regions—winds which have had most to do with determining the configuration and physico-geographical and morphological features of that part of the continent; as well as to throw light upon the laws governing the not less constant westerly wind, which in winter blows throughout the whole of Tibet, and its possible connection with the monsoons.

The materials of my astronomical observations have been dealt with by Dr. K. G. Olsson, working under the direction of Prof. Dr. P. G. Rosén. Dr. Olsson has expressed himself as satisfied with the accuracy of the observations, and of the results which have been deduced from them. It is self-evident that the value of the 113 observations vary. The best are those which were taken at my headquarters, where I was able to repeat them several times; this enabled me to obtain also a valuable means of controlling the accuracy of my chronometers. Dr. Olsson's work, which will likewise embrace a scientific discussion of the material, is already three parts finished, and is intended to appear towards the end of the present year.

Vol. vi. will embrace descriptions of the collections I brought home with me. The first part of this, namely, Prof. Dr. Wilhelm Leche's account of the zoological collection, has already appeared. It consists almost entirely of skeletons and skins of mammals, but embraces only a very few specimens of reptiles, fish, and *Crustacea*. Small though this collection is, it may not be without interest, and the words with which Dr. Leche opens his paper may be regarded as an anachronism: "Only the most interesting of the forms brought home by Hedin are mentioned in Prjevalsky's account of his travels, but hitherto they have not been discussed by any zoologist." I grant that

specimens of the forms alluded to have already been brought home by Russian travellers; but if they have never been studied by a specialist, they might as well still be in the deserts and mountains of Central Asia as be put away and forgotten in the museums of St. Petersburg. Prof. Leche's essay will be accompanied by eighty excellent illustrations in the text, and by five copper plates representing mounted skeletons of *Camelus bactrianus ferus*, *Equus Kiang*, *Bos grunniens ferus*, *Ovis Ammon*, and *Ursus pruinosus*. Travellers who are trained zoologists as well will no doubt regard this little collection with a certain degree of contempt, and reproach me for not having taken greater pains to augment it. To any such hypothetical reproach I can only reply that zoology does not belong to my special field of labour, and that I made this collection more to gratify my own pleasure or fill an idle hour than with the view of satisfying the demands of the zoological specialist; and if I were maliciously inclined I might proceed to ask my critic a question or two about the geographical and cartographical materials he brought home with him when he was travelling for specially zoological purposes. In general, I have made it a rule to stick to my own special sphere of work, namely, geography and map-making, in which I am at home. The material, therefore, which I offer in vol. vi. is of necessity defective, and always occupied a secondary consideration in my regards. It is impossible for one man to be master of everything. It must also be remembered that the skeletons and other parts of my collections had to be carried thousands of miles through Asia, being day after day loaded up on the backs of camels and unloaded again, very often under accompanying circumstances of the most unfavourable character.

The same remarks apply to the botanical collection: it is very small, and was gathered by a "layman" who has no idea of botany, and plucked his flowers *en passant*. The collection, such as it is, is being dealt with by Prof. Dr. G. Løgerheim, who is now engaged upon it, though he has handed over certain sections to other specialists, e.g. the *Algæ* to Prof. Dr. Nils Wille.

The geological collection consists of about seven hundred specimens, and is being dealt with by Dr. H. Bäckström and other geologists. I have, however, thought it expedient, in my geographical account of Tibet, to mention briefly the varieties of rock I observed in crossing the several mountain ranges. As, however, the identifications rest solely upon a superficial macroscopical observation, they do not possess more than a general value, and require to be completed by the more minute microscopical investigations of specialists. A number of specimens of sand, and various kinds of soil and salt, have been examined by Prof. Baron De Geer, assisted by Mr. G. Aminoff.

To all these gentlemen, who have so readily and so disinterestedly undertaken to throw the light of their special experience upon the

small contributions which I have been permitted to make to the great whole of scientific knowledge, I desire to express herewith my hearty and sincere thanks. The reason I do not include amongst them the scholar who so kindly undertook to deal with the archæological material of my journey, namely, Herr Karl Himly of Wiesbaden, is that no thanks of mine, however deep or however heartfelt, can any longer reach him, for he died on June 1 in the present year, the same day that I received the first proof of his essay, "Die Ausgrabungen am alten Lop-nur." Heavy though this blow is to me, it is nevertheless small as compared with the loss suffered by Germany and science, for of sound sinologues we have not many, and of those we have, Himly was undoubtedly one of the most distinguished. I did not know him personally; I only knew him through our active correspondence since the year 1898, when he helped me in my investigation of the Lop-nor problem, and assisted me in the preparation of my monograph in *Petermanns Mitteilungen*, Ergänzungsheft No. 131; but I look upon him as an old friend. He was a quiet, industrious, conscientious worker, who had no love for self-advertisement, but was ever ready to place his learning, and his deep and thorough acquaintance with ancient Chinese documents, generously at the disposal of others.

