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THE GEOGRAPHY OF THE WAR.*

By HILAIRE BELLOC.

In speaking upon such a subject as the effect of geography upon this war it would have been possible, and perhaps more interesting, for me to have dealt with the matter in its particular national aspect; and that particular and national aspect is, of course, for us in this room the problem, first, whether, for the first time in the history of the world, a naval power can in a critical duel with a military one permanently maintain the advantage with which it necessarily begins by its control of communications on the sea; secondly, whether a highly sporadic, separated heterogeneous system of dominions can survive a universal strain; and thirdly, whether seas so narrow as those which defend this country can really be dominated, as Captain Mahan presumed some years ago they could be, by a modern fleet.

That triple strategical and geographical problem is, of course, by far the largest issue in the present war, and the gravest geographical question which the war will test. But I shall not deal with it to-night because I am not competent to deal with it. No one can deal with that—the infinitely greatest issue before us in the effect of geography upon war—save a man who can talk with confidence upon naval warfare, which I cannot.

I am not even going to discuss the geography of the campaign as a whole in East and West. Nor, save in the briefest possible terms, to touch upon what may be the effect of geographical conditions upon the next developments of the war in the months just before us.

To tell the truth, I have confined what I have to say to a very small and a purely academic subject: to the campaign in North-Eastern France

* Royal Geographical Society, November 9, 1914. Maps, p. 96.

as illustrating certain very obvious and very elementary points in the science of Strategics. This war, upon which the happiness of all our children and our children's children must depend, I desire you to regard for the moment with a complete detachment, as though it were a mere object lesson in the elements of strategy; because the science of strategy (if indeed it is a science—for it can hardly be dignified by that name) is among the most interesting of occupations to which a man may turn in his leisure, and it is fortunate, in one sense, that the intelligence of the average educated person, who has not learnt anything of military history at school or at the university, has been awakened to this subject by the portentous events of this year.

The first question we have to ask ourselves on the campaign in France as an illustration of strategy is this: How does geography affect the war?

Nearly everyone reading history has wondered how geography affects war. He is told in history that a range of mountains, a river, or what not, have such and such a "strategic" value, but he is used to modern travel, under mountains, across rivers, without perceiving or testing these obstacles. His maps are political and arbitrary for the most part. He has no experience to guide him in the meaning of that phrase "strategical value." The modern civilized man has great difficulty in appreciating why geographical conditions still dominate war.

I interpret the words "geographical conditions" to mean those accidents in the varied surface of the earth which are not due, in any appreciable degree at least, to the action and the intelligence of man.

We all understand how a road, a railway, still more how a fortress or trench may interfere with or help the progress of a campaign or an action. But how do general geographical conditions affect them? I say again, that that question, which would seem so obvious to men living under simple and primitive conditions that it was hardly worth asking, does very often puzzle your civilized modern town-dwelling man. Yet it is true that geographical conditions affect a modern campaign almost as much ultimately as they can have affected a primitive campaign.

There are two main aspects of the way in which natural features affect the movements of armies. In the first place, because the variety of the surface of the earth makes it more easy for men to move in large masses by certain lines than by others; geographical conditions provide natural strategic *Lines of Advance*. That is the first point to seize clearly.

Secondly, because of the same variety in the surface of the earth certain districts or belts are more difficult for a body of men to traverse than the average, or than the mass of country before or behind them; as, for instance, a marsh or a wooded country will be more difficult to traverse than the open and dry country before and behind it. In other words, geographical conditions provide natural *Obstacles*.

It is important to remember that both the natural *Lines of Advance* which geographical conditions provide, and the natural *Obstacle*, transverse

to such lines of advance, which geographical conditions provide, are, especially in modern times, relative. There is nothing absolute about them.

It is particularly important to remember this truth in the case of the Obstacle. There is no obstacle which *cannot* be traversed by an army. There is no obstacle in the history of the world which has utterly prevented, at all times, the passage of an army. But when you consider the importance of time in strategics, when you consider that the factor of time is (other things being equal) the all-important factor in war, making for victory or defeat, then you perceive what an Obstacle means in strategy. An obstacle held by a lesser force will always be able to check an assault made by a somewhat larger force. To maintain that condition indefinitely would be impossible, and would certainly not give victory to the force defending. An obstacle only gives *time*, and only a certain increment of time, to a defending force.

Having proved these definitions, let me deal first with the *Line of Advance*.

There are two great geographical conditions which have determined the line of advance from the earliest times to the present day, and which continue to determine it. They will continue to determine it until, or if, traffic by air becomes general and feasible. Until men and munitions can be conveyed in large quantities through the air, geographical conditions will determine that your Line of Advance will always preferably be (1) over plain country, so long as it is not marshy, rather than over hills, and (2) will normally follow a river valley.

To this you may add another very important consideration, which is lost sight of, I think, too often when men are writing even military history. Your Line of Advance will also be determined by what is known in military terminology as *The Defile*.

A *Defile* is the English for "*defilé*," which is simply the French word for something "spun out"—for you know that all our military terms are borrowed from France or Rome. Where a large body of men advancing on a certain front is compelled to contract that front and to "spin out" its advance, or to retreat by a much thinner or congested line than it normally occupied, then it is said to "defile," or to "pass through a defile." For instance, a single bridge over a river is a "defile" in a military sense. A pass over a mountain, a causeway across a marsh, a road cleared through a forest, all these are defiles. Now your line of advance does not only depend upon your having flat country rather than hilly, it does not only depend upon your following a river valley, it is also strictly conditioned by these defiles. If your objective carries you through two lines of hills, you will try, of course, to follow river valleys up one side and down the other, but you will also be conditioned by the easiest passes across those hills. If your advance has later to negotiate, say, a marsh, you will seek a hard way across it, and your line of march will be traced, on the whole, from the first to the second of these

"defiles." When you ask why, even under modern artificial conditions, the river valley and to a certain extent the natural defile still thus determine a Line of Advance, the reason is the old Greek saying, that "the present is rooted in the past." Much the easiest way of conveying weights or large bodies of men in very early times was the broad stream that moved along of itself, that required no mending, required no attention. It also provided the first necessity of life, which is water. Man under simple conditions moved in his campaigns, as in everything else, along rivers. Upon these rivers, especially at certain *nodal* points (that is, points which are "knots," or meeting-places, where other forms of communication—as a tributary—cut into the river), there grow up markets, places of supply and places of exchange, which are towns. And when usual complexity has so far developed that roads begin to be made, the road comes into existence in order to link up these towns. Therefore the road will also follow, as a rule, the river valley. If this be marshy, the road will follow parallel to it at some distance on the higher ground. But it is still the river that determines the great roads, by determining the sites of great towns, and the most modern developments curiously show how in this instance our present is pinned to our past. The railway when it came was constrained to the river valley because it was constrained to linking up the great towns. So was petrol, for petrol was constrained to the road, and the road had come down the river valley even before the railway had. It so happens that in this campaign you have a peculiarly emphasized example of this elementary piece of historical strategics. A series of river valleys have formed not only the main but the only Line of Advance for the German invasion. The middle Meuse, the Sambre, the upper Somme, and the Oise have provided it; and on that line still largely depends the issue of the war in the west. It was the road, the canal, the railway following down that line of rivers which made possible the enormously rapid advance of the main German army upon Paris; the retreat of that army followed that same line as far as Soissons; and to this moment that line is the principal avenue of communications—that is, of supply of food, munitions, and all that is necessary to an army—from the bases in Germany to the German front in Northern France.

Of defiles, we have not in this campaign anywhere as yet a strong *natural* instance. We have some few in the Ardennes. But in the general strategics of the war, what with the open plains of the eastern theatre, with the multiple railway and road system of the western centre, defiles are hardly to be recognized.

Had the German plan included an attack by Alsace Lorraine you would have had excellent examples of defiles, but this front was left aside. There is one very interesting example of what is in practice a defile, and one on which a great deal of this war has turned, but which is not strictly speaking a geographical or natural defile, for it is only partly

produced by geographical, and partly by political conditions. That example is the defile between the Dutch frontier and the heights of the Ardennes, which gate was blocked by the fortress of Liège. There you had a little gut, a little "neck of the bottle," only ten or twelve miles wide, through which the vast advance of what is believed to be by some as many as 14 army corps—certainly more than 10 army corps—was organized by the Germans through the Belgian plain. It is only a defile because the Germans did not chose to violate an arbitrary political boundary —that of Holland. It is not a natural defile. There have not even been natural defiles in the shape of fords, because the one great obstacle that has been used in this war, the river Vistula, is not fordable at any of the points where the Germans attempted to cross it. We may say that so far as Lines of Advance are concerned this campaign has particularly illustrated their character by the necessity the Germans were under of using the Belgian plain rather than the Ardennes, and by the necessity they were under of following the middle Meuse, the Sambre, the upper Somme, and then the Oise, down to the neighbourhood of Paris, and to keep that line as their main line of retreat and communications on their retreat.

When you next consider the *Obstacle* you may say, with more justice than can be said of most of these generalizations, that there are five great strategical obstacles presented by nature for defence against the advance and five only. These are, in the order of their importance: 1. The river, in which you include the arm of the sea and the canal; 2. The Forest; 3. Hill Country; 4. The Desert; and 5. The Marsh—and of these by far the most important is the Marsh.

It is probably marsh which as much as anything will prove to have turned the history of the campaign in the west. Marsh along both sides of and behind the river Yser, between Ypres and the sea, which line and obstacle for some reason no one has been able to point out (I can only conclude it to be because things are as silly as they look), was attacked by the German commanders in an attempt to reach Calais. It is possible that the failure of that attack will determine the campaign in the west.

Let me very briefly recapitulate these five types of obstacle, because on understanding them will depend a great deal—a comprehension of this campaign or indeed any other.

A river is never a *permanent* obstacle, never has been in the history of any war which you can call to mind. A river is very valuable as a temporary tactical obstacle. An army will hold a river for a short time to cover a retirement, or better still while it is preparing a defensive position upon hills beyond it, but a river never has been permanently held for a long time, for the simple reason that man, in all stages of his development, has been able to cross a river fairly easily if there were no marsh upon either bank. He could always swim. He must at all stages of his development have discovered a quantity of objects by which he could float across water—the log, or inflated hide.

The Forest as an obstacle comes next in importance. It is a more serious obstacle for a reason which, like so many things concerned with the elements of strategics, modern people miss because they are used wholly to artificial conditions, and almost wholly to conditions of peace. There are very few men indeed who have been several miles across wooded country without a road or a path. If you try to get through the Ardenne country, for instance, from the valley of the Meuse to the valley of the Sémois, leaving the roads, you will not progress at much more than 1 mile an hour. Underwood, undergrowth, loss of one's way, lack of any provisions or food or people, hundreds of other conditions make the Forest a serious obstacle; and in practice, with the exception of certain types of clear and sparse woods—and even then for any force except cavalry—forest condemns an army to the defiles of its few roads.

Hills, the next type of obstacle, vary in almost every degree, and in the chief case are more formidable than forests. The Pyrenees have compelled all armies throughout the history of the world to three or four very narrow defiles: the Alps to perhaps a dozen. Strategically, only large ranges of hills are an obstacle. Tactically for use in battle, in action, a very small rise, especially to-day, is more valuable than a large one. The tactical value of such obstacles resides in the elementary principle of holding a crest against some one who, to attack you, must run up the slope before he can reach it. The crest of a rise has always obviously thus provided defensive opportunity.

The Desert has not come much into the history of campaigns. It may come into the history of this campaign in a most interesting fashion. When or if it is decided that a considerable Turkish force shall advance from the frontiers of Syria on to Egypt and against the obstacle of the Suez canal, we shall have a very sharp proof of whether or no modern conditions have greatly modified that most difficult of ancient obstacles —a stretch of almost waterless sand. Between Akaba and Suez you have only one provision of water in 150 miles. On the road by which Napoleon and every one else has marched between Syria and Egypt, the sea road, you have only three provisions of water in 120 miles. Whether the use of petrol traction or of a light railway or of any other modern mechanical invention will be able to overcome this difficulty for large bodies of men we have yet to learn.

Finally, there is the Marsh; and the only reason why writers have as a rule not wakened up to the all-importance of the Marsh, both in strategics and tactics, is the comparative rarity of its presence in Western and Southern Europe. It was the marshes in the West of Russia that determined the whole plan of the invasion of 1812, and the Marsh, which we thought would have no effect in this campaign of a highly civilized time and over a highly civilized territory, has reappeared with immense effect in the fighting upon the Yser. Probably under modern conditions nearly all obstacles are tactically opportunities for entrenchment.

A river is an opportunity for stopping a man for a short time while you entrench beyond it; the crest of a low hill is an opportunity for entrenching against the man who would run up the hill against you. *But in marsh you cannot entrench.* It is pretty well the only soil except granite in which you cannot. We have had a very interesting example of this in the last few days in Northern Flanders.

Having said so much, I would like to make one or two points in connection with this campaign which the map will show you. If you look at the map of Europe, you will see that all the centre is a mass of highland, and that to the north runs a great plain. Industrial and densely inhabited Belgium is the continuation of that plain, and it reaches down towards Paris, the centre of the life of the French people. You will perceive that the high-road for armies trying to reach Paris exists, and has nearly always existed, upon that line of invasion through the flat country. The next point to note after this great northern plain is to the south of the hills, the long east and west river valley of the Danube, offering peculiar facilities for the passing of troops from east to west by modern railway communication. The people living in central Europe have therefore a singularly good opportunity for fighting both those fronts east and west, and that especially under modern conditions.

Next there is a valley of invasion leading directly from that northern plain right on to that essential Paris: it is the valley of the Oise. If the invasion comes round south of the Ardennes then there is against Paris another valley of invasion, that of the Marne. Finally note this very interesting point. The German peoples have one parallel line of rivers after another to act as obstacles transverse to an invasion of their country. It is a singular combination of geographical circumstances in favour of the enemy. The Vistula on the east is backed by the Oder. On the west you have the Meuse and then the Rhine, and then the Ems. We must not exaggerate the value as an obstacle of a river, but such a succession is formidable, while there is no river valley leading into the heart of Northern Germany to counteract this succession of river valleys, obstacles against an invasion into the heart of modern Germany. Map No. 1 shows relief by contours and tinting, with the principal towns and railways. Paris, note you, is necessarily the objective of any invasion of modern France, and observe with what singular ingenuity nature has arranged a Line of Advance. There is the Oise. Hardly has that ceased when you have with the Somme and the Sambre a line leading you to the Meuse, and there to the bases of German provision upon the Rhine and behind the Rhine. It is a direct line of advance save for the rather deep gorge between Namur and Mezières, and it is a line which has accompanying it the main railway and a main road. To that line the German invasion has been pinned, and the German retreat also with its communications. See how the towns run in a series along that line—Liège, Namur and St. Quentin, Compiègne, Paris. The next thing you see on the

map is the way in which the Belgian plain is a road of advance for the German armies if they were to go through the north at all. The country of the Ardennes, below that plain on the map, the great triangle to the south, is not only highland, but highland of a very difficult character. There was indeed for some years a school of strategists who believed that the Germans would attempt invasion through the Ardennes, and this scheme was generally called the "Ardennes March." People used to discuss whether it was possible or no. It was possible of course, a modern army could get through, but to debouch from the woods on the map across the rivers Meuse and Somme would have been difficult, progress would have been slow, and advantage would have been taken at once of the invader's difficulties then. It was so fairly obvious that the Ardennes march would not be undertaken that many critics were ready years ago to prophesy that it could not be. I remember doing so myself in a public print, and laying it down that the Ardennes march could not in reason be undertaken by the enemy. What they could do was to advance in upper Lorraine; though it is marked as highland it is easy going and has great roads and a railway system attached to it, but it was supposed to be blocked by the French barrier fortresses, before it was discovered how easily modern fortification falls to the march of the howitzer.

There is also an easier line of advance up the valley of the Moselle and through into Luxemburg and Sedan, but hardly with room enough to deploy any very considerable force, so when the German Government said, as they did say to our Ambassador, that it was *necessary* for them to go through the Belgian plain, they were talking sense strategically, even though morally they were talking nonsense—just as if I were to say that I cannot take your watch if you button up your coat. If they wanted to destroy French power they could not destroy French power on the front Verdun—Belfort, therefore they had, they said, to violate the general principles of international morals, and cross the Belgian plain. Before I leave that head, let me point out that though this is the main avenue of advance dictated by nature on to Paris, there is yet a secondary avenue which is very important. It runs from the Oise to the Somme, up on to Brussels, and then from Brussels eastward through Louvain, linking up of no particular series of rivers, and is not a geographical but a purely artificial development due solely to human energy. You had your great town in Brussels, your great town in Paris; and the railway sought over the easiest country the shortest line of least resistance between them, so it left the Oise altogether.

An inspection of the map will show you the way in which those river valleys have produced the political centres which roads exist to link and which armies march through. Look at all that line of towns from Mons down the Oise to Paris. Note how all the names which you are familiar with in this campaign are right on that line, and note

further how, with very few exceptions—Rheims is one—the main towns are thus strung along the river valleys. The whole defence of the Rhine depends upon a line of the same sort, and there is a point well worth emphasizing which those who have not gone into military history are sometimes at a loss to understand—why towns thus determine the march of armies. It is not only the political importance of a town as an objective—the fact that when you have captured a capital you have put political pressure upon your enemy—it is also that the town is a *depôt*. The great town contains resources of provision which an army can use; shelter, which is very important; the rolling stock of railways; petrol. More than that, the great town provides you with all sorts of opportunities for obtaining every commercial necessary. It is a market: it is an economic centre with the machinery for controlling currency as well. Notice another very interesting point. The great town has never been destroyed even in this campaign. It has not *paid* the enemy to destroy it. There is one further point this campaign may develop before it is over, and that is whether the great modern town can resist. We have had no test of that, and I think opinion is still wise to be in doubt, holding its judgment between two extreme theories. As we are living in a very large town it is just as well to know what those theories are. One theory is that your very large urban agglomeration is an easier prey to an organized army than a smaller one. Being chaotic, unco-ordinated, a dust of humanity, an unprepared target of large size, it is an easy prey. The other theory is the exact opposite of this, the extreme view that a large modern urban population, really determined to prevent occupation by an enemy, though it would suffer enormously of course, would yet probably succeed in preventing such occupation. I incline to the first of these two, because I do not see what your great modern town is going to do against long-distance artillery. It seems to me you could reduce it just as you could a smaller place and just as thoroughly, and it is morally weaker than your smaller town, for it is less co-ordinated. At any rate, towns not only mark the line of advance, but they also are those depôts by which armies must march.

Finally, it is the river systems which, as I have said, give you the great modern railways. To show you how true it is of this campaign look on the map at the railway communication of the German front ever since that front was pushed back to the line of the Aisne. The line of the Aisne runs through Champagne, and the line along which the Germans entrenched themselves was just behind the river from Noyon past Soissons at Berry-au-Bac. The line up the Oise is their main line of communication; the other parallel with the Aisne itself is their secondary line of communication. You should also note, because it is of importance, that there is a subsidiary line going along the valley of Suippe river, and not reaching quite to the Meuse, which feeds the whole German front. Now the importance of noting those three railway lines thus marked,

is that you may be certain in all the future developments of the campaign no force will long stand without a railway parallel to its line and behind it. The German stand along here has been a stand along a line which has railways to feed the army parallel to it and behind it, and my reasons for thinking at the present moment that the German armies in the east are not going to stand permanently on the Vistula, but more probably nearer the frontier, is that on the Vistula they have no railway communication parallel to and behind their line, whereas they have such a line near their eastern frontier, and the importance of good railway communication parallel to your line and just at your back is this, it carries munitions to your heavy artillery. You can hardly work heavy artillery at all—hardly deliver a sufficient amount of shell to do the work you desire it to do—unless you have railway aid. You know, for instance, that the Germans lost a great deal of their heavy artillery just between the East Prussian front by Osowics, although they had one railway leading *to* Osowics, and they lost it because they had no *parallel* railway to maintain their line before the fortress. If you look at the modern map of Europe, you won't get a defensive position in this campaign which has not got a parallel railway to serve it. Those are the two lines of German communication, and for these the fight went on from the middle of September to the present moment. There was a perpetual attempt for the French to get round to these railway communications from the west, but the German superiority in numbers was always too much for them; the Germans pushed the French back from the neighbourhood of the railways perpetually, until at last the line reached the sea. As you see, our present defensive line, which runs north and south, is a long way from being able to attack the main line of German communications; and short of some collapse, which is very unlikely, I think, all the German line along the Aisne will be able to retire at its own time and at leisure by its two main lines of railway. The line through Luxemburg is rather more in peril, because the forces here on both sides are small; a reinforcement of the garrison of Verdun, if the German army eventually began to retire on a stroke from Toul, might cut that line, but the line at St. Quentin, I fear, there is now no hope of cutting; by that I think the mass of the enemy can always retire in safety.

I will try and show you how the Vistula and the San determined the whole battle in the Eastern front. All along the San and the middle of the Vistula, the two forces, Austro-German and Russian, faced each other. The front was absolutely determined by the rivers, and the only place where there was a chance of deciding things one way or the other was at Warsaw, and if the Germans had got Warsaw before the Russians had come out it would have been a battle for the two rivers alone. As a matter of fact, round about October 20, the Germans were beaten in front of Warsaw, and that led to the retirement of their whole line; but the rivers still determined that line.

A still more interesting example of even a little river making a vast tactical difference as an obstacle is the Ourcq.

If you want to understand how Von Kluck got away by that magnificent march of his and saved the whole of his army, you must note how he used the Ourcq. Von Kluck had come down the valley of the Oise, to the neighbourhood of Senlis. The mass of his force was here. His left was reposing on the Oise. That was on the anniversary of Sedan, and he had in front of him the 6th French Army and the British contingent, and still retreating before him the 5th French Army. Those units represent roughly the superiority in numbers which he had over the force in front of him, between him and the fortified zone of Paris. It was just at that point, on September 3 and 4, he discovered, whether by spies or by aircraft, that Joffre had hidden behind the fortified zone of Paris six corps, 240,000 men.

When Von Kluck had got as far as Senlis, having driven everything before him, this reserve of 240,000 men behind Paris suddenly threatened his army. Combined with the British contingent and the 5th and 6th French armies, it would not only have been larger than Kluck's, it would have been right on the flank of it; now thus faced with superior numbers in front of him unexpectedly at the decisive time and place, Von Kluck "took counsel," as Cæsar says of Severus, "with his own great soul," and he did an amazingly daring thing. He said to himself, "If I retreat, which is what all the text-books would tell me to do, back up towards the valley of the Oise, I shall carry back with me the whole of the German line, and I shall be the man who will be remembered as having caused the campaign to fail." He would not do that. He took the infinitely more audacious and terrible resolution to do as follows: to change direction, in itself a very lengthy and difficult process, and whereas he had been marching south-west to turn south-east, at right angles. In doing so he marched right across the front of the sixth French army, the British contingent, and the fifth French army. He marched to join the Prussian army next upon his left, and combined to break through the French lines somewhere on that line, hitting in the neighbourhood of Provins and breaking through. It was a perilous experiment, and on the night between September 5 and 6, while he was in what the French call "En flagrant dèlit de marche," Joffre went and saw French and proposed the counter offensive for the next morning. The counter offensive was taken all along the line on September 6, and Von Kluck was within an ace of disaster. But he put all his best troops to protect his rear and flank along the valley of the Ourcq. I do not know whether any of you know it. It is a beautiful little ravine in the neighbourhood of Meaux. He crowned all the heights of the ravine on the west side with his best troops and told them to fight against what would be gradually increasing and at last overwhelming odds, until his main body had got away. They fought so well that they took several French guns and some prisoners, and held that line for over forty-eight hours, while the main

body crossed the Marne and pelted away northward with the British contingent and the French army after them. The whole thing had been so cleverly done that the mass of Von Kluck's army got away with very slight loss in guns and men. There you see what is meant by the obstacle of a river properly used.

The tactical use of a slight rise of a range of hills you have very well illustrated in the positions which the Germans took up on the Aisne mountains, about 90 miles, when that great retreat was over (see map No. 2). The map shows the forest of the Argonne; along the river Oise is the main line of German communications; filling in the angle at Compiègne, is the end of the line close by Noyon. There is a little forest called the Forêt de Laigue. All the bit just north of Soissons is a range of chalky hills about 300 feet high. Beyond that to the east there are two light swells of land not more than 100 feet above the water-level. There was evidently at first some hesitation on which of these two swells the Germans would stand. They dug their trenches along that plateau, then crossed the river at Berry, and then carried the trenches on eastward in front of Rheims, and so along that swell of land to the Argonne, and those trenches in the main they have been able to hold ever since, but only because they were able to check the pursuit by the line of river here—the Aisne. That gave just the time to complete what was probably already a fairly prepared position—an excellent illustration of the way in which a slight rise is a formidable tactical position of defence.

Of forests one has little to say save in the case of the Argonne. The wooded land in all the advance on Paris is confined roughly to a few spots: the advance misses them. Taken as a whole, the attack on Paris from the north did not bring in the strategical, and very little brought in the tactical, importance of forest. But there is one forest in the western field of war which does most singularly illustrate the value of wood, and that is the Argonne.

The Argonne has probably saved hitherto at least one German army. The Argonne ends the great defensive line across Champagne and makes perpetually difficult the combination of the German armies across Champagne for 90 miles. The Argonne is a low ridge of clay about 300 feet above the plain on each side, and it is only crossed in three places by road, here, here, and just out from the top of the map there. It is only crossed in two places by railway; one that goes from Rheims to Apremont, and the other from St. Ménehould to the great fortress Verdun. In history you know it has played a great part. During the great retreat of the German army in Argonne the Crown Prince was foolish enough to lose the main road across the Argonne from St. Ménehould to Verdun. His headquarters were at St. Ménehould, and he was at that moment investing Verdun. He fell back as far as Mont Faucon, with the result that the only road which he commanded, and even that he did not thoroughly command, was the middle road through the woods, and for

possession of that road the fighting has gone on ever since with very close trench work in the woods to the south and north of it. You are always hearing of the wood of La Guerre—which is to the north of the road, and of the wood of La Chalade—to the south of it.

I will close by showing you (see Map 3) what has determined the last phase of the war and may possibly prove the turning point of it altogether —that great example of the use of marsh tactically in modern warfare, the valley of the Yser. For the town of Ypres the British contingent is just now fighting hard (see Map No. 3). Through Dixmude to the sea runs the canalized water which now bears the name of the Yser (though the true Yser runs a little further to the west). Note the modern artificial tactical point, the railway, which is largely embanked above the marshy country. To see how marshy that country is, every one of those fine lines is a more or less broad water-ditch. I know that country by heart and I can put it in this way—there is no ditch there of all those thousands which a body of men could cross without artificial means. You see that labyrinth of water, and what an obstacle it is. No one can tell who ordered that march on Calais or why. The strategical way to re-open the road to Calais, to "uncover" the whole of the sea coast, was to attack in force near La Bassée. If the enemy had massed all his men at La Bassée he might have got through. But somebody ordered the march along the sea coast, and the attack was made between Dixmude and Nieuport, right on the marsh over a front of about 12 miles. In that attack, which has now finally failed, the enemy certainly threw away the equivalent of an army corps. He certainly did not lose less than forty thousand men hit or caught. It was an impossible task.

They tried it in every form. They tried it first of all in the seizing of two bridges; they managed to get those two bridges at an enormous loss of life; they next took this re-entrant angle, when the Belgians, caught between the fire on either side, fell back: they pontooned the part above Dixmude and got over. After fighting eleven days some of their advanced posts just touched the railway line, and there, just as the effort was exhausted, all this country was flooded. It is easy to say so after the event, but many critics were saying it, myself among them, during the action *the thing could not be done.* The marsh was too much of an obstacle. Why it was attempted to force it at all with all that mass of waterways beyond has never been guessed—on our side, at least. Perhaps the answer was what is so generally the answer in human life, that a thing is as silly or even sillier than it looks. That attempt to overcome the obstacle of marsh was due to a political miscalculation and not to a military order, and I can only pray that further political miscalculations of the sort may continue through the rest of the campaign.

The PRESIDENT (before the paper): It has seemed to your officers that we could not begin the session better than by asking Mr. Belloc, whose weekly

articles most of us have followed with interest and profit, to tell us something more to-night about the field of war in the west. For many years I have watched Mr. Belloc's literary career with particular interest. For in whatever he has written he has shown in a very remarkable way a genius for geography —for bringing home to his readers not in hybrid, so-called scientific, terms, but in classical English, the controlling features of the regions he has wandered in. Whether it has been on the road to Rome, in the heart of the Pyrenees, among the skirts of the Algerian Atlas, or along the Roman roads that pierce the familiar wilds of Sussex Mr. Belloc has made me see over again things-seen, and I am confident, therefore, has enabled his less-travelled readers to form vivid and true impressions. For his present task he has the additional and singular qualification of being a veteran of the French army as well as an ex-member of our own Parliament.