When Himly died, the greater part of my archæological collection was in his hands, with the exception of the heavy sculptured beams, though of these I sent him photographs. From the letters I received from him, I can readily see that his work promised to be of the greatest importance and value, and that with the assistance of the Chinese manuscripts that I discovered at Lóu-lan he would have been able to shed light upon many hitherto obscure problems. Unfortunately, he did not live to complete more than an extensive introduction and the first chapter, which he entitled "Chinesische Karten der Westlande." I do not know whether he drew up any outline of the chapters that were to follow, but there is no doubt whatever that he had the plan of the whole clearly arranged in his own mind. I hope, however, that I shall succeed in finding a scholar to complete the work which Himly so ably began.* I venture to quote the opening words of his introduction, for they convey an idea of the importance of the problem he had to deal with: "Of the ruins of ancient cities which have recently been visited and explored by travellers in East Turkestan, those which Dr. Sven von Hedin brought to light in the supposed ancient bed of the Lop-nor have been not the least fruitful in their results for science. Amongst other things, he discovered tablets of tamarisk wood covered with Chinese script, similar to those which Stein dug out in 1899 at the

* I am glad to say that Prof. A. Cunrady in Leipzig has been kind enough to complete Himly's work. Prof. Dr. Hj. Stolpe in Stockholm will describe my collection of terra-cottas from Khotan.

Niya river; further, several written fragments of old papers of different kinds, and letters on wood, of the same kind as those illustrated in Stein's 'Preliminary Report.' On several of these tablets, wooden letters, and scraps of paper we find the name of the ancient kingdom of Lōu-lan. That this ancient state was situated on Lop-nor we know from one of its old names, *e.g.* Lao-lan-hai, or Lōu-lan-hai."

Yes, Himly's work would have furnished an historical and ethnographical proof that the solution of the Lop-nor problem at which I had arrived upon purely physico-geographical grounds is sound and definitive. Himly had already selected from the materials I placed at his disposal the manuscripts and other objects which he wished to use in illustration of his text, and they have been photographed by his brother, Captain Eugen Himly, and will be published, together with the completed text, in the 'Scientific Results.'

I now pass on to the atlas, the *pièce de résistance* of the entire work. My original map consists of 1149 sheets, the length of the actual red-lined itinerary on which amounts to nearly 1000 feet, though the distance actually travelled was over 6200 miles. The scale varies, being on the whole 1 : 30,000 to 1 : 40,000, and reproduces the morphological characteristics in the minutest detail. My field instruments were a chronometer and a compass; by the latter I determined the direction, taking numerous observations, sometimes as many as two hundred in a day, and by the former I measured the distance. I must add that I always kept a check upon the rate of movement. This method may appear very simple, but it has, at any rate, yielded amazingly accurate results. With help of this method, *i.e.* this topographical apparatus, I would venture, starting from any fixed astronomical point, to make a traverse to any other known point you please, and at almost any distance. In other words, I have the most absolute confidence in the accuracy of my method, *i.e.* on the assumption, of course, that the distance is always calculated with the greatest accuracy, and base-lines are measured every day for the control of the rate of speed or velocity. In general, the results obtained on land are better than those obtained on water, although the safest of all are those got in calm weather on stationary water. But when a river is used for motive power, the calculation of the distances is never so reliable, owing to the continual variation in the velocity of the stream, and the difficulty in most cases of measuring its amount with sufficient frequency. This is especially the case where the velocity is great, and the current carries the means of transport along with great rapidity. In general, the distance under such conditions tends to come out too short.

I cannot here give a detailed account of the devices I adopted for indicating the various different features of the country travelled through. All the land-maps of my journey will be published on the scale of 1 : 200,000, except that of the route from Kashgar to Lailik,

which is on the scale of 1 : 100,000. My original drawing is, therefore, so reduced in scale that a great part of the finer details are necessarily lost. This is, indeed, very much to be regretted, especially as several judges, including Lord Curzon, to whom I showed about a hundred of my sheets in Calcutta, expressed the opinion that the maps ought to be published on the scale to which they were originally drawn ; but, on the other hand, there are great difficulties, both practical and financial, in the way of issuing a considerable atlas on a larger scale than 1 : 200,000. It is, therefore, the maps of the Tarim river only that are issued on the scale of 1 : 100,000. At the same time, with the view of giving some idea of the methods I employed in depicting the features of the country I travelled through, I have included in the atlas a number of the original sheets in facsimile, selected from different parts of the interior of Asia. This will also afford the student an opportunity of comparing the original work with the map that has been constructed upon it. In this way my own hand-drawn maps, which took three years of strenuous labour and unintermittent attention, will not disappear entirely in the printed maps, but will also remain, at any rate in part, as evidence of the work I accomplished.

In the labour of reducing, reconstructing, and drawing for the purposes of reproduction, I have had the great good fortune to find exceptionally skilful and experienced colleagues in Major H. Byström and Lieut. O. Kjellström. As a model we have followed in this respect the large atlas, on the scale of 1 : 200,000, which Dr. B. Haassenstein drew to accompany the account of my former journey, and of which six sheets were printed on a reduced scale in *Petermanns Mitteilungen*, *Ergänzungsheft* No. 131. Owing to Herr Perthes' courtesy, I have been allowed to borrow this atlas for the time being. I think it but just to my colleagues to say that the results of their labours will bear comparison with the best work of the kind that has been produced outside of Sweden. A glance at the first sixteen sheets of the published atlas will convince the expert that my words are no exaggeration. Of these sixteen sheets all have been constructed by Major H. Byström, and twelve have likewise been drawn by him ; the other four are drawn by Lieut. O. Kjellström. In addition to these, twelve other sheets are ready, and will be published in the autumn, while my two colleagues, whose industry is as admirable as their skill, are busily engaged upon the rest. Owing to his long and great experience, Major Byström was able, as early as the summer of 1902, to draw up the plan of the entire atlas, to determine its size and the method of reproduction, as well as to select the many technical devices which are necessarily required in a work of the kind, and the atlas was then and there begun.

In addition to these sixteen sheets, which embrace my Tarim journey as far as Yanghi-Kul, the Cherochen desert, and my journey to Bostan-toghrak, we are now publishing six sheets in facsimile. The atlas

proper is estimated to contain about eighty-five sheets, fifteen or sixteen of which will be on the scale of 1:100,000, and all the rest 1:200,000. Meanwhile, with the view of making the cartographical material more accessible, as well as to facilitate a general view of the entire region traversed, we did at one time contemplate incorporating in the atlas a general map in four sheets on the scale of 1:2,000,000. But further reflection has convinced me that, in view of Penck's proposal to prepare a map of the entire Earth on the scale of 1:1,000,000, it would be more expedient to publish the general map on the scale of 1:1,000,000 and in sixteen sheets. Another advantage attaching to this change of plan is, that the substituted map would be drawn on the same scale as that which Hassenstein prepared after my former journey. The new general map would embrace the whole of the material used by Hassenstein, together with as much as possible of the results obtained by other travellers. In a word, it would reproduce *everything* we know down to the present date about the geography of Central Asia. For the preparation of such a map, which will of course entail incomparably greater expense and involve more labour than a general map in only four sheets, I hope to be able to draw upon the experience, as well as upon the collection of materials in the hands of Justus Perthes' Geographische Anstalt, for it is only there that a map of this magnitude could be produced. I should be glad to learn that the plan of a map on this scale meets with the approval and moral support of geographers, a support which may legitimately be asked for before such a costly step is finally taken.

Thus the atlas and general map together will make in all about 100 sheets. In addition to these, there are about a score of sheets in facsimile, forming an independent series, numbered with Roman numerals. These sheets are selected with the view of giving an idea of different types of conformation, with all the natural details that belong to them. The six sheets now issued reproduce in this way very different parts of the Tarim. From these, and in a still higher degree from those sheets which represent the mountainous parts of Tibet, the reader will be able to see to what extent the details originally incorporated have become lost in the process of reduction.

But there exists another practical reason for the publication of these facsimiles, namely, the hope that they may be of assistance to younger explorers who may follow after me. Moreover, I venture to hope, also, that my atlas may serve as a guide, which, although costly, will be practical and useful, to the first preliminary mapping of an unknown country.

In this connection I would also desire to express publicly my hearty thanks to Major H. Byström and Lieut. Kjellström for their very excellent technical work, and for the pleasure it has given me to labour in conjunction with them; for I have, of course, to superintend their labour and to be responsible for it.

It only remains that I should give some account of my own text, first indicating in a few words the way in which it is divided and arranged, and then adding a sentence or two by way of criticism.

The text will embrace four volumes—Vol. i. The Tarim River; vol. ii. Lop-nor; vol. iii. Northern and Eastern Tibet; vol. iv. Central and Western Tibet. The little vignette map is intended to give a bird's-eye view of the distribution of the geographical material.

For purely practical reasons I have written the original in Swedish: one naturally writes with greater freedom, as well as more rapidly, in one's own mother-tongue than in a foreign language. At the same time, I was fully convinced from the very beginning of the absolute necessity of publishing the work in one of the three great world-languages, and after consultation with Dr. Dahlgren I selected English, not only because it is the most distinguished, but also because it has the widest circulation, and consequently we might hope that the work would secure the largest number of subscribers in Great Britain, the United States, and India. My manuscript has therefore been translated, and I have had the good fortune to find in Mr. J. T. Bealby, B.A., of London, an excellent translator, almost as well versed in Swedish as in his native tongue, who, moreover, has had the advantage of a long acquaintance with my style, for it was Mr. Bealby who translated 'Through Asia,' and 'Central Asia and Tibet.' Mr. Bealby is, moreover, a man of great learning and many-sided culture, and has had considerable experience in translating for the *Geographical Journal*. I feel confident, therefore, that the English of the 'Scientific Results' does full justice to the original Swedish, and I owe Mr. Bealby many and sincere thanks for his conscientious and unwearied labour. With the view of guarding against possible misunderstandings on the part of the translator, I may add that I have myself read two successive proofs of the whole, comparing the translation word for word with the Swedish original, and I hold myself responsible for the matter in the fullest acceptance of the term, as well as for the numerical data, geographical names, etc., etc. Mr. Bealby has also read two successive proofs, and is responsible for the orthography and style of the English. Any errors that may have escaped our conjoint vigilance must be set down as misprints. Dr. K. B. Wiklund also read a proof of the first half of the first volume, but unfortunately was unable to continue owing to illness, and I have taken it upon me to complete his work.