Sir THOMAS HOLDICH (after the paper): So clear and so fascinating has Mr. Belloc's lecture been to us that I think no military officer can possibly quarrel with his conclusions. I have very little to say and absolutely nothing to criticize. But if there is one part of his lecture which appears to me a little more unconvincing than another it is this, that he expressed an opinion that the conditions of modern warfare have in no way altered the relations of geography to the incidents of a campaign. Now, I think that rather remains to be proved. We have learnt lately to see armies drawn out under quite different conditions to what they were in the days when we were taught our military duties. Instead of one army hunting another under most picturesque circumstances through wide stretches of country until the two met, and (more or less by means of information obtained by cavalry scouts) one side out-manœuvred the other, we have now two long lines drawn out across the country, extending for hundreds of miles, in which it appears that many of the old principles of strategy must be entirely lost. These armies, as they gradually progress forward, do not hunt for narrow openings or take particular account of obstacles. They move straight on, and, if they can, they move straight to their front. Whatever natural geographical obstacles may be in front of them they have to take as they come, and they succeed in dealing with them without recourse to any particular lines of advance which would offer easier methods. We have seen that very well exemplified in the Eastern area of this war where the Russian advance in one long line has not been, so far as we know, thwarted by conditions of marshland—the particular conditions to which Mr. Belloc has referred as the most difficult of all to deal with. They have apparently not been deterred by those conditions between the Vistula and Warta rivers, although I recognize that a terrible disaster (for it was nothing else) overtook the Russian armies through the existence of marshland somewhat earlier in the campaign elsewhere. But certain campaigns are still carried out under more or less historic conditions. What Mr. Belloc has referred to as obstacles still obtain, and we still have to deal with them in smaller campaigns. For instance, on the frontier of India, we are always hunting for what he calls defiles, *i.e.* narrow openings, and we are always following more or less the lines of streams and rivers in order to make our way from the plains of India to the great plateaux of Asia; but in considering modern conditions involving millions of men, I contend that the difficulties presented by geographical obstacles are to a great extent absorbed in the general advance of long lines. I regret rather that Mr. Belloc's modesty (or perhaps want of time) has prevented him from dealing with the larger geographical problem connected with the sea. I should like to have known what he considers to be the ideal conditions, for instance, for the landing

of an enemy on an alien shore—what is the geographical nature of the coast-line which offers greatest facilities for invasion? We know that the existence of defiles or narrow outlets on the sea is just as important as it is on land. We have only to think of what the conditions of things now is as regards, say, the Straits of Dover, or Kiel canal, or the Suez canal, to be quite well aware that the great object of naval strategy is to cover those most important defiles; but I am not at all prepared to enter upon a subject which more especially belongs to naval administration. I would only suggest that we geographers should watch as well as we can what happens during this war, and connect in our own minds the geographical conditions which Mr. Belloc has pointed out to us with events as they occur; and particularly would I call your attention to the geographical features of the existing political boundaries of European States, because I think it is more than possible that ere long they may be considerably changed.

Prof. LYDE: May I venture, first of all, to say I think Mr. Belloc gave us a characteristically interesting and stimulating lecture; I say characteristically, because whatever he lectures on, or writes upon, "a Road to Rome" or a "Book of Beasts," is always interesting and stimulating. He has left to-night a little corner I should like to trespass on, the question of climate. I would like to make two suggestions to you about climatic control in this war. The first is simply to remind you that in the next three or four weeks you may have a significant comment on the fact that Russia won Siberia by transport over snow. The other is in the form of a question. How far do you think an army that lays enormous importance on entrenching itself in the most ingenious caverns is going to prosper when the iron grip of a Continental winter settles down on the European plain? [Prof. Lyde then referred to the results of the origin and environment of the Prussians and the military organization which had been forced upon them.]

The PRESIDENT: The hour is so far advanced I will not ask anybody else to take part in the discussion. We have had a most interesting evening. We are greatly indebted to Mr. Belloc for the way in which he has crowded so much into the short space of time at his disposal. I think the fact that remains most in our minds is the importance of marshes in a campaign. I have always felt with regard to means of transport that, as a rule, we fail to realize how much roads are directed by the existence of marshes wherever a country is ill-drained. This is an important consideration in tracking the Roman roads, though doubtless another reason for their keeping to high ground was that they could better see their enemies on either side.

I think the only criticisms that have been made on Mr. Belloc to-night have been that he did not cover the whole field of naval as well as of military strategy, and that he did not go deeply into the question of Eugenics as affecting Prussian militarism which Prof. Lyde has so vigorously put before us. I am not sure whether Major Darwin is here, but even if he is I will not at this moment ask him to enter into that very complicated subject. I will move a very hearty vote of thanks, which I am sure will require no seconding, to Mr. Belloc.

PORTUGUESE EAST AFRICA BETWEEN THE ZAMBEZI RIVER AND THE SABI RIVER: A CONSIDERATION OF THE RELATION OF ITS TECTONIC AND PHYSIOGRAPHIC FEATURES.*

By E. O. THIELE, M.Sc., F.G.S., and R. C. WILSON, B.Sc., F.G.S.

INTRODUCTION.—The plateaux of Eastern Africa throughout practically the whole length of the continent are traversed by one of the great tectonic zones of the Earth's crust. This zone is in general marked by a line of fracture and dislocation in contrast to the great fold lines of crustal movement, which have affected some of the other continental masses. Suess (31), Gregory (11), and others have drawn attention to the great rift-line of Eastern Africa, which has had such a profound influence on the surface features of that region. The area here considered lies to the south of the Zambezi river, far to the south of the great rift zone, but it is traversed by the continuation of the same tectonic line.

The authors, during the past three years, have been conducting a mineral survey in the territory controlled and administered by the Companhia de Mozambique, the work being still in progress. They have thus had a good opportunity for studying the geographical features of that region. Their observations, taken in conjunction with those of others in Rhodesia, Mozambique, and Nyasaland, suggest some broad generalizations in addition to the special observations concerning the district described.

There is no doubt that many important surface features have been largely determined in this region by fractures and earth-movements, but it is not always easy to decide what share is due to tectonic forces, and how much should be attributed to general erosion, guided and influenced by rock texture and structure. Nevertheless it seems clear that tectonic forces have had a dominating influence throughout the part under review.

1. GENERAL DESCRIPTION.—The region described comprises part of Portuguese East Africa south of the Zambezi river. Along its western frontier it extends from about 16½° S. lat. to the Limpopo river—in lat. 22½° S., being contiguous with Southern Rhodesia throughout that distance; roughly about 400 miles. The boundary lies in the vicinity of the meridian 33° E., save towards the south, where it takes a south-westerly trend. Throughout a great part of its course it follows a distinct geographical feature. The coast-line is somewhat shorter, and extends south from the mouth of the Zambezi to 22° S. lat. The area of the territory is estimated at 65,637 square miles, about half of which lies at an altitude of less than 500 feet above sea-level. Most of the remainder lies at an altitude of between 1000 and 2000 feet, but the isolated block of the

* Royal Geographical Society, March 19, 1914. The figures in brackets in the text refer to the bibliographical list at the end of the paper. Map, p. 96.

Gorongoza mountains and numerous parts along the frontier rise to over 5000 feet. Though large areas are often inclined to be monotonous, the scenery in the mountainous regions is bold and picturesque, and often wild in the extreme. The whole of the country lies within the tropics, though towards the southern margin; the climate is therefore hot, but there is a much more marked seasonal change than in regions of the same altitude nearer the equator. Few parts are as much as 200 miles in a straight line from the sea coast, and as the prevailing winds for a great part of the year are from the south-east, they bring coolness from the more temperate parts of the Indian ocean. Even the low coastal region is quite pleasant for at least six months of the year, but in November and December, when the hot season commences and the time for the rains approaches, the shade temperature frequently rises to well over 100° F.

Much of the hill region, however, has a pleasant healthy climate for the greater part of the year. Though the days are hot, the nights are usually cool, and often cold. In the months of June and July, at altitudes above about 3000 feet frosts are common, the temperature often falling several degrees below freezing-point. There is no reliable meteorological information for the greater part of the territory, and though some parts, especially in the Sabi valley, are rather dry, most of the region has a good rainfall ranging from over 20 up to 50 inches in the mountainous regions. There is, therefore, a large extent of well-watered country, possessing numerous fine permanent streams. The most significant feature concerning the rainfall is that the greater part of it falls during about two months of the year, when all the stream courses become powerful torrents. Stranded flood *débris* has been frequently noted 30 to 40 feet above low water. This annual rush and scour, especially on steep slopes, must have a much greater erosive effect than in regions where the rainfall is more evenly distributed throughout the year.

The whole region supports a good growth of vegetation. Forests, though often somewhat of a thin and open character, extend almost continuously throughout the country. There are, however, some extensive treeless belts on the plains of the coastal region. On the whole, the country is very well timbered and possesses some areas where there is a dense tropical forest. There are also large tracts of jungle, which are the result of a custom of the natives, extending over a prolonged period, of deserting their old farms, and breaking new ground by clearing the forest. The old farms rapidly pass into the state of a jungle of scrub and thornbush. The trees are mostly deciduous, and as the dry season advances they rapidly lose their leaves and pass into a state of rest till the approach of the rains, but a noteworthy feature is that they burst into leaf before the first rains occur, though the country is still in a most parched state after months of the dry season. Many of the flowers also seem to anticipate the rains in the same way, and spring starts apparently under the influence of increasing heat, but without the assistance of the expected rains. The

chief economic product of the forests so far, has been rubber from the natural vine, *Landolphia*, which is found over wide areas.

One feature of the vegetation which impresses itself on the traveller, much to his hindrance, is the rank growth of grass in many parts, commonly over 6 feet in height, and often much taller. This has a geographical bearing also, for after the advance of the dry season, usually about September, extensive fires commence, which during the next two months extend throughout the greater part of the territory, save where the densest and moistest forest belts occur. In rocky regions, the effect of these annual fires must prove an important factor in cracking and splitting the rocks. The detonation can often be heard during the course of a fire, and fresh fractures have been noted after the fire has passed by. The bare surface which is left behind is thus exposed to the full force of the torrential rains, and on steep slopes must suffer accordingly.

The country is on the whole fertile, but the white settlement is at present restricted to a narrow belt immediately adjoining the railway line from Beira, *viâ* Maçequeçe (Massi Kessi), into Rhodesia, and also to a much less extent, it is found along the hot but fertile lower Zambezi valley. Outside these relatively small regions there are vast tracts of country sparsely occupied by natives, and where the only method of communication is by kaffir paths, which in some places have been widened, and cleared sufficiently to allow of the passing of the Portuguese machilla or hammock.

2. The geographical features fall into certain well-defined divisions, which will be considered separately under their respective headings. They are as follows :—

(*a*) The Frontier zone.
(*b*) The 1000 to 2000 feet shelf.
(*c*) The Sunklands.
    (1) The Zambezi basin.
    (2) The Sabi basin.
    (3) The coastal lowlands.
    (4) The Urema belt.
(*d*) The Sheringoma plateau.

(*a*) *The Frontier Zone.*—The region here considered stretches over a north and south direction for over 300 miles. It follows approximately the eastern edge of the great Matabeleland plateau of Southern Rhodesia, several blocks of which extend easterly for short distances into the Portuguese territory. These are the Nyowamba and Boandwa mountains of the Barue, Venga and Vumba of Manica, the Shimanimani mountains and the Spungabera highlands of Moribane and Mossurise respectively.

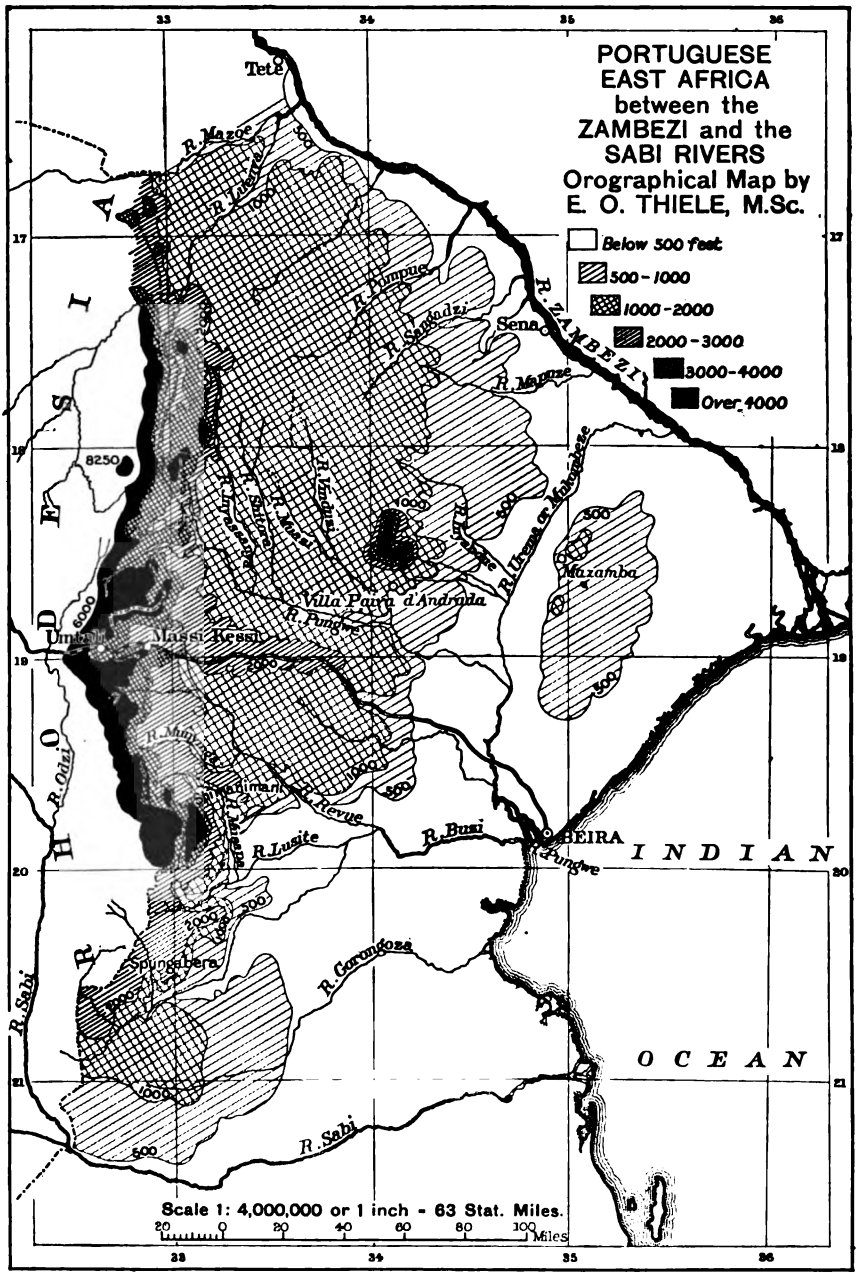
This is one of the most interesting parts of the country, for the tectonic features find striking expression in fault scarps and dislocated drainage lines. It is not the present watershed, though the highest points of the Matabeleland plateau are on this zone, rising to over 6000 feet, and one point near the source of the Pungwe is as much as 8000 feet. The major

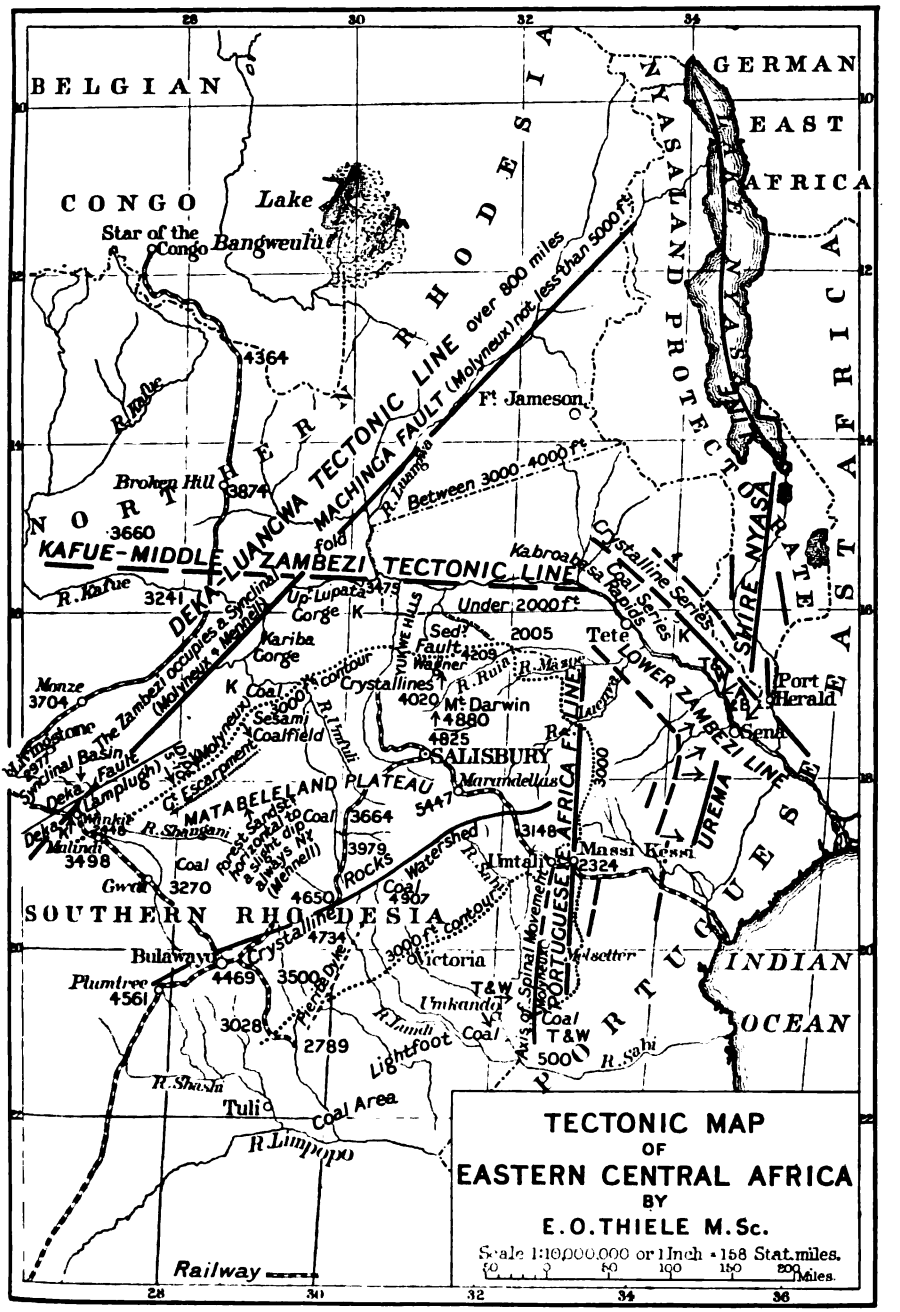
fracture runs almost true north, approximating to the 33rd meridian, and is well defined over a distance of about 200 miles, ranging from about 17° S. to 20° S. It would appear to be interrupted both in the north and the south by transverse fractures connected with the sunklands of the Zambezi and the Sabi. Minor parallel north and south fracture lines are also well developed, both to the east and west of the main line, but their north and south extension is more limited. The country drops suddenly to the east from altitudes of about 5000 feet to an extensive shelf only about 2000 feet above sea-level at the base of the scarp, and sloping away gently in an easterly direction to about 1000 feet.

In the middle portion a number of streams from Rhodesia cross the zone transversely through notches and passes, changing from wide open valleys of gentle grade on the high veldt to rapid rocky descents and falls till they reach the lower shelf, where their course is more gradual again. Some of the larger streams have cut deep gorges well back into Rhodesia—particularly the Lusite and the Pungwe. Several important streams follow the direction of the fracture line for considerable distances—notably in the northern and southern regions. In the north the course of the Gairedsi, an important tributary of the Luenya, coincides with the direction of the fracture line for about 70 miles. While in the south the Harom, a tributary of the Lusite, flows through a profound gorge along a north-and-south fault line bounding the western side of the Shimanimani block. The course of the Sabi-Odzi valley in Rhodesia is bounded on the east for at least 80 miles by a marked fault scarp, which is to the west of the main line. Many, if not all, the passes and river notches in the frontier zone are along transverse fracture or fault lines.

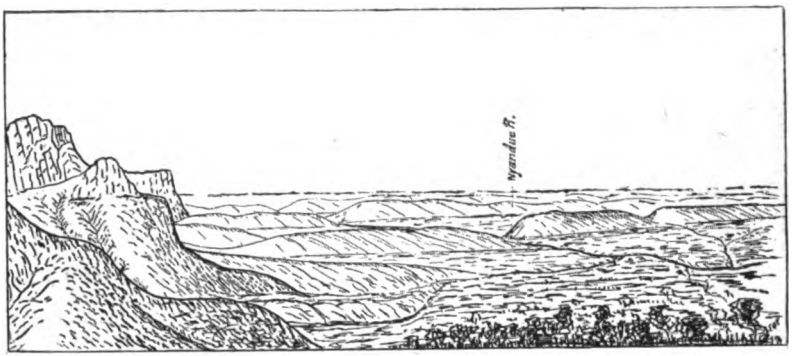
The Lusite crosses the frontier to the south of the Shimanimani block, where a well-defined fault or series of faults occurs, near the boundary of two distinct geological formations—a non-foliated series, consisting chiefly of sandstones to the south, and highly sheared quartzites to the north. The Musapa river crosses the same quartzites to the north along a fracture line. The Upper Munyinga notch occurs along the contact of a sedimentary series with the foliated granite, of the ancient crystalline series. Some of the other valleys have not been sufficiently explored in this part of their courses to give definite evidence on this point.

While considering the frontier zone, the several blocks of the high plateau of Rhodesia, which extend easterly beyond the main tectonic line for distances of 10 or 12 miles, call for some special remarks. We have not had an opportunity of examining the Nyowamba and Boandwa mountains of the Barue, but in Manica, two imposing mountain masses, Venga, 5550 feet, and Vumba, 4950 feet, respectively, rise steeply to nearly 3000 feet above the surrounding country. They both rise abruptly on all sides but the western, where they are joined by a ridge of slightly lower altitude to the main plateau. A striking depression, 6 to 8 miles wide, lies between these two masses. It contains the headwaters of the Revue and several

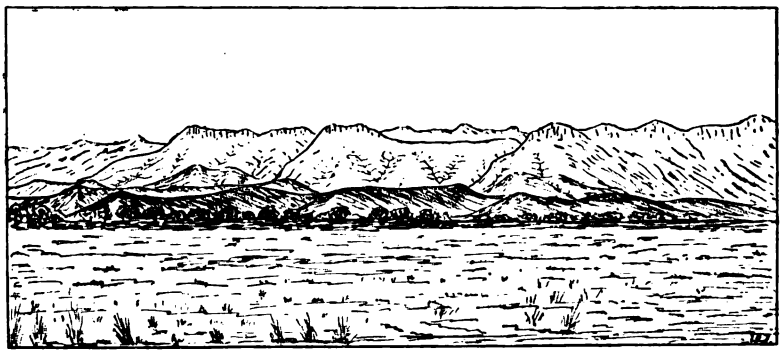




of its tributaries. The depression, however, terminates on the west in blunt ends, caused by steep slopes, which rise to the Rhodesian plateau. The Beira-Mashonaland railway follows the southern side of this basin along the Munene valley, climbing up to a continuation of the same valley at a high level at Umtali, the ascent being over 1000 feet in a few miles. The rocks of the basin consist mainly of a fractured zone of softer schists; while the mountain masses are granitic, but difference in rock texture



NORTHERN FACE OF GORONGOZA MOUNTAINS AND RIDGES DUE TO PORPHYRY DYKES CROSSED BY THE NYANDUE RIVER, LOOKING WEST-NORTH-WEST.

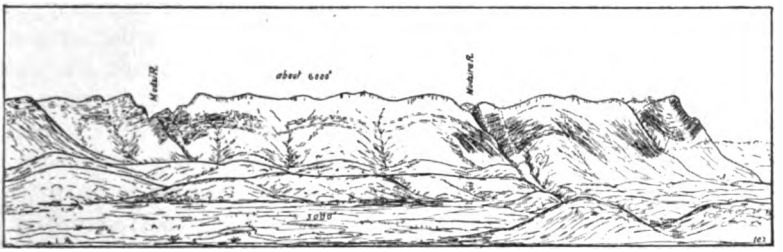


SOUTH-EAST FACE OF SHIMANIMANI MOUNTAINS AND LOWER RIDGES DUE TO FAULTING, FROM LUSITE LOWLANDS, LOOKING NORTH-WEST.

affected by erosion alone does not appear to be sufficient to account for the basin. The schists pass into Rhodesia, and the abrupt step at the head of the Revue valley traverses them. Vumba has an abrupt face to the east and south, where the rocks at the lower level are also granitic; so that it would appear that differential movement has also been a factor.

The next important block is that of the Shimanimani mountains, about 50 miles to the south of Vumba. Here the evidence of block faulting is clear, both geologically and physiographically. The mountains form a

rugged massif nearly rectangular shape, rising to over 6000 feet. It is about 20 miles long from north to south, and between 5 and 6 miles wide. It is bounded on all sides by fault scarps, which rise abruptly from 2000 to 3000 feet above the surrounding country. The rocks of the massif are mainly ancient sheared quartzites of the Swaziland system. Much younger sedimentary series are faulted against them on the west, and partly on the south. Foliated granite lies to the north and gniessic rocks mainly to the



EASTERN SCARP OF SHIMANIMANI MOUNTAINS, FOLDED AND FRACTURED QUARTZITES WITH VALLEYS ERODING ALONG FRACTURED LINES. MABATI PLATEAU IN THE FOREGROUND, LOOKING WEST.

(*From Photos and Sketches.*)

SHIMANIMANI MASSIF AND MABATI SHELF FROM SHIRUMA HILLS, LOOKING SOUTH-WEST.

(*From Photos.*)

east. The Harom river (20, Leverson) flows south along part of the western face, through a profound gorge. Several parallel strike valleys, the Mafumosi, the Merere, and the Little Musapa flow southwards for short distances, in high-level valleys in the massif. All drop over imposing falls before reaching the lower country. The first two have eaten precipitous and practically impassable gorges for some distance back to the present site of the falls, but the Little Musapa drops over the edge of the fault scarp. Two important streams descend over the eastern scarp, along old fracture lines—the Mudzi and Mudzira. A small but

interesting shelf, known as the Mabati plateau, adjoins the eastern edge of the Shimanimani massif.

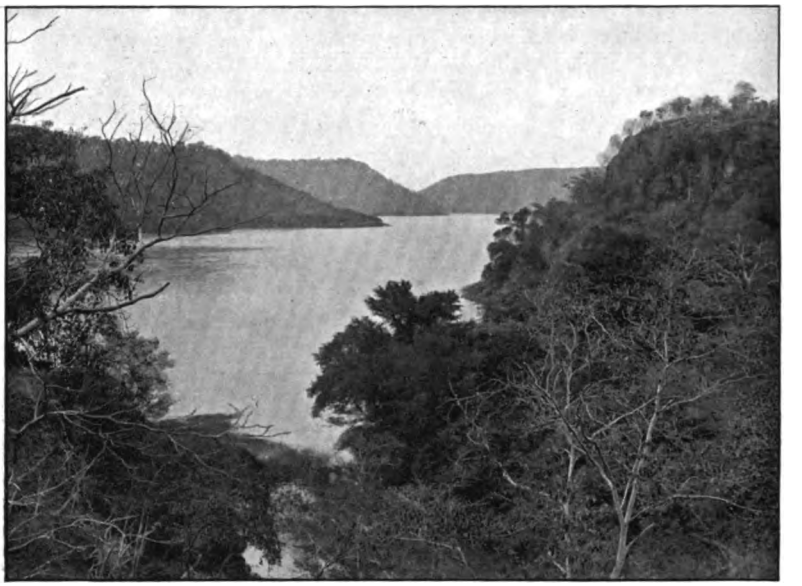
It is overlooked on the west by the precipitous scarp of the Shimanimani mountains, rising fully 2000 feet above it. It has a steep drop to the north to the Musapa valley, and another to the south, both of which are fault lines. Along its eastern side is the deep, comparatively straight gorge of the Musapa, nearly 2000 feet deep, which probably follows a fracture line. The surface of the plateau lies at a general altitude of about 3000 feet. It is a pleasing, open, grassy area with shallow valleys of mature type in contrast to the deep gorges which are cutting back into it on the north and the south. It represents a small dislocated block of an ancient peneplain, so placed that rejuvenated streams are attacking it on three sides. It is difficult of access, but when it is reached it forms a delightful camping-ground, and convenient base for the exploration and study of the eastern portion of the Shimanimani mountains, whose precipitous scarp here reveals some interesting structures and important transverse fracture lines. The struggle for supremacy of the streams descending over its rim is well shown by a marked case of river capture, resulting in the present head of the Imkatuku having been diverted from its original course northwards to join the southern drainage.