By the express wish of Dr. E. W. Dahlgren, I applied to Dr. K. B. Wiklund, Lecturer in Finnish-Ugrish Philology at the University of Upsala, with the view of securing a consistent orthographical system in the writing of the geographical names, and found in him the first authority in that particular field that Sweden possesses. At a later stage Dr. Wiklund will himself explain his system; here it will suffice if I point out one or two of its salient features, which it will be

important, especially for English-speaking readers, to bear in mind. For instance, Dr. Wiklund writes *tesch* instead of *tj*, *desch* instead of *dj*, *ch* instead of *kh* (*sch* instead of the English *sh* and French *ch*), *gh* in words with open vowels, *g* in words with closed vowels, as well as in general reducing the vowels to conformity with the pronunciation employed for the language of East Turkestan in Radloff's Dictionary—that is, as far as it has appeared. Dr. Wiklund tells me, however, that in several cases he has not been quite consistent, but has varied his practice, especially in the employment of *e* and *ä*. He finds that my transcription of these sounds is erroneous—a consequence, in part, of my being a native of Stockholm, to whom the difference between *e* and *ä* is not very distinct. He also considers that it is in part due to the fact that I have often taken the unaccented syllable *a* for an *e*—a common mistake in the case of an ear that is not phonetically trained. He also suspects that I have sometimes mistaken an *i* for an *e*. For these reasons Dr. Wiklund has felt it expedient to depart from strict consistency, and has not written all my *e*'s as *ä*'s, for by so doing a number of *ä*'s and *i*'s would have been incorrectly transcribed. He has therefore confined himself to writing *ä* where he has been able to find the word in the dictionaries, and ascertained that in the book language of East Turkestan the vowel has the sound of *ä*. For instance, he has written my *besch* (= "five,") and *seksan* (= "eighty") as *bisch* and *siksän*, both to bring them into conformity with the literary language and to avoid the multiplication of dialectal forms. For the same reason he has often altered the genitive termination *-ne* into *-ning*, although in certain characteristic words we have resolved, after consultation together, to make no alteration. Consequently, in the text, as well as in the atlas, both these terminations will be found, to say nothing of several other genitive suffixes that are characteristic of the Lop country. In certain words we have not slavishly followed the orthography of the literary language, but have preferred to retain the dialectal differences. For instance, the word *jarsik* (= "river lagoon") we have often written *jasik*, *jarsuk*, and *jasuk*. It has, however, been very difficult to discriminate consistently between *gh* and *g*. The general rule laid down above is not, on the whole, difficult to follow; but, on the other hand, it is uncertain whether *i* ought to be regarded as an open or a closed vowel. For this reason we have written both *igis* and *ighis* (= "high"). But in the case of a word like Ugen-daria the uncertainty is even greater. "What is the value of *u* in this word?" asks Dr. Wiklund. "Is it the Swedish *u*, resembling the sound of *y*, or is it the European *u*? In other words, ought the word to be written *ugen* or *uglen*?" The question cannot be decided; accordingly, I have preferred to keep to *Ugen-daria*, the form adopted in *Petermanns Mitteilungen*, Ergänzungsheft No. 131.

Generally, Dr. Wiklund has abbreviated the long intervocalic consonants, though not always, because, as he justly observes, the

double forms *may* be found in the dialects : thus he writes *attam*, and not *atam* (= "my father"). With regard to the word *Muhamed*, it is sometimes written with a double *m*, although that is an incorrect form. In the second half of the first volume certain violations of the rules of the system as here laid down are entirely due to my fault, owing, as I have said above, to Dr. Wiklund's illness and my having to continue his work single handed before I had acquired complete mastery of it. The spelling *sogot* for *soghot* in two or three places is a pure mistake. I have preferred the old spelling *Ettek-tarim* instead of *Ätäk-tarim*, although the latter would have been more consistent. In the discussion at the end of vol ii., in which Dr. Wiklund deals with geographical names, as well as with the system of transcription adopted, any errors of this kind will be corrected. Small inconsistencies that we have been unable to avoid altogether are, of course, of less importance from the geographical than from the philological point of view.

I need hardly say that in the 'Scientific Results' I have used exclusively the metric system, as well as the thermometric scale of my countryman Anders Celsius, professor at Upsala; and it is not my fault if the conservatism of the English-speaking world makes these two systems less familiar than they ought to be to the readers of the book.

And now to come to my text. All I claim for my work is that it amounts to "Begleitworte zu den Karten;" in other words, it is an explanatory text to the atlas, and its contents are purely physico-geographical, forming a topographical, morphological, hydrographical, and orographical description of the regions traversed. The reader will in vain look for any new strokes of genius or epoch-making ideas of a similar character to those in Richthofen's 'China,' or Peschel's 'Neue Probleme.' What I am in a position to offer to geographers and serious students of geography is only a faithful geographical description, rather dry, but rich perhaps in new facts and geographical discoveries. For this reason I have arranged my text in diarial form, recording each day the observations made, so that in this way the text furnishes a detailed commentary, day by day and sheet by sheet, to the maps in the atlas. This has rendered my task easier and readier of accomplishment, and the connected study which, with the help of Supan's 'Physische Erdkunde' and certain other text-books, I made whilst the journey was in progress, is thus reproduced in my book in its natural order and sequence of development. Possibly this chronological arrangement will occasion the reader some difficulty, and make the 'Scientific Results' an unmanageable work of reference; and the fact that the first volume, now published, contains no index, is perhaps calculated to emphasize these drawbacks. This defect will, however, be made good in due season. The first and second volumes, which treat of the geography of East Turkestan, are so intimately connected that I thought it best to give them one common index or rather two indexes,

which will be printed at the end of vol. ii. The first, containing a list of all the geographical names that occur in the two volumes, will be prepared by Dr. Wiklund; the other, an index of the contents and matters of fact, will be compiled by Mr. Bealby.

The reader of vol. i. will no doubt be astonished at not finding a single quotation in its 512 pages. It is nowadays esteemed a merit to overload a scientific work with quotations of every sort and degree: they are a proof of wide reading and learning. I confess at once that I can lay no claim to either of these qualifications; and I trust the impartial reader will find excuses for me when I say that, having spent a large part of my life in travel, I literally have *not been able* to keep up with the progress and development of geographical study in other parts of the world, and still less with the faithful but laborious results of arranging and cataloguing which learned armchair geographers so unweariedly carry out. I willingly admit that it is with a certain amount of respect I turn over the productions of stay-at-home scholars; but I must say that I prefer a thousand times to turn over the great open book of Nature, and especially those parts of it which have not yet got stowed away in any library. Whilst engaged on my journeys, it will be perfectly evident that I have not many spare minutes for reading; and since my return home the preparation of my observations for publication has claimed the whole of my time, to say nothing of the immense amount of labour involved in controlling the whole, in replying to the innumerable questions of those who are co-operating with me, in keeping an eye day by day upon the preparation of the maps, and in reading through piles of proofs, and, lastly, in using my further "leisure" to continue my own proper work. Under these circumstances I have found it impossible to do anything in the way of comparative geography, having found quite enough to do to write down, without comment and without ornament, the bare story of my own independent observations. The comparative discussion I leave to scholars at home, whose time is not taken up with the actual work of exploration. And when it is remembered that I have always worked alone, without any European colleague or assistant, and that the materials which I have collected have often been brought together under extremely difficult external conditions (of which I have given an account in my book 'Central Asia and Tibet'), the reader will, I trust, be willing to acknowledge that I have tried to do my best. In the second volume, however, the reader will find a number of comparisons and quotations bearing upon the sandy deserts and their origin, as well as upon the formation and movement of the dunes, drawn almost entirely from the works of Russian travellers in Asia—works which are in great part inaccessible owing to the general unfamiliarity with the Russian language.

From what I have already said, the reader will see that I have not
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bound myself by other authorities, and have not slavishly followed the views and conclusions of other explorers, but have recorded my own independent observations, just as I made them, and give them for whatever they are worth. Direct observations always have a positive value; as for discussions about cause and effect, the reader can accept whatever he thinks well and reject the rest. Some of the theories I put forward may possibly appear too bold, but they embody, at any rate, my own convictions.

Vol. i. is entitled 'The Tarim River,' and consists of four principal sections—the Tarim River, the Lakes beside the Lower Tarim, the Cherchen Desert, and the Tarim Delta, divided into thirty chapters. In brief, vol. i. deals with the Tarim system from Lailik all the way to Abdal, together with that part of the great sandy desert that is situated between the lowermost Tarim and the Cherchen-daria. Vol. ii. is concerned with the Kara-koshun, the Kuruk-tagh, a part of the desert of Gobi, the desert of Lop, and above all the former Lake of Lop-nor and its history. This arrangement of the subject may perhaps strike the reader as incongruous, in that the description of the Tarim system is interrupted by the account of the desert of Cherchen. The reason is that I desired to discuss the desert lakes of the Tarim immediately after describing that river, for the two are inseparably connected, and this necessitated my giving an account of the *bajirs* of the desert of Cherchen in close connection with them, for the two phenomena, the lakes of the Tarim and the *bajir* depressions, are intimately associated. In consequence of this, vol. i. swelled out to such dimensions that there was no room in it for the Kara-koshun, which is, of course, quite as closely connected with the Tarim as any other of its lakes. To describe the Kara-koshun without reference to the Lop-nor problem would be absolutely impossible. I had, therefore, to abandon my original plan, by which vol. i. was intended to embrace the Tarim system and its terminal lake, while vol. ii. was to deal with the adjacent deserts and the problems they suggest. However, with the idea of furnishing a general view of the Tarim system, vol. ii. contains, first of all, a review of the entire river system, with illustrative maps in the text, as well as bathymetrical and other measurements.

Hydrographical specialists will probably be disposed to accuse me of dwelling on matters of too elementary a character, when I give the variations of the river at different seasons, the phenomena connected with its erosive energy, its alluvia, and so forth; but, as I have remarked above, I have written down my own observations, no matter what their value and significance, and they possess at any rate this merit—that they will at least confirm observations which have been made scores of times before.

Vol. i. is profusely illustrated. It contains 448 cuts in the text,

39 lithographic plates, and 17 maps and vertical sections. The autotypes consist for the most part of reproductions of my own photographs; in addition to them there are a number of drawings by my own pencil, which of course make no pretensions to artistic excellence, but all the same serve the purpose of illustrating the text. Of the cuts in the text, 95 consist of vertical sections or profiles through the Tarim and its tributaries, showing the depth, breadth, and velocity. Dr. N. Ekholm explains, in a couple of pages, the method he has employed for calculating the volume from the material thus supplied. From the observed velocities—that is to say, the river's fall, he has obtained also the means of determining the absolute altitudes, or rather the means of controlling the results furnished by the boiling-point thermometers, the aneroids, and the barometers. A special chapter of vol. ii. contains a list of absolute altitudes for the basin of the Tarim, and for defining the shape of the basin as a whole. These have been deduced by Dr. Ekholm from the absolute altitudes I have supplied to him.