The Spungabera Highlands.—This area is traversed by the frontier to the south of the Shimanimani massif. It forms part of the south Melsetter plateau of Southern Rhodesia, which extends across the frontier into Portuguese East Africa, and, geographically, it should be considered as a whole. The frontier line has here no relation to the surface features. The region is a very fertile one, possessing a good climate and rainfall, but its present inaccessible position and lack of adequate communication with the main railway line have retarded the development which it deserves. Geologically it is quite distinct from the rugged mountainous region of Shimanimani, consisting mainly of a much younger sedimentary series of somewhat uncertain age, associated with extensive intrusion of doleritic and other igneous rocks, to which the area largely owes its fertile soil.

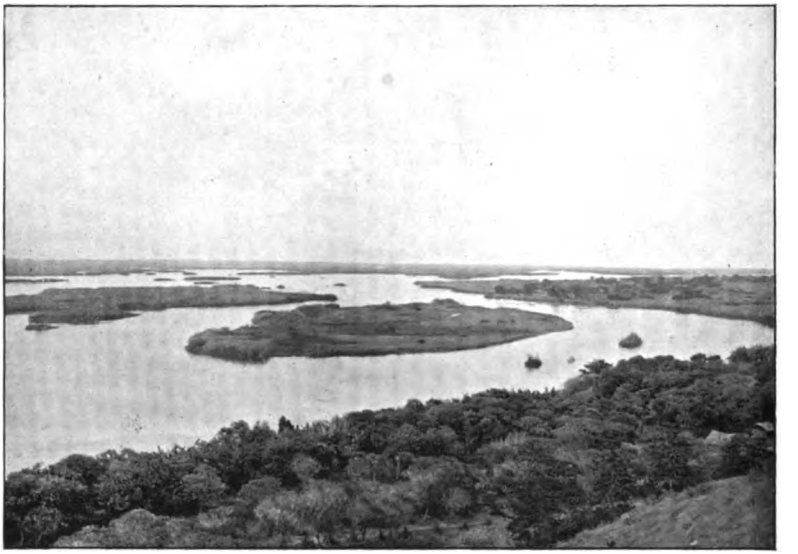
Its surface may be described in general as a somewhat broken plateau, deeply dissected by relatively narrow steep-sided valleys from 1000 to 1500 feet deep. The highest portions of the region rise to well over 3000 feet, and most of it is over 2500 feet. It is bounded on the west, overlooking the sunkland of the Sabi and lower Odzi valley, by a well-defined fault scarp, 1500 to 2000 feet high. The northern boundary is not clearly marked, the country gradually rising to the main part of the Matabeleland plateau. On the east it abuts in part the western scarp of the higher Shimanimani massif, and in the Spungabera region it extends more easterly towards the Statonga range, ending against crystalline rocks. On the south it overlooks the great sunkland of the Sabi, dropping by a well-defined step of nearly 1000 feet, this line again marking a geological

SHIMANIMANI PASS, 4500 FEET, UPPER MUSAPA RIVER, LOOKING EAST. QUARTZITE ROCKS.

UPPER MAFUMOSI VALLEY, 3000 FEET DEEP, AND FALLS, SOUTH-EASTERN PORTION OF SHIMANIMANI MOUNTAINS.



LUPATA GORGE, ZAMBEZI RIVER, THROUGH VOLCANIC ROCKS, LOOKING EAST-SOUTH-EAST.



ZAMBEZI RIVER FROM TAMBARA, BELOW LUPATA GORGE, LOOKING SOUTH-EAST.

boundary. Thence southwards, the frontier traverses a great sunkland across the Sabi river to the Limpopo, a distance of about 150 miles.

(*b*) *The* 1000 *feet to* 2000 *feet Shelf*.—This area covers a wide extent of country amounting to nearly 20,000 square miles. It is about 100 miles wide, and is bounded on the west by the well-marked frontier scarp and plateau blocks just described. On the north it is bounded roughly by the sedimentary rocks of the Zambezi basin, and its southernmost extension ends along the south-west to north-east fault line of the Morungwezi-Buzi valley, but a branch of the coastal lowlands breaks across it a little to the north along the Lusite valley. The eastern edge is on the whole well defined by a sudden drop to the lowlands of 800 to 500 feet, but in northern Gorongoza and in the Sena district the change is less abrupt. It however follows closely the geological boundary between the ancient crystalline rocks, of which it is composed throughout its entire area, and the sedimentary series of the Zambezi basin: it is noteworthy, also, that the line coincides closely with a narrow zone of basaltic hills and ridges for a distance of more than 100 miles.

The general features of the area show clearly that the whole region is a huge dislocated block of a vast peneplain, part of which is now at a much higher level on the Matabeleland plateau. Evidence of the ancient dislocated valleys was described when dealing with the frontier zone. As the edge of the shelf is approached towards the lowlands, the rejuvenation of the streams becomes more marked; practically all descend to the plains through deep rocky gorges over numerous rock bars, rapids, and small falls. The rock bars persist right to the edge of the plain as a rule. The entrenched valleys are naturally less marked as the western side of the shelf is approached, but practically throughout the whole area the struggle to adjust a new grade is very active, most of the rivers flowing over very rocky channels with only occasional quiet pools. Most of the area is well watered by numerous permanent swift streams, save in the northern portion of the Barue, where they are intermittent, but nevertheless active during the rains.

The two most important rivers are the Pungwe and the Revue, both of which flow across the grain of the country in a south-easterly direction. The major fracture lines in the territory are north and south, and along the frontier zone there are also transverse fractures of varying length, in general between east and north-east in direction. The strike of the foliation planes of the crystalline rocks shows great local variation, but its prevailing direction lies between north and north-east. The general direction of the main-drainage, therefore, shows no relation to the above features, and would appear to be a consequence of the slope seawards of the eastern portion of the Matabeleland plateau. The tributary valleys as a rule also cross the grain in all directions, though, occasionally, local influence of structure is shown. The Lusite valley towards the south of the region is an important stream, but hardly belongs to the shelf, for it

enters the country from Rhodesia, south of the Shimanimani massif near the apex of a wedge of the lowlands, caused by faulting, bringing a tongue of the sunklands close to the frontier. After traversing a short but rocky canyon-course in the frontier zone, it emerges on to the plains at a point less than 50 miles from the frontier. Several of its important tributaries, however, belong to the region under discussion. The most interesting of these is the Musapa river which has a remarkable Z-shaped course. Its history has been markedly influenced by some of the important fractures and dislocations which have affected so many of the features of the country. It rises in Rhodesia at an altitude of over 5000 feet, and follows a more or less south-easterly course as an open high-level valley, coinciding in part with the western fault line of the Shimanimani block for a short distance. It then turns easterly through a narrow rocky gap, near the northern end of the Shimanimani mountains and next follows a rapid descent of several thousand feet through a wild and rocky cleft to the base of the mountains continuing easterly over a rocky channel, but at a less steep grade, entrenched in the shelf along one of the transverse fracture lines along the northern face of the Shimanimani block.

Its next change is a sudden turn to the south, to the east of the Mabati shelf. Its course here is a rocky gorge 1500 to 2000 feet deep along probably one of the minor north-and-south fracture lines, till it suddenly emerges on to the sunkland of the Lusite trough. Thence south-easterly till it joins the Lusite, it flows over wide sandy plains less than 500 feet above sea-level. Double capture influenced by earth-movement appears to have given it the present course.

The remaining chief feature of the shelf zone is the existence of isolated blocks, ridges, and inselberge. Some of the smaller of these features can easily be explained by differential erosion on rocks of varying texture and durability; but in the case of some of the larger blocks this explanation alone seems inadequate.

By far the largest and most striking of these isolated masses is that of the Gorongoza mountains. They lie near the eastern edge of the shelf to the north of the Pungwe river, forming a huge block rising steeply on all sides to nearly 6000 feet above sea-level and over 4000 feet above the surrounding region. Its shape is roughly that of a triangle with its apex truncated, the base being to the south. The greatest length is from north to south, amounting to about 20 miles, while along the southern base it measures about 15 miles. Its slopes and heights form a very rugged and precipitous piece of scenery. Its altitude is sufficient to ensure a copious rainfall, which has induced the growth of dense forest on its southern and south-eastern slopes and valleys, and also feeds numerous fine permanent streams, which descend by extremely rough courses often over picturesque waterfalls. Exploration is therefore difficult and arduous in this region. The geological features are important when considering the origin of this mountain mass. It is entirely composed

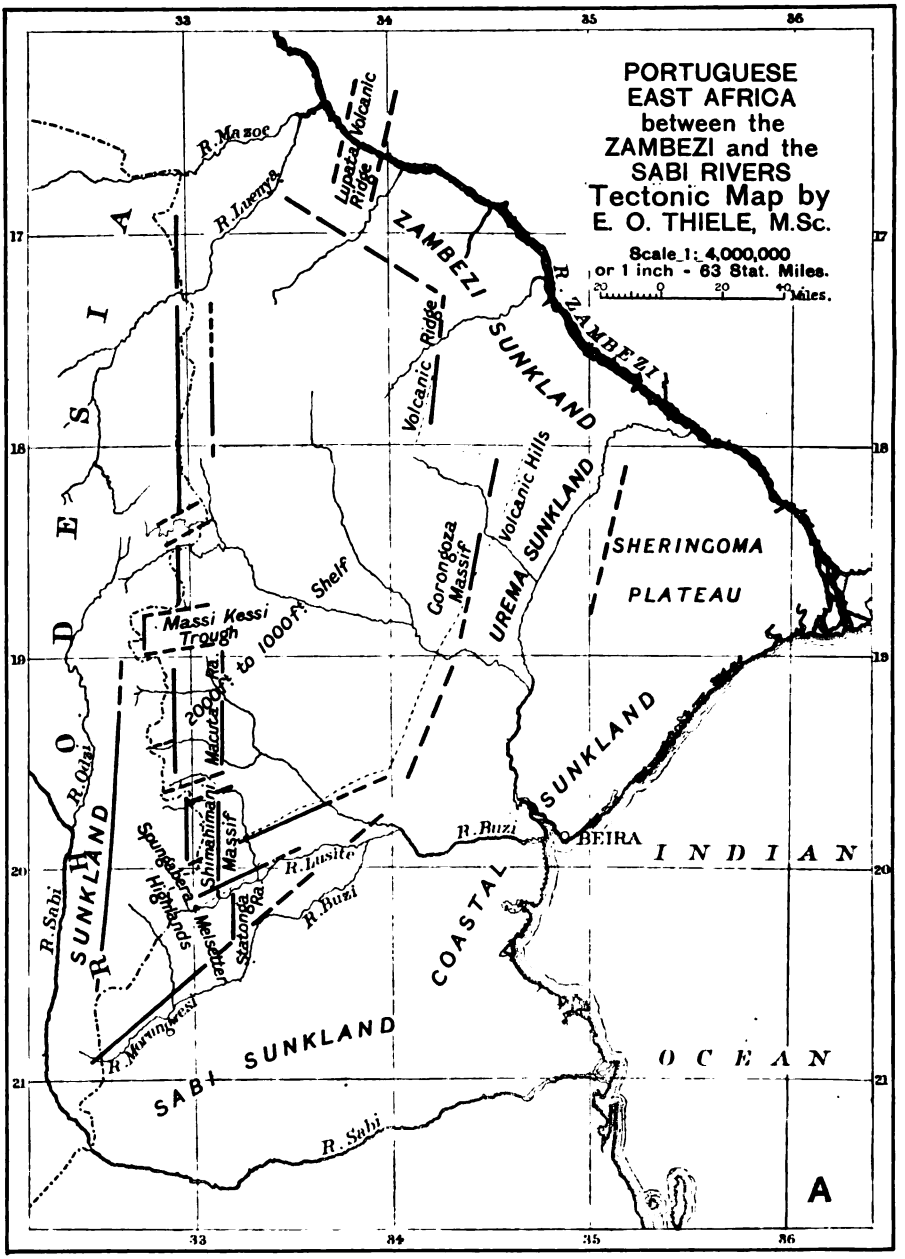
of syenite * and allied hornblendic rocks, while the surrounding country consists of ancient gneisses, the foliation planes of which lie at low angles of dip throughout this region. Though a complete traverse round the mountain was made, the actual contact of the syenite with the gneiss was only seen at one place. This was at the north-western corner, and the exposure was very limited, giving no evidence concerning faulting. Nevertheless, we feel that erosion alone is inadequate to explain the development of this huge elevated block. It seems necessary, therefore, to assume that block faulting has been an important factor here. The continuation of this line to the north appears to be a shatter zone with numerous fractures filled with porphyritic and basic dykes.

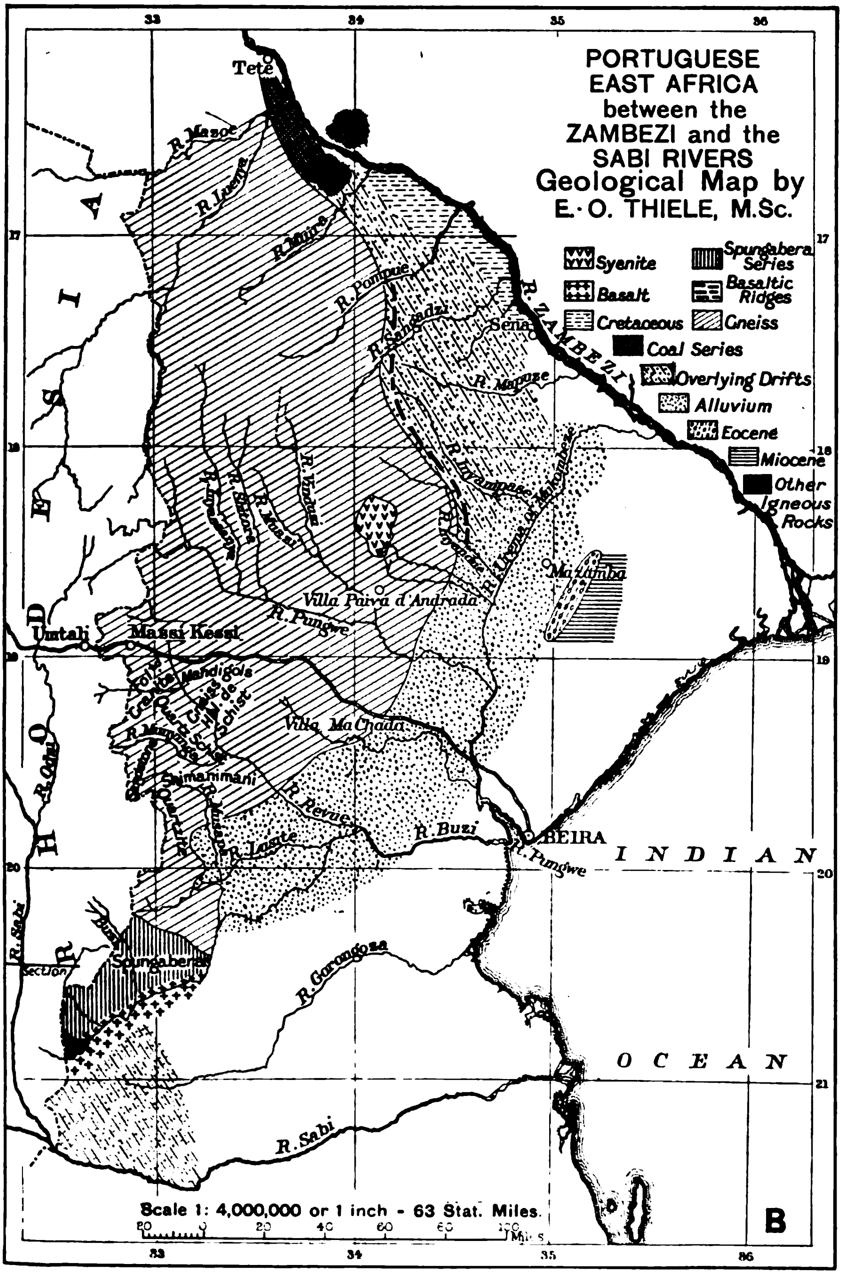
Another region much nearer the frontier calls for some attention. It consists of a broken ridge of some prominence running roughly north and south for at least 30 miles, and distant from the frontier about 20 miles, in the district to the south-south-east of Maçequeçe (Massi Kessi). It is composed chiefly of quartz schist and gneiss, while the country to the west consists mainly of later foliated granite, above which it rises abruptly to a height of 1000 to 1500 feet. The Revue cuts diagonally across the northern end, and the Munyinga transversely across the central portion through a rocky gap. The southern end of the ridge, known as the Macuta range, terminates abruptly, suggesting faulting. The present features are shown in Maps A and B.

The simplest explanation of the above features is that differential movement has taken place along the line of the Macuta ridge, but at a rate sufficiently slow to allow the streams to maintain their corrasion, and thus avoid deflection. The grade of the Munyinga is still steep and rocky where it crosses the ridge.

The inselberg type of landscape, so common in most of the crystalline areas of Africa, has frequently been described and discussed by various writers dealing with African topography. These hills are clearly types of monadnocks, and are hard remnants which have escaped peneplanation. Though showing a great variety of shape and form, they are, in general, marked by bare-rounded and dome-shaped surfaces, often so steep as to be quite unscaleable. The study of the relations of the surrounding rocks is usually made difficult by the rock *débris* and vegetation round their base. These hills vary in size from mere swellings above the general surface to prominences of considerable size and height, rising occasionally to as much as 1000 feet above the surface of the peneplain. Great curved and cracked shells of rock frequently hang in unstable positions on the steep faces ready to slide off to the base. Their abrupt discontinuity with the surrounding peneplain is one of their most striking features. Sometimes

* Syenite is used here as a field term; the rocks have not been examined microscopically. It is only necessary to note that the rocks of the massif are of a non-foliated granitoid type intrusive into the surrounding gneisses.




PORTUGUESE
EAST AFRICA
between the
ZAMBEZI and the
SABI RIVERS
Geological Map by
E. O. THIELE, M.Sc.
Syenite
Spungabera Series
Basalt
Basaltic Ridges
Cretaceous
Gneiss
Coal Series
Overlying Drifts
Alluvium
Eocene
Miocene
Other Igneous Rocks
Tete
R. Mazoe
R. Luenha
R. Muira
R. Pompue
R. Sangadzi
Sena
R. Zambezi
R. Mapaze
R. Inyampasse
R. Urema
Mazamba
Villa Paiva d'Andrada
R. Pungwe
Umtali
Massi Kessi
Villa Machada
R. Revue
R. Lusite
R. Buzi
BEIRA
R. Pungwe
INDIAN
OCEAN
R. Gorongoza
R. Sabi
R. Odzi
R. Sabi
Spungabera
Section
RHODESIA
Scale 1: 4,000,000 or 1 inch - 63 Stat. Miles.
B

they appear to show an approach to irregular grouping or linear arrangement, but just as often their irregular distribution is quite as marked. They are sometimes elongated along the strike, but frequently the direction of the foliation planes has no apparent connection with their shape or arrangement. Messrs. Holmes and Wray (13), in a previous number of this journal, enter into an interesting discussion on the origin of this type of landscape in Mozambique. Their observations led them to suggest that "the inselberg mark the positions of phacolitic or batholitic intrusions of igneous rock below. It would seem that dome-like intrusions have been the primary cause in determining the sites occupied by the present inselberg, the contrast of surface relief brought about by weathering and erosion being the outward expression of internal structure."

If this observation can be proved to be general it offers a simple explanation for many of the features. We have examined a great many of these hills in the territory under description, but do not yet feel convinced that we can confirm the above observation. We are, in general, in accord with the support they give to the views of Dr. Bornhardt (4), in German East Africa, and Dr. J. D. Falconer (10), in Northern Nigeria, to the effect that during a prolonged period of weathering at a time when stream activity was at a minimum on account of the country having reached base level, the rocks became decomposed to a considerable but varying depth. Subsequent elevation produced a rejuvenation of the streams, which then swept away the loose rock, leaving the resistant parts which had escaped decomposition as isolated hills. In this way earth-movements have had an effect, but we have so far failed to recognize any relation in their distribution or occurrence to local block faulting. The most striking feature in the weathering of these hills is the very large scale on which exfoliation is developed, the large curved shells scaling off more or less concentrically quite independently of the foliation planes of the rock. It is generally accepted that the exfoliation type of weathering of crystalline rocks is a temperature effect, but its degree of development in the inselberg type of hills is so marked that one seems forced to expect some internal structure of which the exfoliation is the outward expression. More research is required, however, to settle this point.

(*c*) *The Sunklands.*—These lowland regions occupy more than half the area of territory. In contrast to the shelf region, which is composed almost entirely of ancient crystalline rocks, those of this area are, with the exception of a few volcanic hills, entirely sedimentary. Rock exposures are, as a rule, rare, the surface being covered largely with a considerable depth of sand, clay, and gravel.

Few parts of these regions rise much more than 500 feet above sea-level, while most of it lies at a very much lower altitude.

(1) *The Zambezi Basin.*—That part of the Zambezi here dealt with embraces chiefly the territory of the Companhia de Mozambique, and

specially refers therefore to the country south of the Zambezi along its course for a distance of about 300 miles from its mouth. On the south bank of the river no solid rock has been observed from the mouth as far as the Lupata gorge, a distance of over 200 miles. The nearest edge of the crystalline series to Sena lies more than 60 miles away to the south-west. This margin continues more or less north-westerly, nearly parallel with the river course, but tending to approach somewhat nearer the river towards Tête. In the opposite direction it turns more southerly, diverging from the course of the Zambezi. For more than 100 miles this line has been traced showing the edge of a sedimentary series, chiefly sandstones and grits dipping at low angles in a direction varying from north-east to south-east, and passing under later more or less unstratified deposits of sand and gravel towards the river.

That this is a tectonic line seems certain, for it is marked also along a distance of, at least, 100 miles by a series of volcanic hills and ridges.

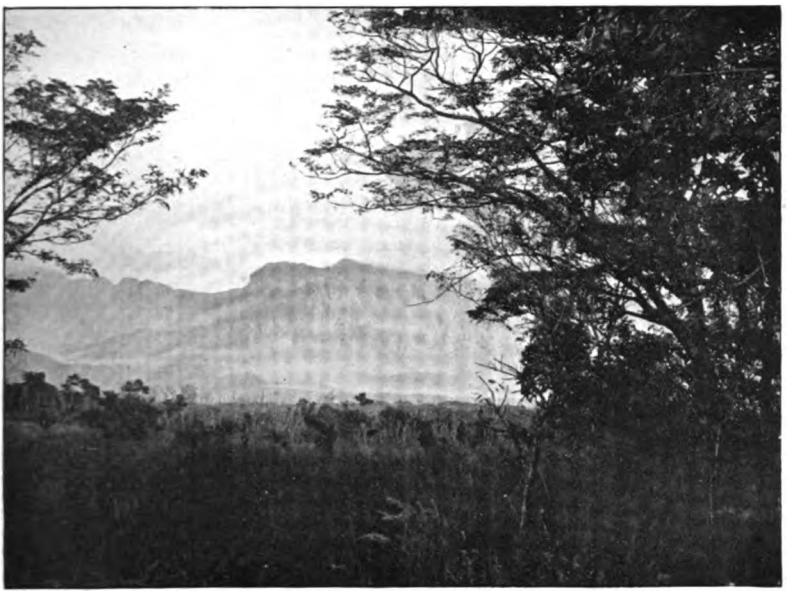
The Lupata gorge is an instructive example of the effect of a hard rock band changing the type and scenic character of a river course. It consists of a belt of volcanic rocks about 8 to 10 miles broad, striking transversely across the river in a north-north-easterly direction, and through which the river has cut a relatively steep-walled channel 400 to 500 feet deep. Above the gorge the river occupies a wide bed up to a mile in width with numerous sandbanks and islands, and on either side there are alluvial flats and low sandstone hills of the Karoo formation. On reaching the Lupata belt it suddenly contracts into a channel not more than several hundred yards wide, issuing again after a course of about 10 miles, and immediately spreading out over a width of several miles, divided into innumerable ever-shifting channels among reedy banks and islands. Following the river downward from here for more than 100 miles, that is below its junction with the Shire, the contrast between the scenery on either side of the river is very marked. On the north side a considerable amount of relief and variety of outline is shown at a relatively short distance from the river-bank. Between the Lupata and Sinjal, hills rising to well over 1000 feet show a slight dip and scarp contour due to the erosion of slightly inclined sedimentary beds of the Karoo series. Below Sinjal, and continuing for some miles, rocks of the crystalline series approach to within a few miles of the river, forming prominent and pointed hills. Opposite Sena, in the neighbourhood of Muterara, some lower hills approach close to the river, composed chiefly of red grits with a marked dip towards the river. Basaltic rock is also associated with the series, outcropping at the water's edge. On approaching the junction of the Shire river, the abrupt massif of the Morambala mountains can be seen running northerly as a wall-like mass to the east of the Shire river, rising steeply to more than 4000 feet, and terminating abruptly at the southern end overlooking the vast extent of the plains of the lower Zambezi. This

prominent and elevated mass would appear to be the southern extension of the great block which in Nyasaland rises in the Mlange mountains to 8000 feet, and lies to the east of an important tectonic line extending from Lake Nyasa along the Shire valley.

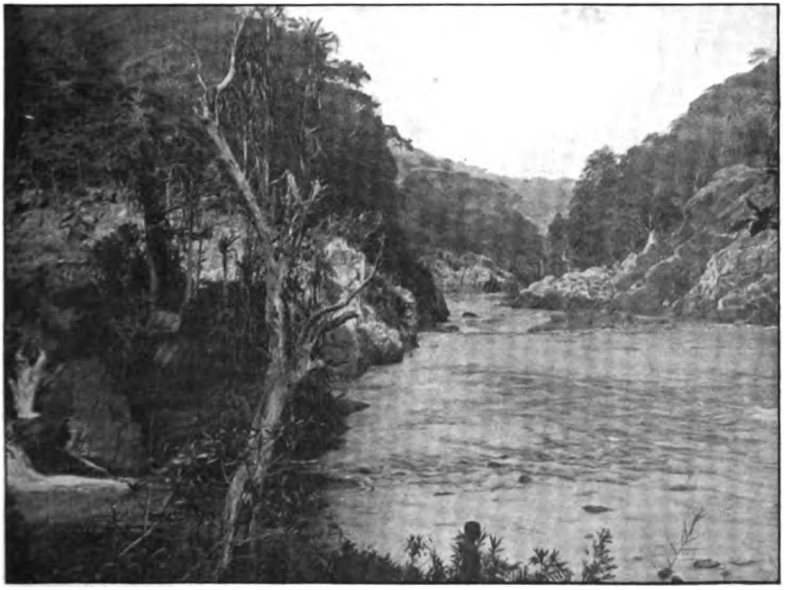
Turning now to the southern bank of the Zambezi, the contrast is striking. A low monotonous and even line meets the eye, broken only in the neighbourhood of Sena by several small conical peaks of volcanic origin. It is the surface of a low plateau of soft rocks rising to barely 200 feet above the river, and consisting of very soft pebbly sandstones and clays overlaid by beds of gravel, occasionally passing into extensive beds of coarse, waterworn boulders. These deposits continue back from the river for a distance of roughly 60 miles, close to the edge of the crystalline series where harder sandstones dip underneath them associated with the line of volcanic rocks previously referred to. The greater altitude of the country on the north side of the river, the abrupt termination of the elevated granitic and metamorphic masses, together with marked faulting and tilting of the sedimentary series, point clearly to a decided fracture line running from north-west to south-east, more or less parallel with the course of the river and intersecting the Shire fracture line. Concerning the age of the fracture little can be said save that it is post-Karoo. Possibly it was connected with the volcanic disturbance which marked the close of that period, the movement continuing with interruption into late Tertiary times. One of the latest movements would appear to have been a slight general uplift, resulting in the shallow dissection of the soft rocks of the Sena basin, by the Sangadzi, the Pompue, and other similar streams, and the development also of alluvial terraces of great fertility along the Zambezi river.

(2) *The Sabi Basin.*—This area is part of a great lowland in the southern portion of the region extending probably as far as the Limpopo river. Like the Zambezi sunkland, its surface is largely covered with loose sandy deposits, and in places beds of coarse, waterworn boulders similar to those of the Sena basin are found. The northern margin is marked by a distinct surface feature which is also a geological boundary. It is formed by the southern edge of the Spungabera highlands, and further east by the termination of the crystalline series. The marked north-and-south ridge of the Statonga range here comes to an abrupt termination. The break in the continuity of the surface is here distinct, all the evidence pointing clearly to an important fracture line running in a north-easterly direction, the course of which is followed by the Morungwezi and the Buzi after the latter issue from the hill region.

The lowlands extend uninterruptedly into Rhodesia, where an important branch runs north, forming a wide flat-bottomed depression along the Sabi valley, bounded on the east by a strikingly straight scarp, the western edge of the Spungabera-Melsetter plateau. As in the Sena region, a shallow dissection appears to indicate a slight uplift. A few miles from

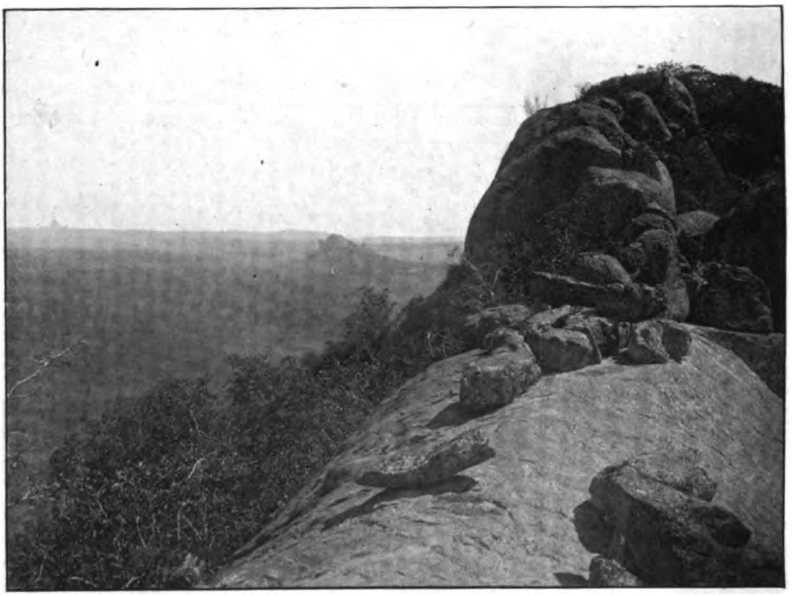


FRONTIER MOUNTAINS, ABOUT 6000 FEET, LOOKING WEST FROM NEAR SHAIA, ABOUT 2000 FEET.



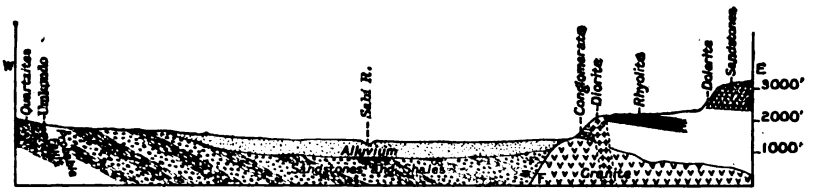
GORGE OF LUSITE RIVER IN QUARTZ-SCHIST AT LITTLE MUSAPA JUNCTION, LOOKING EAST-SOUTH-EAST.

ENTRENCHED VALLEY OF UPPER MERERE RIVER, SHIMANIMANI MASSIF, ALTITUDE ABOUT 6000 FEET, LOOKING NORTH-WEST TO HIGHEST POINT OVER 7000 FEET.



PART OF THE 1000-2000 FEET SHELF WITH INSELBERG FROM SANGA HILL, NORTH FROM GONDOLA, LOOKING NORTH-WEST-NORTH.

the frontier on the Rhodesian side the course of the Sabi is crossed by a hard band of rocks, causing imposing falls which have been referred to by Leverson (20). We have not had an opportunity of examining this interesting feature.



DIAGRAMMATIC SECTION ACROSS THE SABI VALLEY
Horizontal Scale 6 miles = 1 inch
Vertical Scale 6000 feet = 1 inch

(3) *The Coastal Belt.*—This region covers a vast extent of country but little elevated above sea-level. It is for the most part tree covered, with considerable tracts of open grassy plains interspersed. The drainage is ill defined, and during the rains vast areas become flooded with water, a fine breeding-ground for myriads of mosquitoes, resulting in a very unhealthy season for this zone. We have not had an opportunity of examining the coast, so cannot say whether there is any evidence of the interesting raised beaches described by Holmes and Wray (13) to the north of the Zambezi delta.

(4) *The Urema Plains.*—This area forms an interesting belt between the Zambezi and the Pungwe, extending over a distance of about 130 miles, and in general covering a width of 30 to 40 miles. It is continuous with the coastal plains on the south, and the general surface features are quite similar, but it is convenient to consider it separately, for, unlike the coastal plains, it is bounded along the greater part of its eastern side by the well-defined plateau scarp of the Sheringoma tableland of post-Miocene age, rising in its highest point to an altitude of about 1000 feet. It therefore takes the form of a wide shallow trough, its western side being the edge of the shelf of ancient rocks previously described. It is significant that this line of depression is a direct southerly continuation of the Shire fracture line. Its shallow features may be accounted for by the greater depression of the whole of the country south of the Zambezi fault line.

(*d*) *The Sheringoma Plateau.*—This forms an interesting elevated block lying between Beira and the lower Zambezi. It is an isolated area rising above the surrounding lowlands to an altitude of about 1000 feet. It is composed of marine sediments ranging from Upper Cretaceous to Middle Tertiary, its top consisting for the most part of a Miocene foraminiferal limestone. Only a small part of this area has been examined by us, but it gives interesting information concerning the post-Miocene age of the movement of this block, and the evidence of the youthful character of the streams cutting into its western scarp favours a recent date for the movement.

2. The Relation of the Main Fracture Lines to those of the Adjoining Areas, especially Rhodesia.—Our observations in the region described have led us to consider and compare those of other workers in adjoining areas to the west and north, with the result that a similar relationship between tectonic movements and existing surface features is so striking that we find it well worth reviewing some of the broad aspects. It becomes increasingly clear that, powerful and important as ordinary denuding agencies have been in these vast areas of ancient land surface, the great controlling factor concerning the existence and distribution of the vast plateaux, basins, and river systems must be attributed to far-reaching tectonic forces.

The observations of Lamplugh (17), Molyneux (26), Mennell (23), Maufe (24), and others in Rhodesia; Lapierre (18), and our own in Zambezi; Andrews and Bailey in Nyasaland (1); Holmes and Wray (13) in Mozambique, taken in conjunction with those we have made south of the Zambezi, show convincingly how closely many of the broad physiographical features are connected with powerful and extensive fault and fracture lines.

Taking the great Matabeleland plateau of southern Rhodesia, which consists in the main of a huge block of unyielding crystalline rocks, we find that it is bounded on almost all sides by striking scarps, which are either proved fault lines or are parallel to them.

The western and north-western side of the plateau is bounded by part of one of the great tectonic lines of the continent, which may well be described as the Deka-Luangwa line.

It has been traced practically continuously from near the Victoria falls in a north-easterly direction for more than 800 miles towards the northern end of Lake Nyasa. We owe much of our knowledge of the Deka end to Lamplugh (17), while Molyneux's (26) valuable contributions embrace the greater part of it extending into northern Rhodesia along the Luangwa.

It is intersected in its middle portion by a transverse line, about which our knowledge is still very imperfect. This we have called the Kafue-Middle Zambezi line. Molyneux has referred to an east-south-east line in the neighbourhood of the Zambezi-Luangwa junction, but it would appear that the line has a much greater extension affecting the middle course of the Zambezi nearly as far as Tete, and accounting also for the northern scarp of the Matabeleland plateau. Little is known of this region, but the observations of Wagner (34), who made a rapid traverse in this part in the neighbourhood of Mount Darwin and the Mazoe river, are of great interest, pointing to the probable extension of the fault-line in this region. It is important to note that these lines appear to be directions of pre-Karoo movement also.

Our own observations have enabled us to study a great part of the eastern edge of the southern Rhodesian plateau, and this we have named

the Melsetter-Massi Kessi line. It also affords good evidence of being an ancient tectonic zone.

The lowland regions in the south-eastern portion of Rhodesia towards the Sabi and Limpopo basins are very imperfectly known, but there would appear to be a repetition in this area, though on a less marked scale, of many of the features of the Zambezi basin.

We have examined all the geological information we could find bearing on the physical features of Rhodesia, which, though scanty and fragmentary, is most instructive, for it all points to the view that the great Matabeleland plateau, covering an area of more than 1500 square miles, is the result of far-reaching tectonic forces acting upon a great mass of crystalline rocks tending to arch and uplift it in a broad dome-shaped manner. The unyielding nature of these ancient rocks, however, to folding, together with a greater tendency than sedimentary rocks to fracture, has led to the formation of a series of fracture lines and dislocations. The major zones bound the plateau, and are best developed along its eastern edge and in the Zambesi basin.

The intersection of many of the minor fractures has developed a series of blocks which, during the successive crustal adjustments, have suffered differential movement, some undergoing uplift as horsts, others remaining more or less stationary or subsiding. Our observations, based mainly on a study of the rejuvenation of streams, are in accord with those of Molyneux (26), that movement is probably still in progress.

The deep Mozambique channel, an important tectonic line, lies to the east of the area under discussion, and it is, perhaps, significant that it is approximately parallel with the great Deka-Luangwa line.

It will be seen from the above review that the main directions of fracture or movement run north and north-east respectively. A glance at the map of the east coast of Africa, including the coast of Madagascar, shows a remarkable alternation of north and north-east trends—so marked is it that it seems to suggest a definite relation to the important tectonic lines that have such a controlling influence on many of the broader features of the great plateau blocks of the continent.

Taking a general review of our present knowledge of the main tectonic lines in Rhodesia, Nyasaland, and Portuguese East Africa, they appear to fall into four groups, and two of which, the north and the north-east, are the most important.

North.—Nyasa-Shire line (1); Melsetter-Massi Kessi; Sabi-Odzi; Lebombo (25); Rababwi and others of Mozambique (13); east coast of Madagascar (31); many of the basaltic and other intrusions coincide with this direction.

North-east.—Deka-Luangwa line (17 and 26); Mozambique channel (31); Buzi-Morungwezi; Urema. The prevailing strike would appear to coincide most closely with this line.

East to East-south-east.—Kafue-Middle Zambezi.

South-east.—Lower Zambezi.

It is important to note that the position of a number of hot springs occurring in the region under description, the temperature of which ranges from about 100° F. to about 160° F., is on or near well-marked fracture lines. One found to the west-north-west of Shikore Mission Station lies on the Sabi-Odzi fault line. Unfortunately we failed to see this on account of misleading information given to us in the locality.

The Shaiva hot spring lies just to the south of the Morungwezi-Buzi line, and further to the north-east on the same line there is a much more powerful spring situated at the southern termination of the Statonga range. The flow of water here is considerable, but we had no opportunity of gauging the amount.

The Shimuriro spring in the south of Gorongoza near the Pungwe river lies close to the eastern edge of the shelf. This is the hottest one, the highest temperature noted being 160° F. From all these springs there is a notable evolution of gas, which is probably for the most part carbon dioxide. The waters are only slightly saline, but the results of analyses are not yet available.

Summary of Conclusions.

The special features to be emphasized in connection with general erosion are—

(*a*) A long dry season, during which the country becomes very parched.

(*b*) Annual fires, fed by a rank growth of grass, extend over a great part of the country, laying bare the surface, and often cracking the rocks considerably.

(*c*) Temperature effects are important on exposed rocks on account of the wide range between day and night temperatures.

(*d*) The rainfall is abundant and of a torrential character, most of it falling during about two months of the year.

(*e*) The altitude of much of the country is sufficient to render the streams of the hill region extremely active.

(*f*) From a consideration of the above features, taken in conjunction with the character of the stream sands, it would appear that mechanical erosion is very active.

The surface features are divided into four divisions—

1. A mountainous frontier zone, the eastern edge of the Matabeleland plateau, which rises in general to over 5000 feet in altitude. Though modified to a considerable extent by erosion, the north and south direction of the scarp is wonderfully straight over a distance of more than 200 miles. The abrupt rise of about 300 feet above the country to the east, taken in conjunction with the geological evidence, indicates that it is an important tectonic zone of fracture and movement.

2. The features of the 1000–2000 feet shelf are those of an ancient peneplain. Its characters could not have been developed in its present position. The steep scarp to the west, the sudden drop to the plains in the east, and the rejuvenated river system, all point to recent dislocation. Its surface features are similar to those of the Matabeleland plateau, with which it would appear to have once been continuous.

The inselberg type of landscape is well developed, and is accounted for mainly by differential decay and erosion during long-continued peneplanation. The exfoliation which is so marked a feature of the weathering of crystalline rocks appears to be mainly a temperature effect. No satisfactory evidence seems to be yet forthcoming to indicate whether or not internal structure has any controlling influence.

3. The sunklands.

Though these are composed of softer sedimentary rocks in contrast to the hard crystalline rocks of the plateau, erosion has not been the only factor in their development. They occupy basins some of which were initiated in pre-Karoo times. The synclinal structure of the beds, together with the evidence of later faulting, indicates subsequent movements, due to successive adjustments along old tectonic lines. These features appear to prevail throughout the Zambezi and Limpopo-Sabi basins. Tectonic movements, therefore, seem to have controlled to a great extent the general position and main direction of these basins.

4. The Sheringom plateau forms an isolated tableland rising above the coastal lowlands. Its marine sediments afford interesting evidence of the post-Miocene age of this uplift.

The directions of movement and fracture fall into four main groups.

(*a*) North and south.
(*b*) North-east.
(*c*) East to east-south-east.
(*d*) South-east.

The north and south line is the most important, coinciding with the main tectonic zone of Eastern Africa—volcanic features and other intrusions are associated with this direction. This and the north-east line represent ancient tectonic lines of pre-Karoo movements also.

The persistent alternation of northerly and north-easterly trends along the east coast of Africa and Madagascar, together with the parallelism of the margins of the Cretaceous and Tertiary rocks with this direction, appears to have some relation to the two major tectonic lines of the continent. The Matabeleland plateau, with the surrounding lowlands and basins, is the result of far-reaching tectonic forces, which have developed well-defined fracture-lines. Ordinary erosion effects have been considerable, but have been controlled and guided largely by the tectonic factors. Important movements appear to have started at the close of the Karoo period, and they have continued with interruptions until recent

times. Though the north and south direction is the dominant one, it is probable that the movements along some of the other lines were more or less simultaneous, especially where block faulting took place. The influence of structural features on the direction of some of the river-courses is most marked in the frontier region. Portion of the course of the Buzi is influenced by a north-east fault-line; but in the case of the Pungwe and the Revue no relation to structure has been noted. The convergence of all the important streams, however, toward a point near Beira is an interesting feature.

In conclusion, we would like to express our indebtedness to the various commandants and other officials in the territory of the Campanhia de Mozambique, who have offered us hospitality and assistance during our explorations in the country, and particularly we would like to mention Mr. Austin King, Director of Mines, Massi Kessi, Mr. G. d'Almeida and Mr. W. Donkin, both of the Mines Department, Mr. Lanne, Commandant of Mossurise, and Mr. Bivar, Commandant of Gorongoza. To the last-named also we wish to acknowledge a very useful sketch-map of his district, the result of much care and work, which proved a very useful guide and basis for our explorations.

We wish also to thank the Directors of the Companhia de Mozambique for permission to publish the results of our observations.

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Sir Thomas Holdich (Vice-President): Having recently had a business connection with the Mozambique Company, I have naturally listened to Mr. Thiele's lecture with very great interest. I may say his description of the geological features of the country is entirely new to me, but the beautiful series of photographs with which he has illustrated the topography of the country has given me a much clearer idea of Portuguese East Africa than I ever had before. For some years I struggled in vain to persuade the Portuguese Government to have a geographical survey made which might prove useful, both commercially and geologically, but I never succeeded; so I may congratulate Mr. Thiele on having, at any rate, developed a thoroughly sound descriptive analysis of the Mozambique hinterland, which certainly seemed at one time to be quite beyond reach. By the way, I particularly call attention to the useful nature of those diagrams and sections which he drew to illustrate geographical features. To my mind they are more useful even than photographs. If I may venture on one small criticism it would be we should like to have had a reference here and there in the general map to the particular portion of the country to which he was referring at the time of speaking. There are present gentlemen personally well acquainted with the country who no doubt will be able to tell us something more about it.

Mr. G. W. Lamplugh: The paper is a clear account of the possible structure of the country, and brings together helpfully the facts that have been gathered. My own impression is that it will be found eventually that erosion has been more potent than faulting in the production of the features described. In rapidly traversing a country, it is natural at first to suppose that the big straight features are uplifts by faults. If Britain were an uninhabited island and only known from a few traverses, I am sure that some big faults would be drawn where we now know there are no faults. In fact, that is what did really happen to some extent in the first geological surveys of England; many faults were put in that have proved to be non-existent, while, on the other hand, mining has proved the presence of many faults of which there is no evidence at all on the surface. From what I saw in the Zambezi country, I believe it will be the same there. The big Deka fault, where I first saw it up on the plateau, showed very little evidence at the surface in the way of feature. But in descending the Deka valley, the river began to pick out the lithological structure and found a hard barrier along the fault: and then it was that the fault became a conspicuous feature, but it was not developed until the plateau broke away into the Zambezi basin. This fault is evidently older than the plateau, and where the fault-feature exists it is evidently secondary; and though in one sense structural, it is not tectonic. If the high plateau is as old as it appears to be, it is difficult to imagine that any of the faults that may have occurred at its edges can have remained as sharp features for such a prolonged period. My impression generally is that in the future, when the country is better known, we shall probably appeal more to the torrential erosion on the steep marginal gradients for the actual production of the features, although the old faults may have had much to do in guiding the erosion along lines.

Mr. John Parkinson: I should like to join Mr. Lamplugh in expressing my indebtedness to Mr. Thiele and to Mr. Wilson for the paper they have given us.

It has been of a special interest to me, for I have lately spent a year in British East Africa in that part of the Rift valley which borders on German territory, and in the photographs which we have seen this afternoon I recognized many familiar features, especially the broad flat valleys with their vertical sides. The Authors have mentioned one point of importance to which I should like to refer, and that is the "bulging" of the central portion of Southern Rhodesia, implying, I conclude, lateral pressure. Near Lake Natron, almost on the borders of English and German territory, Uhlig mentions the superposition of quartzite-mica-schists on recent lavas, and infers that overthrusting may have been a factor in the production of the Rift valley. Evidences of pressure were found by myself in the same district, and I would ask whether the authors have noticed any indications of such an agency or of overthrusting amongst the later rocks. A few specimens from the northern province of Portuguese East Africa are in my hands, collected some years ago by my friend Mr. L. H. L. Huddart about south latitude 12° and 39° east longitude. In a letter he talks of precipices dropping at least 1000 feet and mentions the very constant north and south strike of the schists and crystalline limestones, from which it seems possible that a structure similar to that south of the Zambezi may be found to distinguish also the northern part of this territory.

Mr. Arthur Holmes: I think all of us, and particularly those of us who are geologically interested in this part of Africa, must have listened to Mr. Thiele with the greatest of pleasure. I had the good fortune about three years ago to be occupied as geologist on an expedition to the Portuguese district of Mozambique. It may be of interest to make a few remarks in reference to the structure of this part of East Africa, for in many respects it bears a close resemblance to the structure of the Protectorate south of the Zambezi, as described by Mr. Thiele.

In Mozambique the contrast between plateau and mountain is more marked than in the southern area. Denudation appears to have progressed further, for the outlines of the plateau are less rugged, and the contours of the inselbergs are, if possible, even more precipitous. To some extent these features may be due to the prevalence of granite and gneiss throughout the country.

Much attention has been given to north to south, and north-east to south-west structural lines. In Mozambique the latter are represented by the prevailing direction of foliation of the gneisses, and by the lines of granite intrusions, which in some cases appear to be responsible for the presence of inselberg peaks. The north to south lines are generally represented by more recent faults and fractures. From Fernão Velloso bay to Mokambo bay, a distance of 25 miles north and south of Mozambique island, there appears to be a fault, or a series of small faults, between the Cretaceous sediments on the east and the Archæan complex on the west. This line is parallel to many of the major faults described by Mr. Thiele; and other important tectonic features which follow the same direction include the long eastern coast-line of Madagascar, many of the inselberg blocks of Mozambique, and parts of the Nyasa depression.

It is claimed that the Rhodesian plateau represents an upward-lifted portion of the earth's crust, and the question arises whether Mozambique affords any further evidence for a similar uplift. I think that it does, and particularly from a petrological point of view, as I shall now try to show. Along the coast of Mozambique lies a zone of sedimentary formations, partly of Tertiary, but largely of Cretaceous age. Crossing the country westwards, as soon as the coastal belt has been left behind, one traverses Archæan rocks without a break

for hundreds of miles. Schists are not very abundant in Mozambique, but those few which do occur, together with bands of crystalline limestone, and gneisses of sedimentary origin, are, as far as I know, confined to within about 50 miles of the coast. Further west the gneisses become coarser in structure than is usual nearer the coast, and granite intrusions are found in steadily increasing abundance. West of Ribawe, about 200 miles from the coast, basic rocks, eclogites, and anorthosites, are found. It has been suggested that garnet may be taken as an index of high pressure, when it occurs in igneous rocks. The presence of this mineral, and the basicity of the associated rocks, seem therefore to imply a more deep-seated source in the earth's crust than that represented by granites. Thus, the rocks from east to west are successively of a more and more deep-seated character.

This generalization is by no means applicable to small areas, but it appears to express the outstanding structure of the country. Since, then, the garnet-bearing igneous rocks west of Ribawe outcrop in the plateau at a level of 2000 feet, and since the schists, etc., occur almost entirely below a level of 500 feet, it seems clear that the deep-seated rocks occur in the most elevated positions, and that the central part of Mozambique has therefore been upthrust relatively to the coastal belt. This would, indeed, be naturally expected, for this part of the earth's crust appears to have, structurally, a wave-like form. Lake Nyasa represents a depression; Mozambique, an elevation; Mozambique channel, a depression; Madagascar, an elevation; and finally the Indian ocean, the greatest of all the depressions.

It may be interesting to observe that where volcanic rocks occur they are generally near the borders of the depressions, that they always represent fissure eruptions, and that they usually include alkaline varieties. In my opinion the Mozambique area supports Mr. Thiele's view that certain parts of the African plateau have been relatively uplifted. It would be interesting to learn whether the observations of geologists working in other parts of the continent lead to similar conclusions.

Mr. F. P. Mennell: I should like to make some remarks as one of the few people whose observations link up with those of the authors. I have geologized along the Sabi valley somewhere about 20 miles from the Portuguese territory they have described, and there are one or two things in my observations which support their ideas. Mr. Lamplugh has alluded to the fact that it has been the tendency in countries like Rhodesia and the surrounding territories to attribute too much to faulting, and I agree with him regarding the importance of erosion, but, on the other hand, I might say that I have noticed a very big fault along the Sabi river which has been put on record on a map which the authors have evidently not seen. It is one which you can actually see, and it follows exactly the course of the Sabi and then of the Odzi river a considerable distance above its junction with the Sabi. It thus runs almost north and south, and seems to follow a practically straight line, while it is not away back from the river: the course of the river has closely followed it. There is another point to which I may allude, and that is the upward bulging which the authors attribute to the Matabeleland plateau. I may say that this is not the Matabele plateau at all, but the plateau which includes the greater part of Mashonaland; it ought to be called the Rhodesian plateau. An upward bulging of this plateau has certainly taken place in the way they suppose, but nevertheless sedimentary rocks are much more common on the high country than they seem to realize; indeed, a few years ago I wrote a paper, which was actually called the "Sedimentary Rocks of the Rhodesian Plateau." With regard to the question of the age of the

sandstones of the Sabi valley, I think they are undoubtedly of Waterberg age. I travelled over them for some 60 or 70 miles, and I obtained very good evidence that they correspond in their order of succession to the Transvaal rocks, and have the same lithological characters. At their base I found a limestone which does not seem to be known in the Transvaal at all, and I do not know quite how it corresponds to anything in the Transvaal, but there is no doubt, I think, of the Waterberg age of the other beds. There are sandstones on top and shales below, and they are thrown down in the flats on the western side of the Sabi river by the great fault to which I have alluded. The throw of the fault may be called *plus* 700 feet and probably a great deal more: it depends on how far the top of the granite is below the surface of the ground. I should like to congratulate the authors on the very valuable contribution they have made to our knowledge of the region, which is a very interesting one.

Mr. R. Bullen Newton: I am desirous of placing before the meeting one or two remarks on the fossils Mr. Thiele has collected in this territory, because, from the stratigraphical point of view, they are of great importance. This collection has been presented to the British Museum, and although no properly detailed work has yet been attempted upon the specimens themselves, I am able to recognize the fact that they belong to three very definite geological horizons. The oldest are to be referred to Upper Cretaceous times on account of the presence of the characteristic oyster, known as *Alectryonia ungulata*. This oyster is found in similarly aged rocks of Madagascar and India, an occurrence which helps to support the theory that a land connection existed between Africa and India during the Cretaceous epoch. Next in order is a series of fossils containing a well-marked nautiloid-shell resembling *Hercoglossa diderrichi* * with deeply angular or sinuated septa, and therefore indicative of a Lower Eocene age. The youngest specimens are to be referred to the Miocene period, being represented by a limestone composed entirely of minute Foraminifera belonging to the genus *Amphistegina* (size = 2 or 3 millimetres in diameter), and which is closely allied if not the same species as that occurring in the Austrian "Leithakalk" (= *Amphistegina hauerina*), which is recognized as part of the Tortonian stage of the Miocene deposits. This interesting organism has also been found in the Miocene limestones of Egypt, Madagascar, India, and the far Pacific regions, such as Formosa, New Hebrides, etc. The genus also lives in tropical seas. It was my privilege some eighteen years ago to announce for the first time the presence of Upper Cretaceous (*Journ. Conchology*, 1896, vol. 8, p. 136) and Eocene rocks (*Geological Magazine*, 1896, p. 487) in Portuguese East Africa, a result obtained from an examination of fossils collected by Mr. Draper from the Buzi river district and Sofala, about 100 miles south of the area whence Mr. Thiele obtained his material. The Cretaceous rocks on that occasion were identified by the same oyster (*Alectryonia ungulata*), whereas the Eocene were recognized by a limestone containing various species of *nummulites* and orbitoidal organisms. Mr. Thiele's specimens allow us to go a step further in our knowledge of the sedimentary rocks of that country as the *Amphistegina* limestone indicates that a Miocene sea once invaded that area. Mr. Thiele is to be congratulated in every way on the success of his expedition.

Mr. E. O. Thiele: I am pleased to find that the paper has called forth such an interesting discussion. At this late hour, however, there is hardly time to

* This species has been described and figured by M. E. Vincent from the Bas Congo region of Africa, and regarded as of Palæocene age (*Ann. Mus. Congo Belge Geol. Pal. Min.*, 1913, Ser. 3, vol. 1, pl. 6, p. 37).

do justice to the numerous points raised. I will endeavour to reply in a general way to the main questions, and hope the enforced omission of some of the minor points will be excused. Three of the speakers referred to the upward bulging suggested for the Rhodesian plateau. I unfortunately omitted to point out the nature of the evidence when describing one of the diagrams. It is mainly based on the consideration of the dip of the sedimentary strata flanking the margins of the plateau, taken in conjunction with the bearing of the general physiographical evidence. The information is somewhat fragmentary, but it all points towards the suggestion we have made. We were quite aware of the existence of the sandstones referred to by Mr. Mennell in the western portion of the Rhodesian plateau. He has pointed out that though the dip is at a low angle it is always northerly towards the Zambezi, all the evidence being in favour of that region consisting of a synclinal basin. The work of Molyneux also in this region and that of Wagner in the vicinity of the Mazoe river supports the synclinal view, as also do our own observations in the lower Zambezi basin. Further, the sedimentary rocks along the eastern flanks of the crystalline rocks have a dip seawards, and in the southern portion of the territory of the Company the dip of the Karoo rocks is southerly towards the Sabi river. Little is known about the sedimentary rocks in the south-eastern portion of Rhodesia, but the work of Lightfoot seems to indicate that the dip though somewhat variable is in the main between south and south-east. All this points to a general sagging down of the sedimentary basin flanking the margins of the plateau, and the physiographical evidence is in favour of the view that the plateau as a whole has been uplifted. Broad doming accompanied by fracture and dislocation appears to offer the best explanation of the features.