The full-page lithographic plates have been executed by Lagrelius & Westphal of Stockholm, being reproductions of my negatives taken on Edwards's plates. All the large photographs were taken with a camera by Watson of London, and about a thousand of the small photographs on glass were taken with a Richard's Verascope camera. Both these cameras yielded excellent results; but for the future I shall fight shy of Eastman's Kodak, for it was only exceptionally that my Kodak yielded passable results. Fortunately, my supply of glass plates was so great that even in these four volumes I have found it impossible to use them all.

Perhaps it may be objected that in vol. i. I have introduced a number of pictures which have no direct bearing upon the text. This applies especially to the groups of natives, which, strictly speaking, are out of place there, for this work deals exclusively with the country, and not with the people. Nevertheless, I have not hesitated to print them, and for two reasons—in the first place, it will do no harm; and in the second place, it is precisely because the natives do not figure in the text that I have thought they might have a place in the illustrations. In vol. ii. I intend, unless the expense prove too heavy, to include a number of drawings I have made, illustrating racial types from Central and Western Asia.

The small sketch-maps in the text have been for the most part redrawn by Lieut. O. Kjellström in a very meritorious manner, and with praiseworthy industry. These small sketch-maps, as also the large maps in the atlas and all the autotypes, have been executed by the Lithographic Institute of the General Staff of the Swedish Army, the chief of which, Mr. A. Lagrelius, who is also my publisher, has rendered me the most disinterested and valuable assistance, both in

counsel and in deed, even with regard to the minutest details, for which I beg to thank him sincerely. The book is being printed by Messrs. P. A. Norstedt & Sons, under the superintendence of Mr. Carl Ramström, who has devoted to it his best attention. In the production of this book, I have laid it down as a fixed rule, that all the work connected with it should be executed in Sweden, so that foreign countries may have an opportunity of seeing what we are able to accomplish in this line here in Stockholm. At the suggestion of Prof. Supan and Dr. H. Wichmann, I add, as an appendix to this paper, one of the maps we are now publishing, the only difference being that in the atlas it is printed on thicker and more expensive paper. The sheet in question, Plate 10 in the atlas, has been composed and drawn by Major Byström from my original drawing, which was on a scale three times as big. The topographical features—that is to say, the sand-dunes—are drawn by Lieut. O. Kjellström. The most interesting sheet of the now published part of my atlas is, however, Plate 12. The explanatory text to this one sheet alone occupies eighty pages of vol. i., and is illustrated by four special maps of the lakes sounded, and three general maps throwing light upon the genesis of the region. I may perhaps be permitted, in a few words, to indicate the physico-geographical phenomena which have given rise to unusual and regular structure of this region, which is one of the most curious and interesting on the whole Earth. As the main stem and backbone, or rather as the principal artery, of this map we may with justice regard the Tarim, which is here flowing towards the south-east. On its left bank we have my headquarters at Yanghi-Kul, where my caravan spent the winter from December 7, 1899, to May 19, 1900. It was from this point I started on my two great excursions—one through the desert of Cherochen (the first two days of travel are shown on Plate 12), and the other through the desert of Lop; as well as the two shorter excursions I made to the lakes of Bash-Kul, Yanghi-Kul, and Gulme-Keti. Moreover, the map shows the first three-days' drift of the ferry-boat down the river in May and June, 1900, as also the routes of two canoe-trips undertaken from two fixed camping-places to the Karaunelik-Kul and the Ullugh-Kul.

By far the most conspicuous features on Plate 12, are the numerous elongated, and in part parallel, lakes lying close to one another on the right bank of the Tarim, and all of them fed by small canals from the river. According to the information I collected, these lakes number no less than thirty-five; but out of these I did not investigate more than six, a quite sufficient number, however, seeing that they are so like one another. Their dimensions, which are not very great, are shown in the following table:—

| Name. | Length in km. | Max. breadth in m. | Min. breadth in m. | Mean breadth in m. | Area in square m. | Max. depth in m. | Mean depth in m. | Volume in cubic m. |
|---------------------|------------------|--------------------------|--------------------------|--------------------------|----------------------|------------------------|------------------------|-----------------------|
| Bash-Kul | 15.9 | 2000 | 1000 | 1345 | 21,000,000 | — | — | — |
| Yanghi-Kul | 13.85 | 1508 | 965 | 1244 | 15,000,000 | — | — | — |
| Gulme-Kuti | 8.0 | 2500 | 1000 | 1662 | 13,794,000 | 7.0 | — | — |
| Karaunelik-Kul ... | 5.2 | 2000 | 3000 | 1125 | 5,850,000 | 9.4 | 5.61 | 32,800,000 |
| Ullugh-Kul | 7.35 | 3200 | — | — | 14,860,000 | 10.0 | 4.92 | 69,500,000 |
| Beghelik-Kul | 11.6 | 4150 | — | — | 30,000,000 | 11.0 | 3.67 | 110,000,000 |

I have endeavoured to prove that the origination of these lakes is one of the causes of the shrinking of the Kara-koshun, a process which has been constantly going on during the twenty-five years that elapsed between Prjevalsky's first visit and my last visit.