With regard to Mr. Lamplugh's objection to faulting and earth-movement overmastering erosional forces, he has raised a very debatable point. We admit that it is a very difficult matter to assign the proper share to erosion and tectonic forces respectively, for both have had a powerful influence. How much of the face of these imposing scarps is due to recent movement and how much to erosion? This is the vital question. After having considered it very carefully, we favour the view that in this region tectonic forces *have* dominated erosion.

The plateau margins throughout Africa south of the equator are characterized by striking shelves or step-like descents to sea-level. Natal is one of the regions where these features are well developed, and there also various observers have differed as to their origin. It has been held that faulting is the correct explanation, while Molengraaft believes that the uplift has been of the type of a broad monoclinal fold, and that the shelves have been cut out by the erosion of the consequent streams. The stratigraphical evidence in many places points to the type of uplift, but it seems difficult to explain the succession of steps together with the straightness and abruptness of the scarps over long distances, without invoking the aid of faulting also. It has been suggested that the shelves are due to marine erosion, and in some cases in South Africa marine sediments rest on them, but the 1000–2000 shelf under discussion is 100 miles wide—a very broad platform for marine erosion. There is here not the slightest evidence of marine sedimentation, and the features of the whole surface are those of a peneplain with a rejuvenated river system. It is difficult to explain such a wide area of mature erosion bounded on one side by an abrupt scarp of three to four thousand feet high and a steep drop on the other, without the aid of faulting. The scarp, though notched by erosion, is wonderfully straight; foot hills are either absent or insignificant along its base, and there are no gradually sloping spurs leading up to the scarp between the river basins. It is well known that faulting often brings a soft set

of rocks against hard ones, and that erosion subsequently cleans away the softer material forming a scarp. There is no evidence, however, that this applies in the case under discussion. Perhaps the best instance we can quote in favour of faulting is the southern face of the Shimanemani massif; here a scarp cuts across the quartzite mass and the foundered ridges of quartzite, a few hundred feet in height, and abruptly against the base of the scarp which rises steeply at least 4000 feet when the ridges continue along the top of the Massif.

It has been suggested that many of the scarp features are due to the laying bare of a pre-Karoo landscape by the stripping off the strata by erosion, and this must be carefully considered. Mr. Mennell has shown that in the maturely eroded central portion of the plateau this feature can be observed in various stages of development. The plateau margins do appear to approximate to direction of pre-Karoo movement, but it is clear that they are also lines of post-Karoo faulting, particularly along the Zambezi valley, and it is significant that these fault lines are parallel to the present scarps and usually not far from their base. We admit that erosion has modified the scarp and caused some recession from the fault, but our stand is that erosion has been dominated by tectonic forces in the cases being discussed. The age of the movement is difficult to decide. Some of it would appear to have been moderately recent, and the evidence of the Sheringoma plateau shows that there, at any rate, there has been an extensive post-Miocene uplift of at least 1000 feet.

Mr. Mennell's remarks concerning the Sabi valley are very interesting and most important. The fault line he has observed is long and straight and exactly parallel with the western scarp of the Melsetter-Spungatera highlands. That the fault is not exactly at the base of the scarp does not affect the question seriously, for we admit that erosion must have caused some recession. The fault lines represented in our diagram are more or less diagrammatic, and when we have indicated faulting by one straight line there is most probably a system of parallel faults.

Mr. Mennell's objection that the term "Matabeleland plateau" is not sufficiently comprehensive has a good deal to say for it, and we are quite willing to change it to "South Rhodesian plateau."

Mr. Holmes' remarks concerning the Mozambique territory north of the Zambezi emphasize many of the features we have observed, and bring out specially the marked parallelism of many of the surface features to the two dominant north and north-east tectonic lines.

In reply to Mr. Parkinson, we have not observed in this region any evidence of the recent overthrust features which he has referred to, in British and German East Africa.

In conclusion, I wish to thank all the speakers for their appreciative remarks concerning our observations.

Sir THOMAS HOLDICH: It seems to me that we have not only had an exceedingly interesting lecture, but a useful discussion besides. It only remains for me to ask you to thank Mr. Thiele, with whom I will associate Mr. Wilson, for the interest of this afternoon's lecture.

CARTOGRAPHIC NEEDS OF PHYSICAL GEOGRAPHY.*

By ALAN G. OGILVIE.

THE increasing demand for sound regional descriptions induces the geographer to take stock of the cartographical documents of all kinds which exist to aid him in his task of writing these descriptions, and to aid people in general in reading them. As is well known, geography draws its material from the results of researches in many branches of science. The present paper is an attempt to discover to what extent these results—in so far as they affect physical geography—are expressed in maps; and to suggest ways in which the various sciences might farther assist geography by the more frequent employment of cartography.

TOPOGRAPHIC MAPS.

In the description of the surface relief of a region the aid of the topographic map is required. The representation of relief on topographic maps has recently been discussed by Captain Lyons † at a meeting of the Society and there is no need to enumerate here the various methods adopted on existing maps. There are, however, several points which it seems worth while to emphasize concerning the value of these maps to the student and teacher of physical geography. It must of course be recognized that the main object of official survey departments is and must be the publication of maps which will meet the requirements of the greatest number of interests—military, landed, travelling, etc.—in the country. The result of this is that features of special interest to physical geography are frequently obscured, or are indistinctly shown in order that they may not obscure other features.

ORDNANCE SURVEY MAPS.

This state of affairs exists in many countries. Let us consider the case of the Ordnance Survey maps of the British Isles, and the way in which they may be put to better use for the purpose in view.

We have in this country probably a greater number of different editions of official maps than is to be found in any other. Each of those editions has some special merit which makes it the best edition for some particular purpose. In nearly every case, however, editions are withdrawn from sale when superseded. I would urge strongly the advisability of making all old editions available for geographical work, and I believe that, so far as the maps were actually published, this could be done with little, if any, expense to the Government. Two illustrations must suffice to show the need for this reform.

For the study of physiography the wideness of the 100-foot contour interval of our maps renders the hachuring of the greatest importance.

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* Royal Geographical Society, July 2, 1914.

† *Geographical Journal*, vol. 43, p. 233.

The subsidiary and frequently indistinct nature of this in the recent lithographed maps, however, compares most unfavourably with the clear and beautiful hachures of the old engraved map, at any rate in the majority of the sheets. For this reason the engraved map, preferably with hachures in brown, should be kept accessible to all.

Again, in regard to layered maps on the half-inch scale the Ordnance Survey have been met with the difficulty of finding a colour scale suitable to all sheets, and have now arrived at a scheme based on that of the International Map. If a sheet showing moderate relief be selected from the new edition—*e.g.* in S. England—and compared with the map recently withdrawn, which had a different colour scale and in addition a stippled hill-shading, it will be found that the latter gives a far clearer conspectus of the relief than the current edition. That the old edition was unsatisfactory for countries of greater altitude and relief does not seem to me a sufficient reason for withdrawing, at any rate, the sheets covering areas of moderate altitude and relief where it is for many purposes the best map which has appeared on the scale. If the features which are due to man have had to be altered on the new map, the old map might before being sold receive a stamp to indicate that those features are not up to date.

The teaching of physiography in this country is greatly hampered by the high price of the official maps. The most which has been done up till now to make these maps more accessible, is the provision that a large number of copies of any sheet may be sold to schools at a reduced rate. It is probably impossible at present to reduce the general cost of Ordnance maps to a price approximating, for instance, that of the excellent topographic sheets of the United States Geological Survey. And yet it would seem to be a relatively easy matter to get over the difficulty by procuring the publication of selected sheets in the form of an atlas of typical landforms. It is a duty of the Geographical Societies of this country to procure the publication of such an atlas, and to ensure that it be accompanied by a satisfactory descriptive text. It is greatly to our shame that at present we have to turn for such documents to Germany and to the United States. While the materials now existing are quite sufficient for the publication of an atlas on the 1-inch scale, there are many types of landform which it is most advisable to include in such an atlas, but which cannot be shown on this scale. I suggest that the sheets of the "6-inch" scale of the Ordnance Survey on which the land features occur should have contour lines inserted sufficiently closely to illustrate the special features. In some cases an interval as small as 5 feet would be necessary, though in most cases 20 or 25 feet would be sufficient. The Ordnance Survey should be asked to do this contouring, as it would probably cause little trouble in districts where survey parties were in the vicinity. Wherever such work cannot be done officially the Geographical Societies should have it done by qualified persons.

In the case of coastal regions the co-operation of the Admiralty would be necessary, as it is most desirable to show the sea bottom by the same

method as that adopted for the land. Some idea of the scheme suggested may be gained from Fig. 1. It shows two overlapping wave-built forelands formed during a period of interrupted uplift. The contours in this case are approximate.

There is one other means by which the Ordnance Survey might greatly assist the study and teaching of physical geography in the future. The obscuring of one element by another in the complete colour-printed map has been referred to. It would be a great boon if it were possible to obtain the prints from each colour separately or copies showing a combination of printings, but without that printing which obscures the features it is desired to emphasize. It would appear that the only difficulty in the way of this being made possible is the increase of maps to be kept in stock.

Landforms.

An essential part of physical geography is the description of landforms in the light of their genetic classification. Physiographers now agree that in order to describe landforms in this manner three things must be known, viz. structure, process, and stage.

The description of landforms, then, will be greatly aided by illustrations which will represent graphically what an author is trying to tell in words. Thus, block-diagrams, which show diagrammatically something of the surface relief and something of the structure, have been much employed in such descriptions in recent years. For some purposes it is desirable to show but one element in each illustration. Let us see to what extent the map may serve this purpose, and consider in turn whether it is possible to have a *structure* map, a *process* map, and a *stage* map.

Structure.

The structural features which influence the landforms are two, first the chemical and physical composition of the rocks—*e.g.* as in clay, limestone, or basalt; and secondly the posture of the rocks relative to the surface and to one another, *e.g.* horizontal, tilted, folded or faulted.

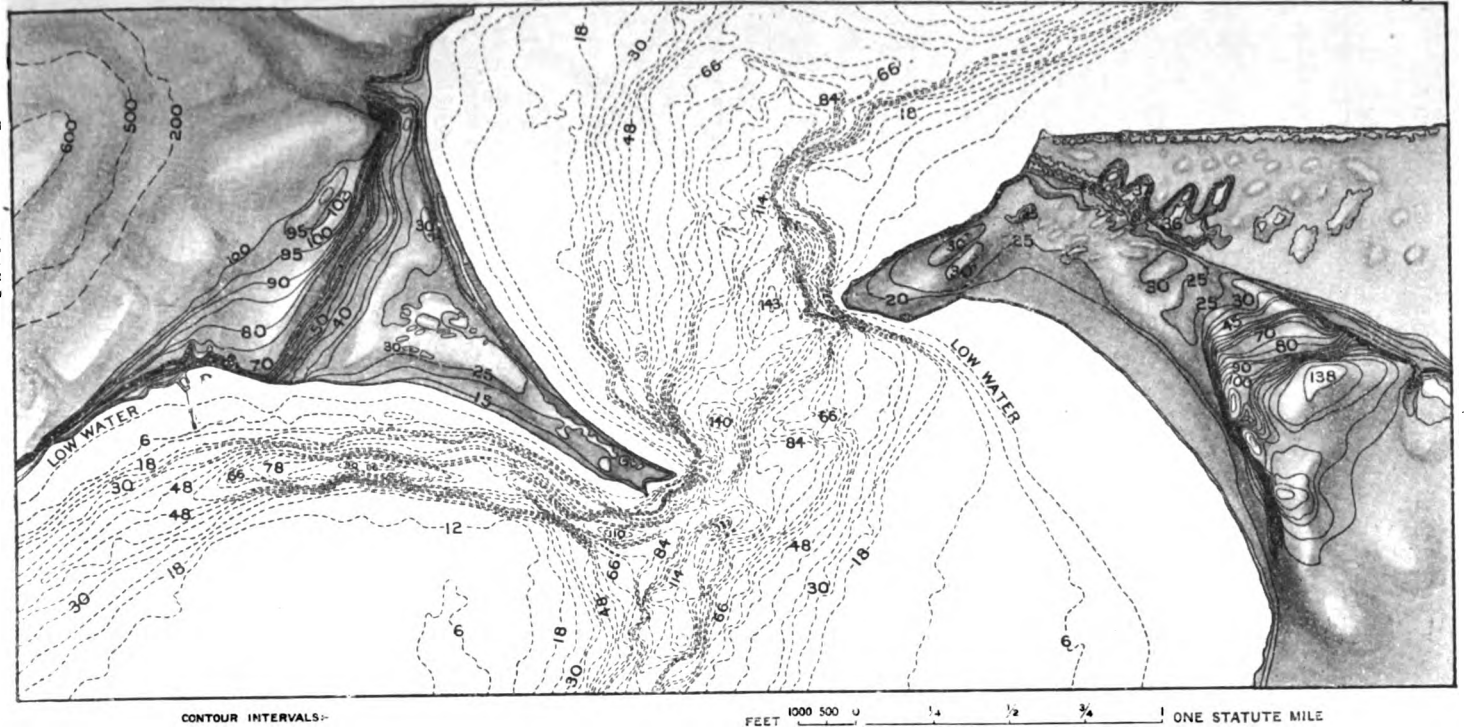
We naturally look for such facts upon geological maps. Do we find them there? and if so, are they in the most suitable form for use in explanatory description of landform? These are questions which we have to answer.

Geological maps are of two main kinds. The first, which is by far the less common, is a diagram showing tectonic lines—axes of anticlines and synclines, faults, directions of overthrusting, etc. Most of such data are of great importance in the discussion of landforms, they help to show the posture of rocks, and must therefore be included in the structure map.

The second type of geological map is much more familiar. It shows the distribution on the surface of the outcrop of rocks of different ages. By referring to the index, as a rule, the reader of such maps can discover no clue to the chemical and physical composition, *i.e.* the lithological

ENTRANCE TO INVERNESS FIRTH

Fig. 1.



character of the rocks.* The igneous rocks are an exception to this, and occasionally a sedimentary rock receives a name which is of direct use in this connection, *e.g.* Old Red Sandstone. But, generally speaking, the names convey no clue to the nature of the strata. They will be found to be classed as "Silurian" or "Ordovician" because rocks of similar age were first examined in the districts of certain Welsh tribes so named, or as 'Permian" because rock of the same age occupies extensive areas near *Perm* in Russia, or again as "Trias," so called from its *three* members—only two of which exist in Britain—or as "Tertiary," because the rock was formed in the *third* of the great geological epochs. No more need be said to show that these geological terms culled from so many sources have no geographical significance, since two rocks bearing the same name in different regions may be as different as black is from white. And yet the English student beginning geography is led, by the inaccessibility of lithological information, to assume for instance that a rock named "Silurian" since it is old must also be resistant; and he finds it difficult to believe in the existence of weak Silurian clay near St. Petersburg.

In order to discover what is the lithological nature of the rocks one must have a detailed geological knowledge as well as a geological map. This may reasonably be exacted from advanced students of geography *in their own country;* but for the help of beginners at home and of all foreign students we must have a short cut to this knowledge. In other words, we must have a lithological map. If we make one for our own country we are doing only what we should like people abroad to do for us. For who is there among us who, desiring to study the surface form—say of Italy—would not save himself the trouble of reading much Italian geology by simple reference to a lithological map?

Maps showing rock type might of course be made on any scale; but probably the most generally useful would be on small scales such as 10, 16, or 25 miles to one inch. Of course, as the scale gets smaller more generalization becomes necessary, and in many cases the determination of rock type becomes arbitrary. In spite of this, I believe the map would be of the greatest service to teachers and students of geography at home and abroad, as well as to foreign geologists.

The following are the chief elements of the map required:—

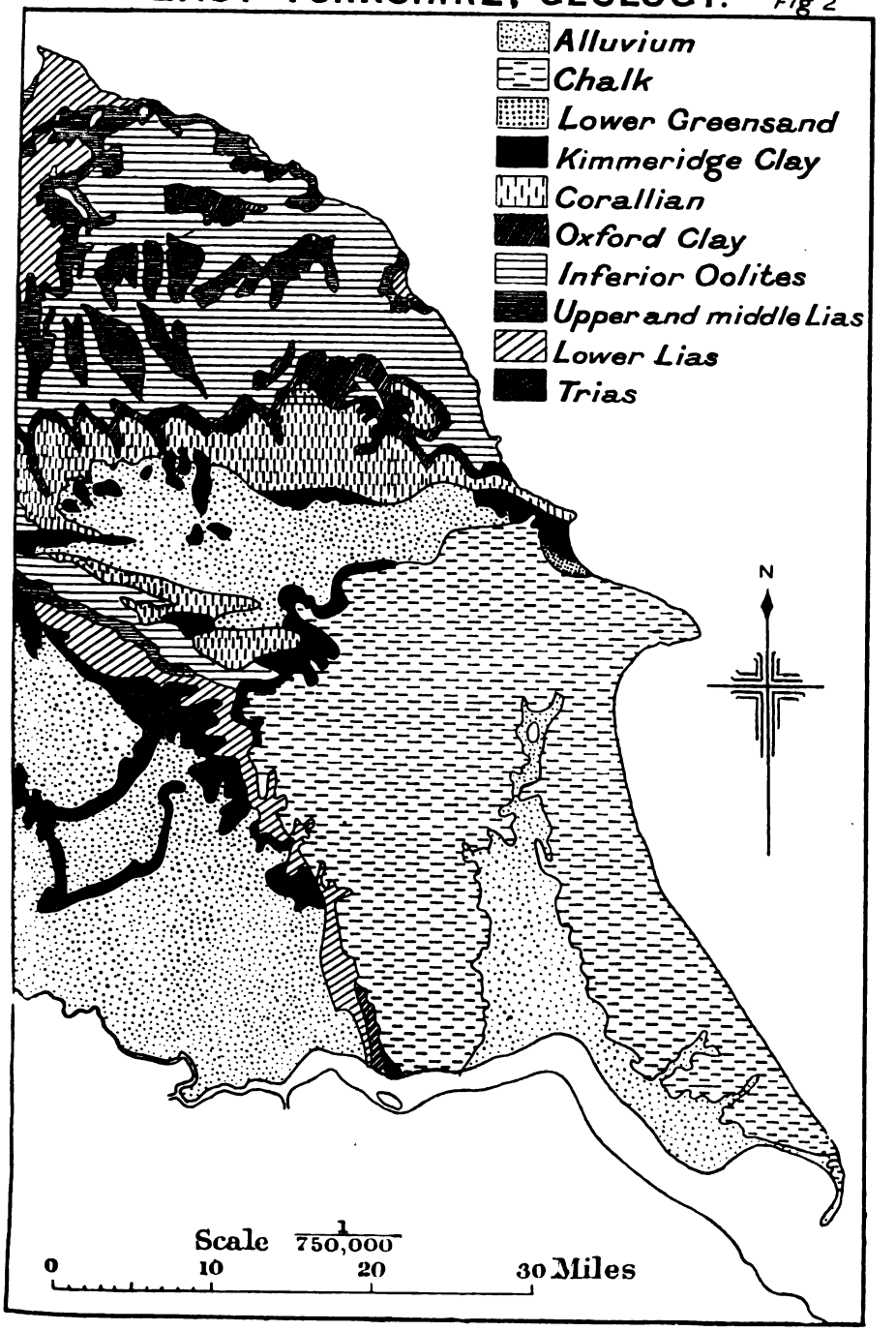
(1) The broadest classification of rock types would be essential, *e.g.* limestone, sandstone, clay, granite, schist, etc., and, where possible, smaller differences should be indicated, *e.g.* between oolite and chalk.

(2) It should be a "drift" map in districts where the rocks are concealed by drift; it is as a rule of greater importance to the geographer that the drift be shown rather than the rock which underlies it.

If the map were not too crowded it should have other features of structure

* This is, of course, true mainly in the case of the smaller-scaled maps—the ones which are most used for geographical purposes. In such maps generalization of rock-type is necessary.

EAST YORKSHIRE, GEOLOGY. Fig 2



added, and might then be termed a structure map. These features are chiefly (1) the main lines of faulting; and (2) the direction and angle of dip of strata.

A portion of the map of Yorkshire drawn on such lines is given in illustration of the above. It is to be regarded only as approximately accurate.

Before leaving the more geological aspect of the paper it may be well to refer to two closely allied subjects which involve investigations by the geologist, researches which would throw considerable light on the origin of our landforms, and of which the results—if they were sufficiently definite—might well be expressed on maps.

The first task we should set is a determination of the permeability of the various rocks, which might result in a map with rocks tinted according to a scale of porosity. The second task is more difficult to perform, viz. to determine the degree of resistance of various rocks. In this case it is often said that an orographical map of a country gives a fairly accurate conspectus of the relative resistance of rocks. But it will be seen that this is not the case, if we take into account the possibility of various districts representing different stages in the cycle of erosion, a condition which may be produced by the greater uplift of one district than another.*

Process.

The mapping of areas which are undergoing different processes of erosion or deposition would be profitable for certain purposes, and especially so in teaching. It is frequently the case that more than one geological process is at work on a region at one time, and in nearly every case existing landforms are to be traced to a number of these processes, which have acted in the past either simultaneously or successively. Thus it is difficult to determine whether a district should be shown as subject to river action, ice action, frost weathering, wind action, and so on. It will probably be best to select the process which seems to have had the greatest effect on the land, and since so much simplification is necessary the "process" map should take the form of the small-scale diagram of the continents or large portions of them. We have what practically answers this description in one of the Oxford Wall Maps, showing the distribution of "deposition and erosion" over the Earth.† Such facts might be expressed on somewhat larger scales than in this map, but between wall diagrams and maps on the scale of about 1 : 100,000 such mapping would be unprofitable. Its treatment on large-scale maps will be dealt with below.

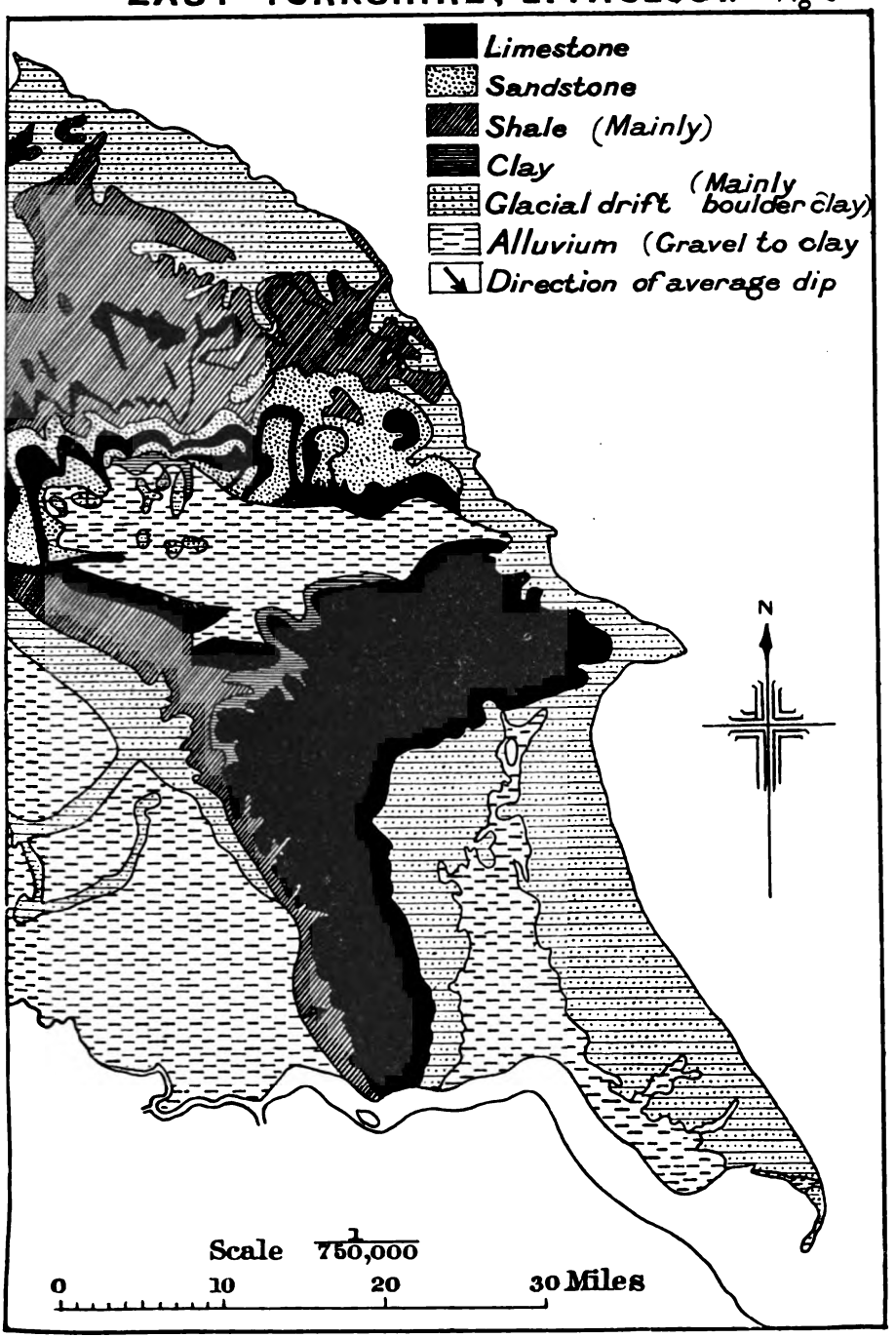
Stage.

We now come to the representation of the third element in physiography, namely the stage reached by a land surface in the cycle of its development,

* See note at the end of the paper.

† This map was based largely on the maps in Berghaus's Atlas.

EAST YORKSHIRE, LITHOLOGY. Fig 3



where certain processes are acting upon certain structures. Physiographers are not yet in complete agreement as to the exact features which shall define the various stages—young, mature, and old—in the case of lands affected by the various processes. Physiography and geography are greatly indebted to W. M. Davis for his clear definition and arrangement of this whole subject; and though his method still has its opponents, it seems likely that some classification such as that adopted by him in his recent work * will eventually be upheld. When a uniform system has been adopted and the lands examined in the light of it, it will be a simple matter to plot the areas on maps. But as in the case of "process" it will not be profitable to do so on all scales. Thus we might tint an ordinary atlas map of England so as to show the lowland of the Oxford clay as a peneplain and the oolitic upland as a maturely dissected plateau. It will, however, be more profitable to consider all the land together which has undergone the same process for the same length of time, and this larger area may be mapped as mature as a whole, though its resistant rock surfaces may be young and its weak rock surfaces old. As in the case of "process" then the maps of "stage" should mainly be small-scale diagrams.

Landform Maps.

While maps of the last two classes must probably be very limited in their uses, there would be general recognition of the value of some forms of maps showing the distribution of landform types, where structure, process and stage have been taken into account in examining the features. The writer would advocate the construction and use of two types of diagrammatic maps of landform. The one small-scaled, the other large-scaled.

(*a*) *Small Scale.*—To appreciate the value of the small-scaled map let us consider a concrete case.

Let us suppose, for example, that we wish to find out from the maps of Russia what are the main physiographical features of that land. A geological map shows us that rocks varying in age from the pre-Cambrian to Tertiary crop out in very irregular belts extending generally from north-east to south-west, with the oldest on the north-west and youngest on south-east. We have no lithological map. We must therefore go to geological books, some of them in Russian, to get a satisfactory account of the nature of these rocks of varying age.

If we now examine an orographical map of Russia we find that in spite of the great variety in the ages of the rocks, and presumably in their lithological character, the land is not far removed from being an immense plain. We are therefore probably justified in assuming that this is a peneplain. To obtain confirmation we may look at large-scale topographical maps such as the Russian map 1 : 126,000 or the Austrian map 1 : 200,000.

* 'Die Erklärende Beschreibung der Landformen.' 1912.

If we examine sheets which show any of the great southern rivers we shall probably find that these are flowing in valleys with entrenched meanders, and with the spurs more or less truncated and flood plains more or less developed according as the rivers are greater or smaller. It is now apparent that we are not dealing with a peneplain, but with a dissected and probably therefore uplifted peneplain. But if before leaving the topographical maps we glance at sheets showing the mouths of these same rivers, we find that arms of the sea enter the valleys, and that these estuaries are practically shut off from the open sea by sand bars. In other words, this *liman* coast of South Russia tells us of subsidence of the land—or, at any rate, of a raising of the base-level of erosion with regard to the land. Thus, by examining various maps we may arrive at a simple and explanatory description of physical features which, though slight, yet determine in large measure the routes and settlements in much of Russia in Europe—viz. *a peneplain somewhat uplifted, tilted, and dissected, with its southern edge slightly submerged.*

Now, this deductive process is undoubtedly educative, but I submit that it should not be necessary for every one to go through it in the case of all known lands of the Earth. Moreover, the conclusion reached may be wrong. When satisfactory information has been obtained as to the landforms of a region—not, of course, by the method just described, but on the ground—it ought to be recorded in a form which admits of easy reference. The most concise form is the map; and the physical atlas of the future ought, I believe, to give maps of this character for all lands of which the physiography has been described.*

(*b*) *Large Scale.*—The identification of landforms on large-scale maps can never be completely satisfactory even on the very best contoured and hachured maps. But when the true nature of the features and their origin have been investigated on the ground, the results of the work ought to be expressed on a map so that any one can recognize the landforms with the help of the map. Two sheets of a map of this kind have recently been published by A. Allix, to accompany a study on Alpine landforms.†

On these sheets the French 1 : 80,000 map is taken as the basis. This map, it will be remembered, shows the relief by black hachuring without contours. Over it are printed a number of conventional signs of different forms and colours to distinguish the special landforms which are described in the memoir. The colours are selected according to the process to which the feature is due, and the shape of the conventional sign bears a general

* Since the above was written, the first part of a new systematic atlas of Europe has appeared ('Methodischer Atlas zur Länderkunde von Europa,' by Dr. Max Friederichsen, pub. Hahn, Hannover and Leipzic, 1914). The first part happens to deal with Russia. On Plate I. a "morphological-tectonic" map is given. It is practically a tectonic map distinguishing mountains and plains dating from different geological periods. There is no map such as I have described.

† "La Morphologie Glaciaire en Vercors," in 'Receuil des Travaux de l'Institut de Géographie Alpine,' vol. 2, Pt. I., 1914.

relation to the landform to which attention is to be directed. Thus by signs of various shapes printed in *blue* we have certain features attributed to *solution* and identified as grikes, swallets, polyes, etc., or again, the signs in another colour direct our attention to drumlins, moraines, ice-worn troughs and thresholds, etc. In reading these maps it is advisable to have copies of the hachured map without overprinting, as the signs inevitably mask the relief to some extent. For this reason it might be well if the map or diagram bearing the conventional signs were issued as a separate print on transparent paper, which might be laid over the ordinary topographic map.

These two sheets, by their clearness and by the great help which they give in reading the description they illustrate, prove definitely that there is room for such large-scaled landform maps.

Hydrography.

Some of the most useful documents in the study of British regional geography are the Memoirs of the Geological Survey on Water Supply. More recently these have had included in them accounts and maps of the rainfall of the areas described by the pen of Dr. H. R. Mill, Director of the British Rainfall Organization. Except for the unfortunate fact that the areas dealt with are the extremely unnatural county divisions, these memoirs are, from the geographical standpoint, entirely satisfactory, so far as they go. They would, however, be greatly assisted by maps showing areas supplied by (*a*) wells, distinguishing those where the wells periodically dry up; (*b*) surface streams; and (*c*) stored rainwater. These data might be plotted on an outlined lithological map on which the zones in which water is thrown out could also be indicated.

The representation of surface streams upon large-scale maps deserves consideration. The sources of streams frequently lie at different points at different seasons, with the result that many valleys are wet and dry alternately. In Britain this is mainly true in the pervious rocks, and is due to the raising and lowering of the water-table. These periodic stream courses should be accurately represented on all large-scale maps, at any rate down to the "one-inch" map. At present they are either shown as permanent streams or are left out altogether. The importance of the whole question of river flow in the British Isles is now fully recognized. The small river-basins and the large rainfall of Britain make the study particularly interesting in these Islands. We now await the final report upon the first serious investigation in the matter; but it may not be out of place here to refer to the graphic representation of the results of such work. On all the smaller-scaled maps rivers are shown by the conventional line which thickens gradually from source to mouth. It may not be assumed that the thickness is proportional either to the width of the river or to its volume. It will, I think, be agreed that some method of showing more accurately the average volume of water flowing at any point would be

useful for special purposes, and the comparison of such a map with maps showing river-basins, lithology, rainfall, and evaporation would be of high educational value. To make the thickness of line proportional to volume would in most cases be impracticable, as the lines might give a false impression of the width of rivers. But would it not be possible in such special maps as these, to employ a scale of graded colours such as is used in bathymetrical maps, using the lighter tints for small volume and the darker for large volume ?

Climate.

Meteorologists now provide us with full series of daily, monthly, and yearly charts on small scales, showing temperature, pressure, rainfall, etc. for all countries in which stations exist in sufficient numbers to provide the data. They also provide the valuable pilot charts of the oceans. In countries, then, with great wealth of data, the need for development from the geographer's point of view does not lie in the direction of more mapping of general temperature and pressure conditions reduced to sea-level; but rather in the more frequent plotting of actual meteorological conditions on our rugged land surfaces. For instance, in our own Islands we require data for the temperature variations and ranges, and rainfall and evaporation records at different altitudes and exposures, in different parts of the country. All such data when obtained should be plotted on large-scale maps, and the generalized maps reduced from these. The scientific value of such maps is greatly enhanced by the close relationship which their lines would have to the vegetation zones now being mapped by the plant ecologists, and it is certain that these two types of map studied together will be of the highest value in determining to what extent the economic regeneration of our waste lands may be undertaken.

Glaciers.

Glaciers are now recognized as extremely sensitive indicators of climatic change. For this reason alone it would be most desirable that all glaciers be carefully mapped on a large scale (*e.g.* 1 : 10,000) with frequent contours. It is doubly important that this should be done on account of the many scientific problems which glaciology has to solve. In Britain we have no glaciers, but in the British Empire we have; and we should do all in our power to cause the mapping of the glaciers of Canada, India, and New Zealand on the model of the work already done in the Alps by the German-Austrian Alpine Club. A good beginning has been made by the Canadian Alpine Club, under the able leadership of Mr. A. O. Wheeler, by the New Zealand Geological Survey, and in the Himalaya by several private expeditions. In this task the mountain climber has an opportunity to render a signal service to science.

Vegetation.

In recent years the mapping of plant associations as opposed to the distribution of species has made great strides. We have a school of plant

ecologists happily as active in Britain as anywhere—who have shown by their work that by more or less generalization, useful vegetation maps can be constructed on any scale. Thus we have "6-inch" maps for special purposes, "1-inch" sheets scattered over Great Britain, the highlands of Scotland on the scale 1 : 633,600, and the vegetation maps of the continents on various scales in the series of Oxford Wall Maps. Geographers should do everything in their power to encourage this excellent cartographical work by the ecologists. In the British Isles means should be sought for publishing the survey on the "1-inch" scale sheet by sheet as soon as the work has been done. It is greatly to be regretted that the Board of Agriculture has not long ago undertaken this work.

Soil.

In this country the department responsible for topographic mapping is the Board of Agriculture and Fisheries. It is remarkable that British investigations relating to agriculture and fisheries have resulted in so little cartographic representation of data. The scientific study of soils is actively carried on, and it is to be hoped that ere long we may have a systematic soil survey publishing its results in map form. The value of such maps in making agricultural statistics intelligible is evident, and it must be remembered that the ecologist requires a soil map, and at present he must construct his own. Further, the soil map is as essential as the climate and vegetation maps referred to above in discussing the regeneration of waste land. The construction of large-scale soil maps is obviously a matter for the co-operation of the Geological Survey and the Board of Agriculture. The lithological map described above should be studied in conjunction with the soil map to make the latter completely intelligible.

Sea.

In the Government fishery investigations we have a valuable source of oceanographical information, and it is to be hoped that the physical conditions of British waters at different seasons will receive increasing attention in the future, and that the results will receive full cartographical treatment.

Summary.

It may be useful to tabulate the suggestions made above :—

Features shown.	*Requirements.*
Topography.	(1) Ordnance Survey : maintenance of all editions on sale.
	(2) Ordnance Survey : Sale of separate prints from colour-printed maps.
	(3) Atlas of landform types, "1-inch."
	(4) Atlas of landform types, "6-inch."
Landform.	(1) Lithological or structure maps.
	(2) Porosity maps.
	(3) Maps showing degree of resistance.
	(4) "Process" maps, small scale.

Features shown.	*Requirements.*
	(5) "Stage" maps, small scale.
	(6) Distribution maps of various landform types—
	(*a*) as small-scale diagrams;
	(*b*) as large-scale maps.
Hydrography.	(1) Maps showing areas with various types of water-supply.
	(2) Accurate representation of variable headwaters.
	(3) Representation on maps of river volume: method suggested —lines on graduated colour scale.
Climate.	Detailed mapping of actual meteorological conditions in different altitudes and exposures in different parts of the land.
Glaciers.	Detailed large-scaled maps of British Empire glaciers.
Vegetation.	Official publication of "one-inch" vegetation maps of British Isles.
Soil.	Official publication of results of soil surveys.
Sea.	Mapping of all oceanographical data collected on Fishery researches.

It gives the writer the very greatest pleasure, as one occupied with the relatively young study of geography, to acknowledge the great debts which geographers owe to others. The oldest debt of all is to the surveyor and cartographer, who gives definition to what, without him, must be vague statements; a long-standing debt also there is to the geologist, and especially to his younger brother the physiographer. To the botanist, and especially to the plant ecologist, he owes much and will owe still more. He is also in high degree the debtor of meteorologist, oceanographer, biologist, anthropologist, and ethnologist. While fully recognizing that this is so the writer ventures to put forward these few suggestions in the hope that the discussion of them may lead to an increase in the cartographical expression of results obtained by the various sciences. Such an increased wealth of map types must surely help to spread the knowledge of the interdependence of earth sciences which is the spirit of geography.

NOTE.

Since the above was written my attention has been drawn to two recent papers which bear on this subject, and farther, a third work of the kind has since appeared, They are as follows:—

1. W. Behrmann, "Die Oberflächengestaltung des Harzes," in *Forschungen zur Deutschen Landes- und Volkskunde*, vol. **20**, No. 2, 1912.
2. E. Wunderlich, "Die Modernen Vorschläge für kartographische Morphologische Darstellungen," in *Kartographische und Schulgeographische Zeitschrift*, vol. 2, No. 1, 1913.
3. S. Passarge, 'Morphologischer Atlas,' Lieferung I., "Morphologie des Messtischblattes Stadtremda;" 8 sheets with explanation. Pub. L. Friederichsen & Co., Hamburg, May, 1914. Price 10 marks.

Of these the first is an important morphological study, and it contains, among others, maps showing what the Harz contours would be without marginal valleys, a pre-glacial contour map, and a morphological map in which the various physiographical divisions are plotted.

The second paper is a brief but interesting *résumé* of work done and arguments adduced.

In the third an interesting attempt has been made by Passarge to analyze the land-forms of a small district and to represent the results of the examination in a series of eight maps on the scale of 1 : 50,000. The features shown are as follows:—

1. *Contours and vegetation cover*—viz. Closed, open, or wanting.

2. *Slopes*—represented by a scale of four colours marking areas having gradients respectively of 0°–5°, 5°–20°, 20°–35°, over 35°.

3. *Valley form.* Different types of valley are represented by different tints and by conventional signs.

4. *Geology.* Strata are coloured according to age. The lithological character is made clear in most, though not in all cases.

5. *Power of resistance to mechanical processes.* Account is taken of various qualities, *e.g.* cohesion and firmness, jointing, porosity, capacity for physical change when wet, etc. The scales for each of these are superimposed on the map.

6. *Power of resistance to chemical process.* The rocks are divided into three grades.

7. *Soils.* Not only the chemical and physical composition of the soils is here considered, but also origin and position. Thus, for instance, detritus beds at different levels have different signs.

8. *Historical development of the landforms.* The areas of land surface formed at different periods are distinguished by different colours.

To obtain an estimate of the true value of these maps it is necessary to examine in detail the monograph which accompanies them. And I shall comment here only on such features of the maps as appear to suggest either additions to the matter treated above or modifications of the treatment.

Map 1. Maps showing the thickness of vegetation cover would be useful, especially on the borders of arid or polar regions, and in high mountains.

Map 2. It is obvious that the degree of the slopes must be clearly represented on the map used in discussing landforms; and if the topographic map does not show it, then some such diagram as this must be made. But a carefully hachured map with vertical lighting serves as a diagram of slopes, and gives the plastic effect as well.

Map 3. This map in its character closely resembles that published by Allix, and described above. Maps of this kind will be most useful.

Map 5. The superimposition on this map of the scales for different qualities gives a somewhat confused effect—there are three tints and seven different types of shading. But the map is an interesting experiment; and it and the method of its construction might well form a basis for the discussion by geologists of the possibility of registering the power of resistance of rocks. It must be remembered that the scales are not absolute, but relative for this one district. Only one who knows the ground and the rocks can say if they are reasonable for the district.

Map 6. "Power of resistance" is given two separate maps (5 and 6) for its expression. Of these the second (chemical) is much the simpler; and the determination upon which the map is based also appears to be simple. There is no map of average power of resistance, combining the facts expressed in maps 5 and 6; but in the text (p. 156) the author attempts to give numerical values to this quality in the case of each stratum.

Map 7. For purely geographical purposes it is unnecessary to add anything to the distribution of soils of different chemical and physical composition. The distinction of soils according to level and origin is mainly geological in its purpose.

Map 8. It seems to me that the two most important cartographical tasks of the physiographer are the construction of maps of this type and of the type of Map 3. Map 8 is really his *geological* map; on it he expresses the *history* of the surface development. Map 3 is his *geographical* map; on it he plots diagrammatically the *actual forms* which he has classified.

Sir THOMAS HOLDICH (Vice-President): Before asking you to join in a discussion on the rather technical subject which Mr. Ogilvie has set before us in his address, I have first of all to express my regret for the absence of Colonel Close, who was unable to be here, and also of Mr. Beckit. Both of them have written letters regretting they are unable to be present. I had the advantage some little time ago of reading the paper which Mr. Ogilvie has prepared, which is in all essentials the same as the address he has given us now, and I made a few notes at the time on the subject, which, with your permission, I will read, as they may assist discussion. They refer chiefly to the practical question of attaining such maps as Mr. Ogilvie has suggested.

Mr. Ogilvie does good service in calling attention to the educational value of maps in scientific fields which are not all of them purely geographical. He points out that it is the duty of the geographical societies of this country to procure the publication of selected sheets of the Ordnance Survey in the form of an atlas of typical landforms such as may be found in Germany or the United States. Incidentally he advocates the maintenance of all editions of Ordnance Survey Topographical maps on sale, as well as the sale of separate prints from colour-printed maps. The atlas of landform types he would have on two scales, 1 inch and 6 inch, and then he proceeds to divide his landform maps into six different classes. So far we agree entirely. The value of such maps, if we could get them, no one will question. The question is how to get these maps. To what extent are the geographica societies of this country to be held responsible for their production and maintenance. Up to a certain point there can be no doubt that geographical societies can lend valuable assistance by advice and suggestion. For if the Geographical Society is not an official surveying department itself, it is of little use if it does not foster and encourage the very first elements of map making, and bring all its influence to bear on good map-production. Mr. Ogilvie draws attention to the debt which is owed by the geographer to the cartographer and the surveyor, but it should not be forgotten that it is a debt, and that the opportunity for the geographer, apart from the surveyor, to supply the basis of such technical maps as he recommends (*i.e.* the simple topographical sheets) is very limited indeed. Such maps are not geographical maps at all in the ordinary sense; they are the finished product of a Government department, and all the geographer can do is to criticize methods and results, and occasionally perhaps reproduce for special purposes. As a matter of fact, on the production of the initial maps on which is to be finally grafted all that special information concerning sciences such as geology, botany, meteorology, and the like, the geographer, apart from the official Government surveyor, is not really in it, and all the Geographical Society can do is to bring its influence to bear on the Government Survey Department.

Having obtained the 1-inch and 6-inch sheets required for the landform atlas series, *i.e.* the simple cartographical expression of those forms either by contour or other method of relief, it is obviously necessary to call on the geologist for the elaboration of those further details which are to represent lithology, porosity, resistance, "process," and "stage." I may go further: hydrography, climate, glaciers, vegetation, soil, and sea all demand the treatment of specialists, and all are based on that work

of the surveyor which the Geographical Society does not control. How then could effect best be given to Mr. Ogilvie's recommendations? Assuming that the Geographical Society ought to maintain a directing influence on the production of everything in the nature of a scientific map, it would require a very wide extension of its present office accommodation and financial support to undertake the production of a physical atlas of such importance within its own premises. I am afraid, indeed, that it would be impossible. Neither can we expect that those scientific societies whose interests are involved can undertake map production on a large scale even within the limits of their own special requirements; finally, I doubt the effect of an appeal to Government to extend its mapping interests into fields of speculative public advantage.

With the general expression of Mr. Ogilvie's views, I do not doubt that we all of us agree, although there may be points open to discussion in detail. It would, however, be interesting to know in what practical way he proposes that this Society should give its support to his recommendations.

Colonel W. C. HEDLEY: I think we should all agree that it is easier to grasp knowledge when explained on a map than when one has to read it up, and we should be very pleased if all these maps could be published. I am afraid, however, that we shall none of us see that done. The topographical maps are, of course, the work of the Ordnance Survey; for lithological and other maps pressure would have to be brought on the Geological Society, and for the vegetation maps application would have to be made to the Board of Agriculture. One very important point is the matter of scale. Small-scale maps are a comparatively simple matter, and if pressure was exercised by this Society and the educational authorities at Oxford and Cambridge it might result in the production of such maps provided the information was supplied to the Ordnance Survey in a satisfactory form, but when it comes to producing a series of maps on the 1-inch and 6-inch scale it is another matter altogether. I think there are about 140 sheets of the 1-inch map in England alone, and for Great Britain this would mean the production and maintenance of some 200 sheets. Before the great expense involved could be incurred it would have to be shown that there was a real demand for such maps. There should be a demand of, say, 500 copies a year: it would not be worth the expense unless there were a real demand of that kind. In the case of the 6-inch maps, I imagine Mr. Ogilvie only meant to suggest that specimen sheets should be produced. I am afraid that his first suggestion that the Ordnance Survey should maintain all editions would prove to be impossible. Perhaps an edition may sometimes be dropped which some people think ought to be maintained, and it is possible, though improbable, that pressure from this and other societies might result in the restoration of certain maps so dropped. Mr. Ogilvie is apparently of opinion that the old series of half-inch maps is for many purposes better than the new. The maintenance of both kinds would hardly be possible. The true solution is an edition which would combine the merits of both. At the present moment I believe a new half-inch map is being engraved which will, we hope, combine the merits of all its predecessors. I think that considerations of storage would make it impossible to keep separate prints from each colour stone of all printed maps, but if anybody wanted copies of any particular sheet he would probably get them at a reasonable price on application to the Director-General of the Ordnance Survey. It would be quite impossible to store different combinations of one, two, or three plates of all the different maps for the whole of England. In designing new maps simplicity and economy ought to be the great consideration. The expense of producing a series of eight forms of maps, each giving some special information, with five or six different colours on each, would be prohibitive for any

large area. Such maps should be based on one of the Ordnance Survey maps, which shows all detail in black. The map would be printed in some lighter colour to allow the special information to stand out plainly. The simpler the form, and the fewer colours you have, the cheaper the maps will be. I think it is a great advantage that maps giving special information should also show the detail, for this makes it possible to identify your position. Without such detail it is very hard to locate a position with any accuracy.

I do not think the method suggested by Mr. Ogilvie for representing the volume of water is a practical one from the printing point of view. The simplest plan would be to print the volume of the water in figures at various points on the river. There would be no difficulty about that at all on a special map prepared to give information with respect to the water. It would not be possible to give such figures on a topographical map, at any rate in England.

Prof. A. P. Brigham, President Amer. Assoc. of Geographers: It gives me a great deal of pleasure to be here this afternoon to hear Mr. Ogilvie. I had the pleasure of being very close to him in an American Pullman car and found him a good companion as well as a good geographer, and with your permission I will read a few words by way of remark.

Through the kindness of the author and of Dr. Keltie, I have had the satisfaction of a preliminary reading of the proofs of this most interesting paper. The demands made upon the geographer at the present time would be appalling if they were not so fascinating and compelling as they are. At no time has geography opened so wide a field for intensive research and for new educational appliances as to-day. Exploration has exposed to us, and described in brief and sketchy fashion, a world of regions which call for precise interpretation. Geology has led us to the new science of geomorphology; and the sciences of man have filed a mountain of unworked material before the geographer.

In this great elaboration, which the younger geographers will have occasion to work out during the next generation, maps will fill a steadily enlarging place. They are almost the only representative material which can afford a correct understanding of remote localities—perhaps I should say—other localities than the one little spot where the geographical expounder happens to be. Pictures, specimens, and even books are complementary to maps, for which geographical education never ceases to call.

Here I base the importance of Mr. Ogilvie's paper. We must have maps by which the principles and facts of the new geography can be put before the eye of millions who will never have the time or taste to master a library. That such maps are not easy to make is to be assumed. The facts of structure, process and stage, are complicated; they vary indefinitely, and in infinite variety as one pass from one region to another. But the task cannot be shunned because it is hard, and I do not see how any one can doubt the goodness of the result, if one quarter of the author's suggestions should be realized. Asa Gray once wrote to Darwin, or possibly it was to Hooker, that he was working on that "rascally genus, the aster." But I do not suppose the botanists have ever thought of giving up the work of classifying asters.

I will not attempt to discuss particular points except to cite in a word a few examples. I remember my surprise some years ago, on visiting a pit at Summertown, in the north of Oxford, at seeing the labourers dip their spades in water and scoop out the clay. The geological map says it is Jurassic, that is, of quite respectable antiquity. But it is yet soft, and has led to the making of a lowland—and a cuesta, if you like the word. I have never seen an adequate—I think I will say a good—map of the Great Appalachian valley. It is a difficult feature to describe, yet its importance, physiographical and historical, is vast. The geological map must make the

zone of the valley look just like the bordering zone of mountains, for in a large part of the extent, the two are parallel. It is hard to explain a valley which is a series of valleys interrupted by long ridges of 500 or 1000 feet altitude. A *resistance map*, if it could be made, would help. I might add that as we have, in the arid regions of the west, much to do with rivers of extreme variability, our topographers use a symbol for intermittent streams. I am sure the idea could be much extended, as Mr. Ogilvie suggests. You are also aware that there is in the United States a Bureau of Soil Survey which has put forth a large number of useful soil maps of selected areas.

I have lately had occasion to say elsewhere that I believed the geographer should build over against his own house. He is likely to under-estimate the value of what to him is familiar and possibly commonplace. But such work is what we need. I think I could make a resistance map of central New York, but I should never have time to learn enough about central England to do it successfully there, even though the conditions are relatively simple. Whatever we gain will be attained through many workers, by a toilsome and often confusing evolution; but we shall attain, and I am confident that Mr. Ogilvie's paper points the way to large and interesting results.

Colonel E. P. Brooker: I am from the Ordnance Survey, and my duties are chiefly in connection with the printing and production of maps. I was extremely interested to hear what Mr. Ogilvie would say about the great possibilities of maps. For statistics and generalized information they excel,—in fact, maps are used frequently by us for other Government Departments to illustrate various statistical information that can best be shown in that way, and I suppose there is practically no limit to the number of maps one could invent to show distribution by different methods of colouring and so forth. As regards Mr. Ogilvie's remarks as to the cheapness of maps, I should like to point out that Ordnance Survey maps are sold now to schools at prices from 1*d.* to 1½*d.* for 200 copies or more, which places schools in the United Kingdom in a better position than the American instance he quoted, where their geological maps are priced about 1*s.* each, so that, as regards cheapness, I think our Government has met that need. The difficulty is as regards numbers. Some people say you cannot expect two hundred copies to be taken, but by a little combination on the part of those interested one would think two hundred is really a very small number if there is really any demand for a map. There are 360 sheets of the 1-inch map which was published from copper in outline with brown hachures. Regret has been expressed that this edition was withdrawn; but it is clear that 360 sheets take a lot of storing, and since it became quite evident that the public did not purchase these maps, it required something more than a few people saying they would like to have them available, for the department to keep them on the catalogue.

I should like to point out that that map is a double printing from copper, and has not the artistic value of the original black edition printed from one plate. Copper plates are not suited for overprinting in that way. If you print a second printing on the first you flatten down the outline and destroy its beautiful sharpness. The ordinary 1-inch coloured edition at present published has the hachures in brown from stone. If these are compared with the edition that was withdrawn, I do not think there is very much difference except that the coloured edition has other information added. I have brought up here examples of the new 1-inch map not quite complete. These will illustrate what Mr. Ogilvie has said that the hachures rather tend to disappear; for, in order to maintain the clearness of the outline the hachures have had to be subdued. I have also brought up some other copies taken from the plates of the hill features only, and I should like to point out that by arrangement such special printings could always be obtained from the Ordnance Survey at rates

corresponding to those at which maps are supplied to schools. The main point as far as it affects Mr. Ogilvie's main contention is that selected sheets can be obtained by special arrangement. When you have these large numbers of sheets covering the whole country, you cannot expect a department to print and keep in stock copies of special maps which may never be asked for. They are for a special purpose, and I would suggest to Mr. Ogilvie that he should adopt the system followed by the Geological Survey, which gets out memoirs for districts and maps to illustrate these memoirs. In that case, I have no doubt special arrangements could be made with both the Ordnance Survey and a publisher by which the maps could be specially printed, much in the same way as we have, on occasion, printed special maps to illustrate books, and sent them to the publisher. Mr. Hinks had some maps which we printed for him to illustrate a very interesting book he wrote. I am sure the Ordnance Survey is always ready to do what it can to meet a definite want.

Rev. H. N. Hutchinson: I should like to say that I attach enormous importance to models. The model of Palestine in the Museum illustrates how much instruction you can get from a model. You can have casts reproduced very cheaply in plaster —one for geology, vegetation, soils, &c., and I think every town that has a Museum ought to have a large model of the country round that town, and teachers and others should bring their pupils and get them round the model, and I think a model can teach a great deal more than a map, because it is the nearest approach to the real thing. I will only put forward the suggestion that models are worth a great deal more than maps.

Sir Thomas Holdich: There are a few remarks in Colonel Close's letter that I ought to read, as he is the responsible head of the Ordnance Survey. Mr. Beckit also sends a few remarks.

Colonel C. F. Close sent the following statement which was read: "As I shall be unable to attend the reading of Mr. Ogilvie's paper on July 2, I should be much obliged if you would kindly have these few remarks read at the meeting.

"Mr. Ogilvie is not quite up to date in his remarks about Ordnance maps. Thus, he talks of the 'wideness of the 100-foot contour.' He is, no doubt, unaware of the fact that on the new type of 1-inch map the contours will be spaced at 50-foot intervals. Then he mentions 'the high price of the official maps.' Here, again, he is no doubt ignorant of the fact that a Departmental Committee is sitting at the present time, which, among other matters, is investigating the question of a possible reduction in price of the small-scale maps. Then he suggests putting 20-foot contours on certain specially selected 6-inch maps. This sort of thing can be done if there is a real and considerable demand for it. But it is 'up to' the schools of geography to come to an agreement with each other and then make a definite suggestion to the Ordnance Survey. Personally I welcome all suggestions tending to make the National maps more useful to all sections of the public, and I should be glad to meet the needs of the geographical schools. But it seems to me that the first thing required is an agreement amongst these schools as to what it is they really want. When they have come to an agreement they might perhaps send representatives to Southampton, and we could then usefully discuss the question as to how far their requirements can be met.

Mr. H. O. Beckit sent the following remarks, which were read: I regret that I am prevented from hearing Mr. Ogilvie's timely and interesting paper. A perusal of his printed text goes a long way towards showing how essential to many, if not most geographical studies is the work of the map-maker. Cartography and geography might surely with mutual advantage move a little more closely hand-in-hand. It will probably be generally agreed that geographers are likely to have to prepare for themselves a good many of the special maps referred to in the paper.