Another circumstance, quite as peculiar and unexpected as the regular configuration of the lakes, is the fact that they are very considerably deeper than the parts of the river adjacent, so that on the right bank of the Tarim there is a whole series of depressions stretching from north-north-east to south-south-west, the lakes thus lying at right angles to the river. The entire system resembles a branch with its leaves attached, each lake-leaf hanging on to the stem by a short stalk. From the table above, it will be seen that the maximum depth of the four lakes sounded increases downstream, that is from west to east, but that the mean depth grows less, and is smallest in the most easterly of the lakes measured, namely the Beghelik-Kul, which is situated outside of the edge of Plate 12. But this must be a pure accident due to the insufficient number of soundings taken. In the Beghelik-Kul I took soundings at eighty-eight points, or three points in every square kilometre. But the feature which stands out with the sharpest distinctness in this series of soundings is the extraordinary regularity in the relief of the lake-bottom, and for our present purpose that is the principal thing. For instance, we ascertained that the greatest depths in all the lakes occur near their eastern shore, and the contours gradually rise towards the west. The very first glance I took at these lakes led me to suspect that the relief of their several basins must be of this character. For the eastern shore of each lake is overhung by the steep (33°) leeward slope of a dune-accumulation—that is, a heaping up of individual dunes into a compound mass—but on the west or windward side the surface slopes slowly up to the crest of the next dune-accumulation, while over on the western side of it there is yet another lake.

With the levelling-mirror I measured the height of the dune-accumulation which separates the Karaunelik-Kul from the Toghraklik-Kulning-dashi (the last named, being cut off from the river, contained salt water), and found that its culminating point was 89.5 metres (294 feet) above the surface of the Karaunelik-Kul. Other

measurements convinced me that the highest crests have in general an altitude of about 90 metres (300 feet), and this may be regarded as the limit beyond which the dunes in this region do not rise. It is at this altitude that the tendency of the dunes to increase in height is counterbalanced by the wind's transporting power.

My journey across the desert of Cherchen, a journey of 177 miles in length, proved to me that these gigantic ridges of sand stretch diagonally across almost the entire desert all the way to the Cherchen-daria; and at the Eittek-tarim I found that they begin on the very bank of the stream, or on the extreme eastern boundary of the desert. It is, however, in the northern part of the desert that the dune-accumulations or sand-ridges are most powerfully developed. In the desert of Cherchen the sand is arranged in waves, presenting the same appearance as the waves of an ocean across which a hard and steady wind is blowing.

At first it struck me as strange that these sand-ridges in the extreme north of the desert should run towards the south-west, and then gradually incline towards the south-south-west and south, until upon reaching the Cherchen-daria they stretch towards the south-south-east, thus describing arcs of circles. But I believe I have discovered the cause why the sand-ridges assume these directions. The greatest difficulty was to understand how it is possible for the storms of inconceivable violence (60 miles an hour at the surface of the Earth) which sweep, especially in spring, across the country of Lop and the adjacent regions, can arrange the sand-accumulations in such a way that the direction of the wind and the crest of the dunes form an acute angle with one another, because the natural expectation is that the wind must of necessity strike the crests of the dunes at right angles. It is only in the extreme south of the desert, where the dune-accumulations stretch towards the south-south-east, that this necessary physical law appears to be fulfilled. There must, of course, be a special reason for the apparent anomaly in the northern part of the desert. Upon noticing carefully the orientation of the individual dunes, I found that their crests do lie as I expected them to do, namely, at right angles to the wind. The explanation I have to offer of the anomaly to which I have called attention is this: assuming that the strength and direction of the wind are the same throughout the whole of the desert, then the deviation of the sand-ridges from the normal—that is to say, their curved shape—is due to the fact that the mass of sand in the northern dune-accumulations is greater than the mass of sand in the dune-accumulations in the south of the desert, so that the dunes in the south travel faster than those in the north. The consequence is, that the winds in the northern part of the desert strike the long axis of the dune-accumulations at an acute angle. Of course the curves which these sand-ridges describe are not perfectly regular, but,

as a rule, the angle may be said to increase from north to south; for instance, in *bajir* No. 1 it is 28° , and in *bajir* No. 4 87° , or as near as possible a right angle.

In between these stupendous waves of sand, built up by the remarkably constant east-north-east winds, which bring their materials from the disintegrated and crumbling Kuruk-tagh, there exist hollows or kumatic valleys, *i.e.* chains of depressions, parted from one another by comparatively low thresholds of sand. Each such depression—some of them are shown on Plate 12—is called by the natives a *bajir*, and forms a small self-contained basin, with a clay bottom, and is surrounded by sand, steep on the east side, and with a slow ascent to the next crest on the west. The lakes on the right bank of the Tarim are nothing but *bajir* depressions of this character, which by pure chance have become filled with water. The chance in question is that in former times the Tarim flowed due east along the bed of the Kuruk-daria, and emptied itself into the ancient lake of Lop-nor, but subsequently changed its direction to the south-east, washing away incalculable masses of sand from the desert. And the river is still at the present day continuing its destructive work—that is to say, it is travelling farther and farther towards the right, towards the south-west, breaking down and transporting the projecting ends of the sand-ridges, pushing itself farther and farther into the desert, levelling it down as it advances. An excursion by boat along this part of the river is extremely interesting, and offers a succession of grand and picturesque views. Time after time the river-loops penetrate southwards deeply into the high sand; dune-masses, 300 feet high, shoot straight down into the water at an angle of 33° from the right bank. The question arises, How is it possible that the dunes can be so steep just there, where they turn their broken ends to meet the predominant winds, for one would naturally expect those slopes to be extremely flat? The explanation is simply this—that the river keeps moving incessantly towards the south-west. On the one hand, the wind labours to make the upper layers of the dune-masses flatter and flatter, while on the other hand, the river keeps breaking down the base of the dunes and washing the sand away, thus preserving their steepness; and as the river is the stronger its effects prove the more permanent.