From some little experience of compiling such maps in the course of my own studies and in teaching, I am inclined to venture a criticism of two of Mr. Ogilvie's conclusions. To take the smaller point first, it appears to me dangerous physiographically, to carry very far any classification of land-surfaces that results in placing under one category in relation to stage areas of heterogeneous structure, because they have undergone identical physiographic processes for the same length of time: this will tend toward some confusion, always only too easy, between stage and age. Probably in all small-scale diagrams the difficulty will have to be faced; but I should like to suggest to the author of the paper a second and more general criticism, that he may perhaps be a little premature in deciding, I think more than once, in favour of the wider utility of highly generalized small-scale representations, as against the greater detail only possible on larger scales. It goes without saying that the latter will be more exact. That is not the point, but rather that in the really exploratory work of settling many new cartographic methods that will be necessary, the essentially simpler though multiple problems of the larger scales will more safely be tackled first. With most of what is contained in Mr. Ogilvie's paper I should like, in conclusion, to express very hearty agreement—an agreement, I imagine, that will be generally shared by all who are interested in the rational progress of geography, especially on the physical side.

Mr. Ogilvie: I should like to begin by offering my thanks for all the criticisms and suggestions which have been made upon the paper. This is a paper which I hoped would be discussed and criticized, and I am glad to have set the ball rolling. The discussion has given me several welcome pieces of news regarding the Ordnance Survey. From Colonel Close I learn that the contour interval of all "1-inch" maps is in future to be 50 feet. This is a great improvement. Secondly, we have heard that there is some idea of reducing prices, and Colonel Hedley tells us that we may look forward to an improved "half-inch" map. I gather from Colonel Hedley's remarks that I have not made my meaning clear as regards the suggested atlases of landform types. In speaking of proposed atlases on two scales I did not intend to imply that they would include large numbers of sheets, but a small collection of carefully selected maps published at a low price. I should take as models the United States Atlas of Physiographic types and the "Forty maps of the German Empire, 1:100,000." The latter are published for educational purposes at about 2*d.* per sheet. A short description of each sheet was written by Dr. Behrmann and issued by the Geographical Society of Berlin. I thank Colonel Close for the assurance that the co-operation of the schools of geography by suggestions on their part would be welcomed by him. I feel sure that the geographical schools would be only too pleased to help in the selection of Ordnance sheets for such atlases.

Colonel Brooker reminds us of the facilities given to schools in purchasing Ordnance maps. I referred to that in the paper, and I did not consider that the provision met the requirement under discussion. But Colonel Brooker's remarks give me the idea that perhaps the existing regulations would prove sufficiently elastic to give us the "1-inch" landform atlas without delay. Let us say that forty British maps be selected, and that two hundred sets of them, as a minimum, were published at 1*d.* or 1½*d.* per sheet, I am convinced that there would be no difficulty in selling every set. Thus, by altering slightly the present regulation, and by careful selection of maps, knowledge of the main types of British landform would at once be spread throughout the country.*

* Colonel Brooker afterwards indicated that this arrangement would probably be practicable, and he further pointed out that for such a collection of maps special printings—as referred to in the paper—could probably be included.

I am much obliged to Colonel Brooker for bringing examples of the new 1-inch map, and especially for showing us the half-printed map. Nothing could be more graphic than this beautiful and delicately tinted map of the relief of South Devon. But comparison of this map showing relief only with the completed map shows that my remarks apply even more to this new edition than to the old. For the addition of the boldly printed "outline detail," by its great contrast, renders the relief even less effective than in the old map. Colonel Brooker says that the public did not purchase the engraved map. I think there are two reasons for this: first, that the public were not educated to appreciate relief on maps; but teachers now claim with reason that the public is learning, and the best instrument for teaching them has been withdrawn. But probably the map was not purchased even by all teachers for the second of my reasons, viz. that the map was never properly advertised.

I recognize that the brown engraved map as an engraving is somewhat inferior to the earlier black map. But I presumed it would be useless to attempt the restoration of a map which disappeared at a still earlier date. Moreover, I think that the best of the shades of brown which was used appeals to the eye in a remarkable way.

Colonel Hedley raised the question of storage difficulties. If the necessary funds can really not be procured to provide for the preservation of the stones or plates of all editions, or even for a reserve stock of printed maps, I would suggest a small reform in procedure which might go some way to meeting the difficulty which has arisen. I suggest that, before any edition is withdrawn, the fact be well advertised by the agents and by special notice to geographical societies and teaching institutions, of which a list should be kept by the Ordnance Survey. In this way institutions or individuals would be given an opportunity of purchasing, before withdrawals, copies which they would otherwise have obtained more gradually.

As Colonel Hedley says, the production of a variety of colour-printed maps showing different features of the same area is expensive. But the eight maps referred to (of Passarge's Atlas) are sold at 10*s*. I do not suggest that such map-production be undertaken wholesale by any one. These maps should be published merely in illustration of special studies.

I wish to thank Prof. Brigham for coming here to-day, and for his remarks. I ought to have referred to the excellent "soil" maps of the United States of which he spoke; but my mind was occupied rather with maps which exist or do not exist in this country.

I agree with Mr. Hutchinson in his reference to the educational value of models; but their bulk must greatly limit their use. In my paper I was, of course, discussing maps only.

I am specially glad to have Mr. Beckit's criticism of this paper. I am conscious that, however difficult it may be to find a method of mapping the distribution of anything on a large scale, a satisfactory method can generally be found; while small-scale mapping always has hanging over it the danger of false generalization. I think the small-scale diagrams are wanted as handy references to the broader features, since they can easily be made accessible to all. But I agree with Mr. Beckit that the generalized plotting and the cartographic methods to be adopted for the small scales will be better done after the detailed maps have been made on larger scales. I think that Mr. Beckit's other criticism is just; I have probably underestimated the danger to which he refers. I think, however, that generalized "stage" maps can usefully be drawn without making the element of time a criterion in marking out the areas.

And now in answer to the Chairman's question as to the manner in which the geographical societies can help in getting the various tasks accomplished. I would

indicate the parts which might with advantage be played by the various bodies in helping to attain the desired object.

As Colonel Close points out, the schools of geography should come to an agreement as to the precise nature of the various maps required in teaching and in geographical research. Where these maps would be the product of Government departments, and where they might be obtained without much additional cost to the State, the schools should endeavour by conference with the departments concerned to arrange for their production.

Where the production of such maps would involve considerable expenditure by a Government department, the geographical societies must take the matter in hand, provided, of course, that they are satisfied that the proposal is worthy of their support. It would then be the duty of the societies to point out to the responsible member of the Government the scientific and educational value to geography of the work for which they are asking sanction. Moreover, it might not be out of place for a scientific society to point out to the Government the practical utility to the country of such work. The utility of even the maps of the Geological Survey has not always been recognized by those in authority. And if they had now been persuaded by scientists, for instance, that the vegetation survey has a practical value, ministers might review the whole question of the potential values of uncultivated land with the knowledge that their statements were based upon the results of scientific work.

A great number of the map types which I have mentioned do not fall to be produced by Government departments, but would naturally appear as illustrations of papers read to this and other societies. Now I suggest that the geographical societies should remind other societies of the points in which their respective scopes coincide, and let it be known that the cartographic expression of results in all work done on these border zones of the sciences would be welcomed by geographers. Under certain circumstances this Society might well share with other societies the cost of producing maps interesting to both.

REVIEWS.

EUROPE.

'Lombard Towns of Italy.' By Egerton R. Williams. (London: Smith, Elder. 1914. Pp. 561. *Price 7s. 6d. net. Map. Illustrations.*) Mr. Williams' third volume of his trilogy on North Italian cities describes the historic towns of Lombardy. In this study we are reminded of Italy's struggles for independence, and also of our indebtedness to Lombardy for our present form of Anglican ritual. The towns dealt with *in extenso* are Pavia, with its magnificent Certosa; Mantua, the beloved of Virgil; Bergamo; Monza, with its famous Iron Crown, coveted and fought for during many centuries; Saronno; Varese; Lodi, and Crema. History, art, literature, all have a share in the interest of the author, and are entered into as fully as is possible in a single volume, for some of these towns could hardly be exhaustively described if each had a volume to itself.

'Rome. A Practical Guide to Rome and its Environs.' By Eustace Reynolds Ball. (London: A. & C. Black. 1913. *Price 2s. 6d.*) 'A Handbook to Rome and its Environs.' (London: Ward, Look & Co. *Price 2s. 6d. net.*) Both of these guide-books appear to do full justice to the incomparable sights and

monuments of the Eternal City. The former contains a useful account of Commendatore Boni's excavations, which brings modern research up to date. On the other hand, Messrs. Ward, Lock & Co.'s book is richer in its illustrations and maps, though it might have been more convenient if the general map of Rome had been contained in one sheet instead of being divided into three longitudinal sections. A small key-plan of the entire city partly atones for this drawback. The illustrations, etc., to Mr. Reynolds-Ball's volume (borrowed from another volume published by Messrs. Black) are artistically coloured. A bibliography of the principal popular books dealing with Roman history, archæology, art, and topography published within the last few years, as well as some of the standard works on the same lines, forms a useful appendix to Messrs. Black's publication.

ASIA.

CYPRUS.

'Griechische Sitten und Gebräuche auf Cypern.' By Magda H. Ohnefalsch-Richter. Berlin: D. Reimer. 1913. *Map and Illustrations.* 16 *M.*

Cyprus has an especial interest for all of us who are concerned with the anthropogeography of the Mediterranean, as it represents the meeting-place of East and West in both ancient and modern times. Frau Ohnefalsch-Richter has had more opportunities than most for studying the place and people, as she has accompanied her husband on so many of his archæological expeditions, and her book covers a much wider ground than the title suggests. First we have the kind of information we should find in an official handbook, for instance, a chemical analysis of the wine and the condition of the export trade. On the other hand, the book is full of information gleaned from the people themselves, of folklore, of descriptions of primitive customs, and so on. For example, attention is called to the potters of Phynè, who still make their pots without a wheel as did their predecessors in the Bronze Age, and we have a description with photographs of an Aphrodite feast at Larnaka. In fact, we have a most complete list of those things in Cyprus, both cultural and technological, which seem to be survivals of the Bronze Age or other ancient cultures, and we cannot but be grateful for a collection of facts which are day by day becoming more difficult to obtain. Of the present Frau Richter has also much to say, but she often fails to draw a distinction between those things which are essentially Cypriot and those which are common to all or a considerable part of the Near East. We are often left to suppose that a particular culture is centred and centred only in Cyprus.

The history of the island also comes in for due mention, and we are told, what we could well spare, the tale of the recent struggle for the archbishopric. The natural features of the island are treated in a general way, and there is a specially interesting notice of the flora and fauna with reference to their relation to mankind. Many excellent photographs are incorporated in the book, and they serve to bring home the life of the Cypriots better than anything else. It will be seen, then, that Frau Richter has treated the subject from many points of view, but we cannot help feeling that the book, while full of information, is addressed rather to the general reader or to the traveller than to the student of geography; until, however, a more serious book appears it supplies in a convenient form much useful information.

L. H. D. B.

AMERICA.

Bolivia.

'La Bolivie et Ses Mines.' By Paul Walle. Pp. xvi, 444. *Photographs and Maps.* Paris: E. Guilmoto. 1913. 7.50 *fr.*

Bolivia is emerging from its isolation. M. Paul Walle, in the course of his work in connection with the French Ministère du Commerce, visited the country in 1911–12, after an interval of twelve years. He was struck by the distinct progress which had been made, and became aware of an awakening which foreshadows the results which will ensue when the Panama canal is normally in use. His book describes the country in detail from the point of view of the man of business, yet the geographer will find therein a mine of information. From the first chapter, which describes the routes by which the traveller may journey to Bolivia, to the last chapter, which deals with openings for French commerce, the book is intensely practical, yet, with the assistance of the admirable map appended to the book, the reader may glean from the text an idea of the geographical conditions of Bolivia which will serve as a unique illustration of a country in the New World, dependent almost entirely upon its mineral resources, historically famous as one of the richest sources of precious metals—the wealth of Potosi is legendary—yet suffering from its altitude and its isolation, and only now feeling the modern impulse towards the construction of railways on which the very future of the state depends.

Bolivia, in the present and the past, implies the source of silver and tin; yet Bolivia, of the future, will be a much greater country, notable for its agricultural products. Hitherto only the plateau has been exploited; yet roughly half the country lies on the lowland to the east of the cordillera, where there is a great variety of vegetation, and an immense possibility of future production. The forests yield rubber, timber for all purposes, gums of varied kind; the grassy plains are at present practically uninhabited. Contrasted with the high plateau, the lowlands are exceptionally fertile, in consequence of the alluvium regularly fed to the soil by the multitudinous rivers which send water to the Amazon or the Plate. This area, of an enormous potential productivity, is cut off from the world by the barrier of the Cordillera, and awaits the railway and the colonist.

The high plateaux include two regions—the lower land, from 1 to 2 miles above sea-level, with a gentle climate and a varied vegetation, and an extremely varied relief; and the higher land, from 2 miles in elevation up to the snow-line, which is roughly 3 miles above the sea. The lower plateaux yield practically all the vegetable produce required for home consumption—coffee of notable excellence, cocoa, cane-sugar. Cocoa alone is exported to neighbouring lands.

The virtual capital, La Paz, is reached by railway from Antofagasta, in Chile, or from Mollendo, in Peru. This forms the main railway line in the country, yet the branch lines, either constructed or under construction, are important connections gradually joining the mines with the ports just named. At present the journey from Europe to La Paz takes about twenty-eight to thirty days, and the minimum cost is about £50; but when rail connection is completed between the systems of Bolivia and Argentina viâ Uyuni and Tapiza, there will be a saving both in time and money.

The awakening of Bolivia is indicated by the following table, which has been compiled from M. Walle's statistics. Imports and exports have trebled in a decade; rubber production has doubled in seven years. The production of silver has seen various changes, due to two causes—first, the decline

in value of the metal; but secondly, and of greater importance, the transference of the interest of the miner from silver to tin. Tin and bismuth are of increasing importance; but the production of copper depends upon the price of the metal. When copper fetches £70 a ton in Europe, copper mining in Bolivia just pays its expenses, and the great rise in 1912 is due to the high price which prevailed.

Year.	Trade in million pounds		Rubber. Million pounds.	Minerals in thousand tons.			
	Imports.	Exports.		Silver.	Tin.	Copper.	Bismuth.
1912	4·0	7·2	*7·9	0·12	38	4·7	0·38
			(Percentages)				
1903	33	28	—	133	55	85	—
1904	35	35	—	84	58	68	
1905	40	46	42	75	74	98	
1906	60	61	53	92	76	94	
1907	75	55	50	125	74	75	52†
1908	80	54	72	133	79	64	
1909	68	71	86	133	95	66	
1910	98	84	86	117	102	68	80
1911	115	91	100	108	97	68	106
1912	100	100	—	100	100	100	100

B. C. W.

Countries of South America.

'South American Handbooks.' London: Sir Isaac Pitman & Sons. 1914. *Maps and Illustrations. 6s. net each.*

From time to time notices have appeared in the *Journal* of volumes in Mr. T. Fisher Unwin's "South American Series." Sir Isaac Pitman & Sons are publishing a similar series under the general title "South American Handbooks." The first four of these handbooks are 'North Brazil' and 'South Brazil' (both by Mr. E. C. Buley), 'Peru' (by Mr. E. C. Vivian), and 'Colombia' (by Mr. V. Lévine). The volumes are both smaller and cheaper than those in Mr. Fisher Unwin's series, but are equally comprehensive in scope and adhere more closely to a general plan. The four under notice range in length from 216 pages to 235 pages, demy octavo. From a description of the physical conditions they pass through the flora and fauna to man and his varied activities—his history in the country, present distribution, political organization, finance, social conditions, means of transport, resources and industries, and foreign trade. Finally comes an alphabetical list of the chief towns, with notes on each, while appendices give information about such matters as money, weights and measures, posts and telegraphs, steamship lines, and diplomatic representatives. At the beginning is a map of the country under discussion, at the end a small general map of South America, and among the illustrations a sketch-map of the country's waterways and railways. Photographic illustrations number from thirteen to fifteen. An index is provided. Briefly, the aim seems to have been to produce concise, practical works of reference, and this has been well attained in the volumes under notice. It should be observed that in the handbooks of North and South Brazil many of the pages are identical in the chapters on climate and health,

* 1911. † Average 1904 1909.

history and settlement, constitution and defence, federal finance, social conditions, imports and exports. The appendices are also the same, as are two of the three maps. In any future edition, the river descended by Mr. Roosevelt will need to be marked on the maps and included in the list of chief rivers.

'Ten Thousand Miles with a Dog Sled.' By Archdeacon Hudson Stuck. (New York: Scribner's Sons. 1914. Pp. xix., 420. *Map and Illustrations.* $3.50.) The Archdeacon of the Yukon, known to geographers for his 'Ascent of Denali (Mount McKinley),' here describes his extensive journeys in Alaska, with much detail of geographical and allied interest, illustrated by excellent scenic photographs. He ranges over the middle and part of the lower valley of the Yukon and much of those of its tributaries the Porcupine, Tanana, and Koyukuk, and also discusses journeys over three separate routes through the country between the Yukon and the Alaska ranges to the south, in the Seward peninsula, along the Kobuk river, and elsewhere. On conditions and methods of living and of travel in this difficult region, on climatic conditions, as well as on social and other aspects of Alaska, he writes with interest and authority.

'The real Mexico. A Study on the Spot.' By H. Hamilton Fyfe. (London: Heinemann. 1914. Pp. viii. and 247. *Map.* 6*s. net.*) Mr. Fyfe's picturesque narratives, based on his experiences in the most diverse parts of the world, are so well known that to say this collection of letters on a recent autumn tour through Mexico is quite typical and worthy of his facile pen, is to give it no small commendation. The letters are, of course, republished from the journals for which Mr. Fyfe acted as special correspondent. Interspersed with pictures of social existence and everyday life, outdoors and indoors, are character sketches of the chief personages who have figured in the exciting public events of the last few years. The *coup d'œil* is one of bewildering variety and continual movement, but it is difficult to draw or deduce therefrom any general conclusion as to the immediate future of this interesting but puzzling corner of the New World. Sooner or later it is bound to play a great part in the development of the almost boundless West.

'Handbook of Jamaica.' By J. C. Ford and F. Cundall, F.S.A. (London: Stanford. 1914. Pp. viii. and 652. *Map.* 6*s. net.*) This quasi-official publication has now reached its thirty-fourth year. It contains many features which render it almost indispensable to residents—official or otherwise. It is at once a gazetteer and directory, a Government handbook, and a traveller's guidebook. A glance at the contents pages and index is a sufficent indication of the conscientious and painstaking methods of the editor. The portion intended for tourists is unusually complete, and includes full details of the local communications, accommodation, principal attractions, amusements, sporting facilities, etc.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Wave Studies.

'Waves of Sand and Snow and the Eddies which make them.' By Vaughan Cornish. London: T. Fisher Unwin. [1914.] *Map and Illustrations.* 10*s. net.*

Fifty years ago J. F. Campbell wrote a delightful book under the title 'Frost and Fire—Natural Engines, Tool-marks, and Chips, with Sketches at Home and Abroad by a Traveller.' The subject was an old one, but his treatment of it and his diagrammatic generalizations were always interesting,

and often highly suggestive, even where they might be somewhat whimsical. Not the least interesting section of his work is the short part on "Deposition by the 'engines' air and water, working with the 'tools' wind and waves, and characterized by many and varied 'tool-marks.'" Since 1865 the observations and investigations of physicists and engineers have provided much guidance for the study of wave-prints in nature, and Dr. Vaughan Cornish made the reading of their work a preliminary to his own. He has, however, approached the subject in the same out-of-doors spirit as J. F. Campbell did, and he too has collected his instances for observation and record from the wide field of a traveller.

In 'Waves of Sand and Snow and the Eddies which make them' we have eighty beautiful plates, in which the author fully maintains his high standard in photography, and thirty figures in the text—a comprehensive and valuable record of tool-marks which are more or less known to all who have eyes to see. These are illustrations of some of the sandhills, snowdrifts, and sandbanks which Dr. Vaughan Cornish has examined, watched, and measured in the last twenty years, and in this volume he has brought together for more popular exposition many of the results which he has published from time to time in scientific journals. The book may be read with profit by a wide public, as it is nowhere so technical as to demand special knowledge from the reader, and those who have seen much of sand and snow will thank the author for bringing before them many points of interest which they have hitherto missed.

The author's method is to give in considerable detail the narrative of his own experiments and journeys of observation in the field, followed by his explanations of the phenomena described. While the method adopted is scientific, many readers will regret that Dr. Vaughan Cornish has not gone a little further, and pointed out where his conclusions are in agreement and where in disagreement with those of previous writers. In fact, the appearance of a book intended for general readers which is based upon the work of a single observer emphasizes the need for a work which will correlate the results, physical and geographical, of all the observers of waves of this kind, and will give references to their writings; and the literature, at any rate of sand-dunes, is extensive.

In the mean time we have in 'Waves of Sand and Snow,' a work which should perform a very useful function in impressing on its readers the great value of patient and careful observation in the field.

As regards the illustrations, there is a slight criticism which may be offered by more serious students. As the subject is one in which the illustration of form is so important, it is to be regretted that the actual waves—of sand or snow—which were photographed were not also shown by contoured sketch-maps. These would form a useful supplement to the clear diagrams which accompany the text.

A. G. O.

GENERAL.

Ocean Commerce.

(1) 'Ocean Trading and Shipping.' By Douglas Owen. Pp. 277. Cambridge Naval and Military Series. Cambridge University Press. 10*s.* 6*d.* *net.*

The first chapter of this book is of the greatest interest to the geographer: it is replete with suggestive ideas concerning ports and the causes of their success. Chapter II. deals with ships, their ownership and measurement, and especially with the machinery which must be set in operation before a ship can

be employed upon a trading voyage: the chief instruments are, of course, the charterparty and the bill of lading, and specimens of these documents are included in a pocket at the end of the book. Lloyd's, and all that Lloyd's means, is explained in Chapter III., and the rest of the book is devoted to importing and exporting, with special reference to the new circumstances which affect ships when war is declared. The reader owes much to Mr. Owen for the clarity and completeness of his exposition, but the geographer, we repeat, is in his debt for the excellence of the first chapter, which should be read by all teachers of geography.

(2) 'Die Grundlagen der Schiffahrtsstatistik. Ein kritischer Beitrag zur Wertung der Handelsflotte und des Seeverkehrs des Deutschen Reiches. By Dr. Walther Vogel. ('Veröffentlichungen des Instituts für Meereskunde an der Universität Berlin.' Heft 16. September, 1911. Re-issue: Heft 1. Historisch-volkwirtschaftliche Reihe.) Pp. 154. *Diagrams.*

This re-issue of an important communication concerning shipping and sea traffic permits us to call attention to the value of the volume on account of both its parts. The first part contains a summary of the official publications dealing with shipping, a statement of the various methods of measurement employed in the case of merchant ships, and of the errors which may arise from these methods. The second part consists of an attempt to lay bare the progress which has been made in connection with the German mercantile marine since 1874.

All those students of geography or of economics who have attempted to make comparative studies of the merchant fleets of the great trading nations will have experienced difficulty in finding a common measure which will furnish a basis for comparative statistics. Part I. of Dr. Vogel's book will be of immense help in the case of future studies of this kind. It does not remove the difficulties, but it makes the student's path easier.

The statistical inquiry into the growth of German shipping is admirably illustrated by means of diagrams, from one of which we gather almost at a glance the great disproportion which has always existed between the use made of Hamburg and Bremen and the use made of the other German ports. In addition to this disproportion we note that most of the other ports have suffered decline steadily during three decades, and that the out-ports of the Elbe and Weser do not yet hold a high place in regard either to number of ships or of tonnage. From a second diagram it becomes clear that in the cases of the United Kingdom, Denmark, Sweden, and Norway the bulk of the German trade is still in the hands of ships flying the foreign, *i.e.* non-German flag, *e.g.* in the case of German trade with the United Kingdom half the tonnage is under the British flag, and a third is German.

B. C. W.

Coast Economy.

'Coast Sand Dunes, Sand Spits, and Sand Wastes.' By G. O. Case. Pp. 162. 1914. 5*s. net.*

'The Use of Vegetation for reclaiming Tidal Lands.' By G. O. Case. Pp. 36. London: St. Bride's Press. 1913. 2*s. net.*

The first of these volumes is a most useful little book crammed with facts culled from all parts of the world and well illustrated with photographic reproductions and diagrams. Numerous references to other works are given. Mr.

Case discusses the formation and distribution of sand dunes and the devastation caused by them when they move inland, and then goes on to consider protective works and the reclamation of sand wastes. If we have one criticism to offer it is that the book is too condensed. There is certainly not a superfluous paragraph. The author particularly advocates the construction of protective coast dunes to prevent inland sand drift, and to allow existing areas of sand waste to be reclaimed and converted into woods. On this subject the book expands a little.

The second volume is a reprint of several articles which appeared in *Engineering* last year. It is very slight, but gives a useful summary of the subject.

Educational Books.

(1) 'The Teaching of Geography and History.' (Pp. 132. 1*s. net.*) (2) 'Our Island History.' (Pp. 320. 2*s.*) (3) 'The Modern British State.' (Pp. 270. 1*s.* 9*d.*) By H. J. Mackinder. London: Geo. Philip & Son. 1914.

The first of these three books redeems a promise made by Mr. Mackinder that he would indicate the lines along which the teacher should lead his pupils in the early stages of geography before use is made of books, and a second promise that he would provide a teachers' commentary upon the volumes in his series 'Elementary Studies in Geography and History.' It suffices to say that Mr. Mackinder has redeemed his promise in a book which is at the same time stimulating and practical.

In 'Our Island History' Mr. Mackinder endeavours "to give a sense of the stream of time, so that the present may be realized as the outcome of the past." The stream rises in Julius Cæsar, and passes many well-known landmarks until it reaches St. Augustine, when it receives tributaries from Scotland and Ireland, and flows on by Alfred, William I., and Edward I., and becomes a flowing current through the spacious Tudor times till it reaches Oliver Cromwell and Dutch William; it then trickles onwards *viâ* Walpole and Nelson to end at George Stephenson.

'The Modern British State' "aims at giving a description of the social organism which is known as the United Kingdom," and succeeds in a striking and novel fashion in introducing the pupil to the study of civics.

'A Laboratory Manual for Physical and Commercial Geography.' By R. S. Tarr and O. D. von Engeln. New York: The Macmillan Co. 1913.

This manual has been prepared for use in the high schools, the normal schools, and colleges of the United States. There is a series of lessons, for each of which is provided a statement of the purpose of the exercise, a list of the apparatus required, and one or more pages on which there are printed questions each followed by a space in which the reply may be written. The complete set is so arranged that the separate pages may be withdrawn from the stout paper covers and used, and then rebound in the order in which the exercises have been completed. The subject matter is comprehensive, and, although the exercises upon the topographical maps refer entirely to portions of the United States contoured maps, British teachers will find much that is suggestive and helpful in this manual.

The Oxford Geographies. 'The World and its Discovery.' By H. B. Wetherill. Pp. 318. *Maps*. The Clarendon Press. 3*s*. 6*d*.

The aim of this book is to supply an introduction to the study of the geography of a continent by means of stories of discovery. The continents are taken in the order: Africa, Asia, America, and Australia. Six chapters, for instance, are given to the voyages of Hanno, Cadamosto, da Gama, the travels of Park and Livingstone, the search for the Nile sources, and the relief of Emin Pasha by Stanley, and the seventh chapter summarizes the geography of the continent.

Mr. Wetherill has been at pains to intersperse explanations of the prominent geographical circumstances which arise in connection with each story, and has added some helpful maps.

'The British Isles.' By F. Mort. Pp. xii., 232. *Maps and Illustrations*. Cambridge: University Press. 1914. 3*s*.

Mr. Mort provides the pupil with an excellent introduction to the detailed study of the British Isles, since he gives the main features of the geography of the homeland in perspective and in correlation. His maps and pictorial illustrations are excellent.

'A Little Book on Map Projection.' By Mary Adams. Pp. 108. *Diagrams*. Geo. Philip & Sons. 2*s*. *net*.