The lakes, however, offer no hindrance whatever to the advance of the dunes. The table above shows that their capacities are insignificant as compared with the volumes of the dune-accumulations. In spite of the lakes, the masses of sand continue their slow advance towards the west.

One of the clearest proofs that the dune-accumulations do travel is afforded by the characteristic shape of the lake-basins. The same shape occurs again in each and every one of the numerous *bajir* depressions of the desert—that is to say, they are always deepest at the base of the

steep leeward face of the dune-masses which rise on the east side of the depressions. It is this part of the basin which has for the longest time been exposed to the effects of corrasion and deflation—that is to say, to the excavating activity of the wind. The western side of the bajir is less deeply excavated, because it is relatively quite recently that the lowest part of the windward side of the westward dune-accumulation was swept off it. The bajir depressions themselves thus travel westwards along with the dune-accumulations. Whilst the dune-accumulations themselves maintain their individuality, altering their form but very slightly and very slowly, the bases upon which they stand are successively renewed after the lapse of countless centuries. But by the time they reach the Keriya-daria and the route I followed across the desert from the extreme northern tentacle of that river to the Tarim in February, 1896, they have entirely disappeared. The cause of their disappearance is, of course, the less degree of regularity and constancy shown by the winds in the western parts of the desert as compared with those in the country of Lop. In the desert of Takla-makan I did not observe a single trace of the almost unparalleled regularity that characterizes the desert of Cherchen.

A great part of vol. i. of 'Scientific Results' is occupied with the problems which I have here briefly indicated, and I have endeavoured to support my views with numerous diagrams and photographs. Possibly some of my views may appear rather bold, but such as they are I leave them to my critics to deal with. Several of the problems discussed in this connection can only be definitely explained and illustrated in vol. ii., after I have described the relief of the desert of Lop. This desert is grooved by countless gullies, 1 to 3 metres deep, and separated from one another by long clay ridges called *yardangs*, extending in a direction parallel to that of the prevailing wind, which blows here from the north-east, though in the northern part of the desert it comes even from the north-north-east. In this part of Asia it is the wind which, with dictatorial power, controls the surface of the Earth and determines its configuration; not only does it heap up the drift-sand in a manner which for regularity is unparalleled in any other part of the world, and wear down the clay desert by corrasion, but it also causes the river to change its course, and the lakes to migrate; when the lake of Lop-nor became filled with drift-sand and fluvial sediment, the river shifted so as to flow into the basin of the Kara-koshun. Whilst this southern basin, which at the present time has a mean depth of barely 1 metre, is being filled up with solid material, the wind is continuing its excavating activity in the dry basin of the Lop-nor, and some day—I can predict it with almost mathematical certainty—the waters of the Kara-koshun will return there.

All I wished to say, however, is that vol. i. and vol. ii. are in every respect very intimately connected together, as indeed might

naturally be expected, seeing that they are both concerned with the Lowlands, or the vast basin of Central Asia.

At the present moment I am engaged upon vol. iii., which deals with Northern and Eastern Tibet, while in vol. iv. I shall describe Central and Western Tibet. The last route I have to describe is that from Leh to Kargalik *via* the Karakorum pass. These two volumes will have two common indexes, one of names, the other of subject-matter, printed at the end of vol. iv. With regard to the treatment in the two volumes about Tibet, I will merely say here that my main object is to give a description, in diarial form, of the geography of the region I travelled through, the descriptive text thus running parallel to the sheets of the atlas, and describing their features in chronological order. This detailed description will, however, be followed by a general geographical survey of the relief of the Tibetan highlands, their orographical system and absolute altitudes, their self-contained basins and lakes. I hope, from the material I have collected, to be able to give a tolerably faithful picture of the morphology of Tibet. Vol. iii. and vol. iv. will be very profusely illustrated, and will afford a good opportunity of studying Tibetan mountain scenery in lithographic pictures of exceptional beauty.

Finally, summing up what I have already said above, I ask for indulgence for the great defects which unavoidably attach to my work. Had I been able to take with me a large staff of scientific associates, as my friend and countryman Otto Nordenskjöld did, the results would have been more copious; but somehow I like to work alone, and I always have worked alone. Certain parts of my journeys, such as the excursions across the deserts and my advance towards Lhasa (Lassa), were not unattended by a certain amount of peril, and I should hardly have been justified in venturing upon such forced marches had I had the lives of colleagues to answer for. The escort of Cossacks which the Russian Emperor placed at my disposal were ready to lay down their lives for me, a degree of self-sacrifice which is seldom found in those whom in everyday language we call associates and comrades.

Mommsen has somewhere said, speaking of himself, that he was only a child playing with stones on the shore of the ocean of knowledge. What shall I call myself, then? A child who has not even yet seen the immeasurably distant horizon of that same ocean, nor done more than glance at its immense expanse. But the experiences and observations which I have made in the course of my toilsome marches towards that wondrous shore, I herewith offer to the students of geographical exploration, in the hope that my labours have not been altogether in vain.