It is a sign of the times that Miss Adams has written such a useful and teachable account of the various map projections, so shortly after the appearance of Mr. Hinks's authoritative work on the same subject, to which she acknowledges her debt. An illustration of the real usefulness of this little book may be seen in the following summary of the suggestions for teaching the properties of the sphere in regard to its plane sections: take a box with a perfectly plane top edge, fill it with clay, or plasticine, or founder's sand, press a ball, *e.g.* a billiard ball, into the material, remove the surplus material above the plane of the box top, remove the ball and examine the mould which is left.

B. C. W.

'The British Empire beyond the Seas.' By Marion I. Newbigin. (London: Bell. 1914. Pp. xii., 351. *Maps*. 3*s*. 6*d*.) This is a good descriptive geography, commendably free of the formality and dryness of many text-books, and yet not too discursive. The territories of the Empire are arranged on a mainly climatic basis under four sections—regions with cool or cold winters, regions with warm summers and mild winters (in which the whole of the Australian continent is for convenience included, though the arrangement is not wholly satisfactory), hot regions with extensive native cultivation, and hot regions with little native cultivation. The arrangement of the two last sections is ingenious and instructive. This reasoned classification, though explained clearly on broad lines, might perhaps have been kept more constantly in view throughout the descriptive paragraphs. The maps and diagrams are for the most part clear and good.

'The Pan-Anglos.' By Sinclair Kennedy. (London: Longmans, Green. 1914. Pp. x., 244. *Map*. 7*s*. 6*d*.) Under this cacophonous but perhaps unavoidable title the writer discusses the federation of the "Seven English-speaking nations"—the British Isles, Canada, Newfoundland, South Africa,

Australia, New Zealand, and the United States. In so far as he is careful to furnish references throughout and frequently, the book is a valuable index to much that has been written and spoken concerning federation and allied topics of imperial interest, nor is it without value to have summarized and clearly presented the case for British imperial federation; but the case for the inclusion of the United States is less clear, and the probable standpoint of that confederation in the matter is not so fully worked out.

THE MONTHLY RECORD.

ASIA.

The Turco-Persian Frontier.—The work of the Turco-Persian Frontier Commission (*Journal*, vol. **42**, pp. 492, 570) was successfully completed on October 28, twenty-four hours before the inception of hostilities against Russia by Turkey. The last pillar was erected, under the supervision of the British, Persian, Russian, and Turkish Commissioners, on October 26 at the foot of Mount Ararat, on the slopes of which the Turco-Persian frontier unites with the Turco-Russian frontier. By an interesting coincidence a Turco-Russian Commission, which had been re-erecting fallen pillars and effecting certain minor adjustments of frontier, also finished its work during October. The total length of frontier, from Fao to Ararat, as finally demarcated, was about 1200 miles. Practically the whole of the frontier is shown on new maps, specially prepared for the Commission, usually on the 1 mile = 1 inch or 2 verst = 1 inch scales, by the British and Russian survey parties attached to the Commission; the former being supplied by the Survey of India, and commanded by Lieut.-Colonel C. H. Ryder, D.S.O., R.E., with whom was Major H. McCowie, R.E. It remains to be seen how far subsequent events have rendered the Commission's labours nugatory, but it may be confidently anticipated that in the south the frontier that has been laid down will be accepted as the frontier between Persia and the newly acquired British territory of Mesopotamia; and in the north, likewise, it will constitute the frontier between the Persian province of Azarbaijan and the newly conquered territories of Russia in Armenia. The British Commission did not pass unscathed through the lawless regions traversed by the frontier, Mr. G. E. Hubbard, Levant Consular Service—the secretary to the British Commissioner—being severely wounded in the course of a treacherous attack by some Kurds upon a party of British officers belonging to the Commission.

Dr. F. de Filippi's Expedition.—We have received two letters from Dr. de Filippi, the first sent from Yarkand on October 3, the second from Tashkent on November 18, reporting briefly on the last stages of his expedition, which had completed its whole programme by the second date (cf. *Journal*, vol. **43**, pp. 32, 672; **44**, p. 407). In the first letter he states that the extremely bad weather and the flooded rivers frustrated all attempts to reach the Oprang river, though two of his companions—Wood * and Spranger—had, in spite of difficulties, completed the survey of the whole upper basin of the Yarkand river. The party were busy at Yarkand with the gravity station, and purposed to make another at Kashgar and a last at Tashkent, thus connecting the Indian stations and the whole chain occupied by the expedition with the Russian series. The second letter reports the successful execution of this purpose, thus completing the expedition's work. Dr. de Filippi

* Major H. Wood, of the Indian Trigonometrical Survey, who joined the expedition early last year with two Indian surveyors.

hoped to return to Italy *viâ* Bukarest, and to send us from thence a fourth and last report on the work of his expedition.

Recent Coast Erosion at Morib, Selangor.—Mr. C. Strickland, M.A., B.C. CANTAB., sends us some notes on a case of recent rapid erosion of the coast at Morib, a small seaside resort in Selangor somewhat frequented by Europeans. A metalled road which ran at right angles to the sea is said to have been washed away to the extent of 100 yards, a gentleman's garden has lost 30 feet in one year, and stumps of coconuts now stand in the sea some distance from the land, while others lie fallen or are ready to fall. The erosion is localized within a narrow area, and as the trouble is nearly conterminous with the area here cleared and planted with coconuts, it might be thought that the destruction of the original jungle was in some way responsible. But as clearings have not resulted in erosion in other parts of the coast, this does not seem to be the case. Nor does the cause appear to have been the removal of a belt of mangrove, for erosion is proceeding apace behind some of the thickest and best-grown mangrove. Mr. Strickland calls attention to the existence, elsewhere along the coast, of a long narrow barrier of sand and humus, raised several feet above the surface of the land behind it, and covered by soft short grass and casuarinas—probably a storm beach raised by the south-west monsoon. This, he thinks, was probably once continuous, but has been washed away in front of Morib. The cause would seem to have been the cutting of a road drain 10 to 15 feet wide down to the sea at the spot where erosion has been greatest, at the apex of the bight now occupied by the sea. The soft barrier would be easily washed away on its cut flanks by the scour of the drainage and of the tides, where the frontal assault of the sea had previously no effect; every particle of the barrier having lost its lateral *point d'appui*. Now that the process has been started it is bound to continue until some other natural or artificial cause stops its progress, the alluvial formation washing away quickly under the frontal assault of the sea, even where its lateral action has been checked by the erection of masonry. The facts well illustrate the protection given by a storm beach to an alluvial tract behind it, the impregnability of the barrier to a frontal assault, its weakness when pierced, and the failure of the alluvium to withstand a *frontal* attack when exposed by the loss of the barrier.

AFRICA.

Railways in Fernando Po.—A beginning has already been made with the opening up of this Spanish West African island by means of railways, and it is proposed to gradually extend the system until all the more important economic areas are linked in this way with the capital—Santa Isabel, on the north coast. A sketch of the programme suggested, based on a report by Commandant del Rio Joan, appeared last year in the *Revista de Geografía Colonial* of the Madrid Geographical Society. The most important line, part of which is already under construction, is that connecting the capital with the bay of San Carlos on the west coast, and traversing the whole western versant of the island, on which the most important areas of settlement are situated. By keeping somewhat inland it will avoid crossing the more difficult, deeper, parts of the valleys, though not reaching a greater altitude than 300 metres. Its length will be about 45 kilometres. A second projected line is one from Santa Isabel to the bay of Concepcion on the east coast and thence to the southern extremity of the island: this will encounter somewhat greater obstacles than the first, and will have a length of 70 kilometres. Two transverse lines are also suggested, one connecting San Carlos with Concepcion, the other serving the settlements along the southern coast.

AMERICA

Miss Keen's Glacier Explorations in Alaska.—Miss Dora Keen, whose enterprising first (partial) ascent of Mount Blackburn, in the Wrangel mountains east of the Copper river in Alaska, was recorded in the *Journal* for August, 1912 (vol. **40**, p. 217), sends us a short account of an expedition carried out last summer to the glaciers of the Prince William sound region, undertaken at the suggestion of Prof. L. Martin, one of the previous workers in this field.* Her expedition, which left Valdez on August 15, included Messrs. Handy (her guide up Mount Blackburn), Rabehl, and Tucker, all of them experienced in glacier work, Mr. Tucker having been a member of the Parker-Brown expedition which partially ascended Mount McKinley in 1910, and in the Yale party which made the first ascent of Coropuna in Peru in 1911. The first object of the expedition was to explore and map the hitherto unvisited portion of the Chugach mountains in which the Harvard glacier has its origin.† It was hoped that, by ascending this, a crossing of the range might be effected to the Matanuska glacier on the farther side, returning by the valley of the same name. The Harvard glacier has a tidal ice cliff 350 feet high and 1¼ mile wide, approach to which is dangerous by reason of the constantly falling ice. A landing was, however, effected, but seracs made travel on the glacier impossible, so that the supplies (including fuel) had to be painfully relayed for seven miles by a difficult way at the edge of the ice. Getting at last on to the glacier itself, the party pushed on another 9 miles over endless crevasses, but was then brought to a halt by the shattered state of the ice. The divide lay some 10 miles beyond up Brunonian glacier—as the main north-western tributary was named—apparently at an elevation of about 7500 feet. Owing to the hard going and bad weather this trip occupied nearly four weeks, but it resulted in material for the first map of this hitherto unvisited region, with observations of snowfall, temperature, etc. The second main object of the expedition was the observation of the glaciers of College fiord, Harriman fiord, and Columbia bay,‡ in order to ascertain what changes had taken place since the visits of previous observers. To this end photographs of all the leading glaciers (some twenty in all) were made, from the stations occupied by the earlier expeditions. In many cases evidence of recent advance or retreat of nearly a quarter of a mile was found, and the data secured may throw light on the question whether the changes noted are due to climatic variations or to earthquakes.

The Cape Cod Canal, cutting through the neck of land which joined the hook-shaped peninsula of Cape Cod to the mainland, and so considerably shortening the sea route between Boston and New York, was opened to traffic on July 29 of last year. A short account of the undertaking and of the interests which will be served by the new canal appears in the November number of the *Bulletin* of the American Geographical Society, illustrated by a sketch-map. The length of the canal, from

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* The glaciers debouching on the various ramifications of Prince William sound have been seen by visitors to this region from the time of Vancouver's great expedition onwards, but have been scientifically explored only within recent years. Some of them were examined or at least photographed from a distance by the Harriman Alaska expedition, the results being given in vol. 3 of the detailed reports of that expedition. Later researches are those of Messrs. Grant and Higgins (recorded in *Bulletin* U.S. Geol. Survey, No. 526), and of Prof. Martin (*Zeitschrift für Gletscherkunde*, vol. 7, pp. 289 *seq.*).—[ED.]

† Harvard glacier debouches into the head of College fiord, the north-eastern branch of Port Wells, itself the north-western indentation of Prince William sound.

‡ Harriman fiord is a western arm of Port Wells, and Colombia bay, a northern indentation of Prince William sound east of Port Wells.

the head of Cape Cod bay in the north-east to that of Buzzard's bay in the south-west, is 7½ miles, most of the distance being already trenched by natural drainage, so that only 1 mile passes through higher ground, rising to a maximum of 29 feet. Approach channels dredged in the sea at either end raise the total length to 13 miles. The channel has a width at bottom of 100 feet, with a depth of 25 feet at mean low water. The waterway is at sea-level throughout, and though there is a maximum difference of tide-level between the two ends of some 5 feet, this is not enough to cause inconvenience. There are two passing-places within the canal proper. Whereas the distance from New York to Boston by the old route round Cape Cod is 334 statute miles, by the canal it is only 272, so that the reduction is very appreciable, and the avoidance of the storms and fogs of the outside route is an additional gain. The commerce passing round Cape Cod is estimated at 25,000,000 tons yearly, coal and lumber being the principal cargoes, carried in towed barges and steamers.

AUSTRALASIA AND PACIFIC ISLANDS.

Expedition to the Coral Reefs of Torres Straits.—An expedition for the study of these reefs has lately been carried out by a party under the leadership of Dr. A. G. Mayer, on behalf of the Department of Marine Biology of the Carnegie Institution of Washington. It arrived at Thursday island early in September, 1913, intending to work in that locality, but on finding the reefs there to be overwhelmed by a layer of mud, changed its plans, and with some difficulty found its way to the Murray islands, lying in the lee of the northern end of the Great Barrier reef. Investigations were continued here for some time, and a general account of the party's work and experiences has been given by Dr. Mayer in the *Popular Science Monthly* for September, 1914. Most of the time was spent on Maer island, the largest of the group—an extinct volcano which in its active days burst through the old limestone floor of the Barrier reef plateau. On the western side the crater rim rises to a height of 750 feet, falling steeply to the sea. The northern half is formed by a mass of lava which flowed out as the result of an explosion of later times, when the northern part of the crater rim was destroyed. After the cessation of activity, corals began to grow along the shores, and have surrounded the island with a fringing reef. This has grown outwards, particularly on the south-east, the side exposed to the trade wind and the force of the waves, leaving a shallow lagoon behind it. Dr. Mayer, whose previous studies of coral formations entitle him to speak with authority, says that it is quite clear that the island has not developed in the midst of a pre-existing reef-flat, but that the volcano took shape before the modern reefs began to form round it. In their character of fringing reefs they are quite distinct from barrier reefs, which, with Penck and others, Dr. Mayer considers to have originated as breakwaters upon the seaward edge of previously existing platforms dating from the glacial epoch. The characteristic feature of the Pacific reefs—the Lithothamnion ridge, formed where the breakers strike with full force—is well developed on the south-eastern reef of Maer island, completly enclosing a shallow marine lake. Some forty species of coral grow upon the reef-flat, the delicate and profusely branched *Seriatopora histrix* being the dominant species in the middle zone. The region is never visited by hurricanes, and there is a vast array of small coral heads instead of the large ones which alone can thrive in more exposed regions. A careful survey of the corals in a line across the reef emphasized the tendency for the corals to grow best at considerable distances from the shore, probably owing to their inability to stand high temperatures, especially if liable to be buried by sand or mud. In the lagoon the variations in the water temperature were found to be much greater than those of the air. Dr. Mayer considers that the

constant outward advance of the Lithothamnion ridge proves that the older portions must be progressively dissolved, and that if this action cannot be ascribed to the sea-water some other agency must be accountable. Other biological studies were carried out by Dr. Mayer's coadjutors, among whom was Mr. F. A. Potts, of Cambridge.

Dutch Exploration in the Mamberamo Basin, New Guinea.—A Dutch military detachment, under Captain Oppermann, continued the exploration of the great Mamberamo river in north-western New Guinea during 1914, and has secured some interesting results. A survey of the lower course of the river introduced changes and improvements in the map, which has hitherto depended on the survey of Lieut. Kerkhoven in 1884. Several new tributaries were discovered, and the previously reported Lake Rombebai, lying east of the main river, near the head of the deltaic region, was examined. It proved to have an extent of 16 by 8 kilometres, and to be surrounded by a girdle of swamps. The depth reaches something like 20 fathoms, and it appears to be filled by the water of the Mamberamo, with which it is connected by a short channel. The programme included an exploration of two important streams entering the main river from the west in its middle and upper course. The higher of these, named the Rouffaer by Captain Herderschee during his expedition of 1910,* was ascended for some distance by Lieut. Stroeve, who found that by its direction and general importance it is entitled to rank as the main upper course of the Mamberamo, and is likely to afford a good means of approach to the central range. Instead of coming from the north or west, its direction is from the west-south-west, and it reaches a breadth of a kilometre in places, with a good many islands. The banks are well peopled, but the inhabitants were not inclined to be friendly. This discovery led to a modification of the plans of the expedition, it being felt that this river would be a better line of advance for the further survey work towards the mountains than the branch ascended by Herderschee. This preliminary account of the work of the party appeared in the *Tijdschrift* of the Netherlands Geographical Society for September last, further reference being made to it in the next number (November). This gives the melancholy intelligence of the death of Lieut. Stroeve (who had previously done good exploring work on the coasts of Geelvink bay) during an attack in force by the natives. This occurred in September, apparently not on the Mamberamo, but on Geelvink bay.

POLAR REGIONS.

Sir E. Shackleton's Expedition.—It was announced from Melbourne on December 15 that the *Aurora*, the vessel of Sir E. Shackleton's expedition carrying a supporting party to the Ross sea, had sailed for Hobart *en route* for the Antarctic. As already mentioned, this party is under the command of Lieut. McIntosh.

The Anglo-Swedish Antarctic Expedition.—We are informed by Prof. Otto Nordenskjöld that it has been decided to postpone the start of this expedition (*Journal*, vol. **43**, p. 554) until 1916. Apart from the impossibility of enjoying the proposed British co-operation under present circumstances, it is felt that the war, so long as it lasts, would render the fitting out of the expedition extremely difficult. It is hoped, however, that the original programme for a joint expedition may be carried out without change under happier conditions.

Commemoration of American Antarctic Explorers.—The American Geographical Society has lately commemorated the Antarctic explorers, Wilkes and Palmer, by erecting in the lower hall of its house two bronze tablets, each measuring 39 by 17 inches, the step having been taken at the instance of Mr. E. S. Balch,

* *Geographical Journal*, Vol. **36**, p. 497.

whose persevering efforts to secure due recognition for the work of his compatriots are already well known to geographers. Reproductions of the tablets are given in the *Bulletin* of the American Geographical Society for November last. Each contains, above a suitable inscription, a representation in relief of a scene relating to the explorations of the respective navigators. The one shows Wilkes' ship, the *Peacock*, in contact with icebergs in the Antarctic ocean; the other Palmer's Land in West Antarctica, named after Captain Nathaniel B. Palmer, probably the first to sight (in 1820–21) the Antarctic mainland nearest to South America. Although the accuracy of Wilkes' reports of extensive land seen during the course of his voyage has sometimes been questioned (and no doubt in some cases he may have been misled by appearances of land at spots where none exists), his voyage was a remarkable achievement, and the general correctness of his claims is now generally recognized.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Mediæval Climate.*—Dr. Norlind discusses this subject in the paper noted below, the main contribution in which is a table (pp. 21–39) stating the general weather conditions in Europe during the years 709 to 1499, and the usefulness of this compilation is increased by the references to the original records on which it is based. This valuable list is accompanied by a discussion of its evidence, of the freezing of the Baltic and Kattegat, and of the floods on the coasts of Frisian Germany. The author dismisses these floods as of little significance, as they are dependent upon the repair of the dykes. He makes a detailed comparison of the winter and summer weathers for each year for which there are data, between 1121 and 1310; summarizing the results in an interesting chart, based on ten-year averages, of the succession of severe winters and of moist cool summers. The chart shows, as is not surprising, that the summer is usually cold and wet when the winter is mild. The evidence shows a certain periodicity in the weather and during the period dealt with the winter maxima occurred at intervals of 25, 45, 50, and 35 years: as the author remarks, these lengths naturally call to mind Brückner's period. He concludes that owing to the insufficiency of the material, no trace of any greater period can be discovered, but he adds that the records leave him with a presentiment (*Ahnung*) that in comparison with the present, the winter was formerly colder, though to an insignificant extent. The author remarks that the records collected do not establish any very definite conclusions: they therefore support his opinion that the weather has been in general uniform throughout the historic period, and that there can have been nothing more than very slight changes from the existing conditions.

Forms of River-Valleys.—This subject is dealt with by Mr. J. Lyon Rich in the *Journal of Geology* (Chicago) for July–August, 1914. The writer considers that existing literature fails to adequately explain differences in form from a genetic point of view, and endeavours to supply the need, holding that an understanding of the distinctive forms of valleys, and consequent ability to determine the processes which have been at work in their formation, will supply a valuable aid to reading the physical history of the region in which they occur. He distinguishes three main types of valleys by the terms (1) the Open valley, with comparatively straight walls between which the stream swings in broad open curves; (2) the Intrenched Meander valley (the "incised meandering valley" of Davis and others, which last term Mr. Rich would use equally for this and the third type),

* 'Einige Bemerkungen über das Klima der Historischen Zeit nebst einem Verzeichnis Mittelalterlicher Witterungserscheinungen.' Von Dr. A. Norlind. Lunds Universitets Årsskrift, N.F. Afd. 1, Vol. 10, No. 1, 1914, 55 pp.

cut into the rock with little modification of the course inherited from a previous erosion cycle; and (3) the Ingrown Meander valley, in which the meanders have either originated or expanded as the stream sank its channel lower. To understand the method of formation of each of these it is necessary to consider the three main processes by which a valley is developed—vertical down-cutting, lateral cutting, and down-valley migration of the meanders, to which the term "sweep" is applied by Davis. The writer discusses the causes and effects of the dominance of one or other of these processes, or their combination in one and the same case. Sweep, and particularly the ratio of the rate of sweep to that of down-cutting, appears to play a fundamental part in determining the form of the valley, and its dominance may be expected in (1) a stream at grade in a relatively straight valley; (2) a stream which for any reason has ceased down-cutting; and (3) a stream carrying coarse material, which implies a high gradient (favourable to down-valley migration), and is a check to down-cutting. The rate of down-cutting is, of course, closely correlated with differing rates of uplift of a region, and Mr. Rich considers the varying effects of these on streams of different original characters. Slow uplift (unless so slow that sweep dominates) will tend towards the formation of the ingrown type of meander, while a rapid uplift will result in the intrenchment of the stream in its original course, whether meandering or not; if relatively straight, a valley of the open type will develop. The general conclusion is that while dominant sweep produces type 1, the open valley; and dominant down-cutting, either type 1 or type 2; the third type only arises from a nicely balanced relation between the three processes, down-cutting being relatively slow and yet rapid enough to make sweep subordinate.

GENERAL.

Newly-discovered Map by Juan Vespucci. The Buccaneer's Atlas.—An interesting document has lately come to light in the form of a large MS. map of the World by Juan Vespucci, dated 1526, and measuring no less than 8 feet in length. It has passed through the hands of Mr. Quaritch, who has issued a pamphlet describing the map, and reproducing the portion representing Central America and part of the West Indian islands.* The find is an important one as, apart from a small engraved map of the World on an equidistant polar projection (reproduced by Harrisse in his 'Discovery of America'), no sample of the author's work appears to have previously been known. Juan Vespucci was the nephew of his more celebrated namesake, Amerigo, and, as mentioned by Harrisse in the work just quoted, has been known as a capable pilot and cartographer from various documents that have come down to us. He is referred to by Peter Martyr in 1514 as "Magister nauclerus," and he acted as head pilot of the expedition of that year to Darien under Pedrarias Davila. In 1526 he was appointed (with another) to examine pilots in the place of Sebastian Cabot, who had sailed in command of an expedition to Brazil. The newly-found map will therefore well repay careful study by competent experts. As in other maps of the period, there are considerable errors in longitude, especially in the New World. Thus the coast of North America extends through far too many degrees of longitude. From the details given in the pamphlet it appears that, as in other maps of the time (and even considerably later), the opening to the Gulf of St. Lawrence between Newfoundland and Cape Breton island is merely shown as a bay, with land continuous to the north. The island of San Juan (placed by other map-

* Mr. Quaritch informs us that the map has been purchased by the Hispanic Society of America, by which so much has been done to popularize a knowledge of early maps. It is to be hoped that a facsimile may in time be issued.

makers near Cape Breton) is here placed close to Cape Race. From the reproduction given of Central America, Juan Vespucci's map would seem to show some affinity with the Maiollo map of 1527, the "Stretto dubitoso" of which (intersecting the Isthmus of Tehuantepec) is represented by a gulf with uncertain termination running far into the southern coast-line. But whereas Yucatan was eroneously shown as an island by Maiollo (as by Verrazzano, Ribero, and several others) it is connected by Vespucci with the mainland by a narrow neck. The representation of the east coast of Central America (further east and south) is inferior to that of Ribero, though it is not greatly bettered in some maps of a later date, such as the 'Isolario' of Alonso de Santa Cruz (about 1541) or Sebastian Cabot's well-known map of 1544. The Pacific coast stops short at the eastern side of the Bay of Panama. Mr. Quaritch has also offered for sale an interesting item of a later date, viz. a collection of pictorial charts of the Pacific coasts of America, entitled the 'Buccaneer's Atlas, or South Sea Waggoner.' The charts were drawn by William Hack, of Wapping (compiler of the small collection of voyages published in 1699), about 1684, and the volume was formerly in the possession of the South Sea Company. Reproductions of one of the maps and of the upper cover are given in the pamphlet.

Commemoration of Drake's Landing on the Coast of California.—Miss J. M. Hyde, of Inverness, California, sends us a photograph of the wooden cross erected several years ago near Drake's landing-place on the coast north of San Francisco. The spot was lately (September 1, 1914) the scene of a commemoration service, conducted by the Rev. Irving Spencer, probably the first since that held there by Drake himself at his landing in 1579. It is planned to hold a service every June, and hopes are entertained that a suitable monument may in time be erected. Miss Hyde also sends photographs of Drake's bay taken from the headland on which the cross is placed, and of the white cliffs spoken of by him, which suggested the name of New Albion.

OBITUARY.

William Woodville Rockhill.

In Mr. W. W. Rockhill, whose death occurred at Honolulu early in December, the United States lose a public servant who not only distinguished himself in his professional career as a diplomatist, but gained a world-wide reputation as a traveller and orientalist. Born at Philadelphia, in 1854, the son of Thomas C. Rockhill, of Baltimore, he entered the diplomatic service, in which his whole official life was spent, in 1884, becoming in turn Second and First Secretary at the American Legation at Peking. In 1888 he undertook the first of his great journeys in the interior of the Chinese Empire, which gained him the Patron's Medal of our Society in 1893. His knowledge of the Tibetan language, and his familiarity with the manners and customs of the peoples with whom he had to do, gave him unusual qualifications for the task, and though he failed in his plan of reaching Lhasa, he returned to China by Ta-chien-lu after accomplishing a valuable journey through Koko-Nor, Tsaidam, and Eastern Tibet. The narrative of this journey was given in 'The Land of the Lamas,' which appeared in 1891, and shed much new light on the geography and peoples of those regions. In 1891–92 he carried out a still more extensive journey, pushing south across the headwaters of the Yang-tse (Murussu or Dichu)—the sources of which he approached more closely than any European in modern times—and reaching a point on the road to Lhasa in 32° N. He was then compelled once more to turn east, but in so doing traversed a previously almost unknown area of

Eastern Tibet lying between the outward and return routes of A—K in 1879–82. A new volume entitled 'Diary of a Journey through Mongolia and Tibet in 1891 and 1892,' appeared from his pen in 1894. Mr. Rockhill's official duties in the Department of State at Washington kept him at home for some years after his return from this journey, but between 1897 and 1899 he represented the United States as Minister to Greece, Bulgaria, and Servia. In 1900, after a brief interval as Director of the Bureau of American Republics, he returned to China as U.S. Commissioner and Plenipotentiary, becoming Minister in 1905. Between 1910 and 1913 (when he retired) he filled the same office in turn at St. Petersburg and Constantinople. In the midst of these official duties he found time to continue his studies of things Eastern, and, among other services, he edited for this Society the volume by Sarat Chandra Das on his 'Journey to Lhasa and Central Tibet,' and for the Hakluyt Society the 'Journey of Friar William of Rubruck.' He had been an Honorary Corresponding Member of our Society since 1897.

Henry Gannett.

The well-known American geographer, Mr. Henry Gannett, died early in November, aged 68. Educated at Harvard University and Bowdoin College, he worked for a time as civil and mining engineer, and subsequently as Assistant at Harvard Observatory. His more definite connection with geography began in 1872, when he became topographer to the Hayden Survey of the interior territories of the United States—a position which he retained till 1879. His subsequent work was rather administrative and statistical than concerned with survey in the field. He had much to do with the organization of the U.S. Geological Survey, to which he for many years acted as Chief Geographer. He was also Geographer to the successive censuses of 1880, 1890, and 1900, and took a prominent part in the work of the census of the Philippines in 1902–03, as well as that of Cuba in 1907–08. Other posts held by him were those of Chairman of the U.S. Board on Geographic Names and Geographer to the Conservation Commission. His publications were largely of the nature of statistical compilations, for which he possessed particular aptitudes. Among these were the 'Statistical Atlases' of the above-mentioned censuses; the 'Dictionary of Altitudes of the United States'; A Monograph on the 'Boundaries of the United States,' both as a whole and individually; and Gazetteers of many of the separate states. He also was part editor of 'Scribner's Statistical Atlas.' Of more general geographical interest was his volume on the United States in 'Stanford's Compendium,' and his 'Commercial Geography,' published, in conjunction with two other writers, in 1908. His work for the U.S. Geological Survey was embodied in various 'Bulletins' and 'Professional Papers' of that department, and he also contributed many papers to Geographical serials.

Richard Nicklin Hall.

We much regret to record the death, announced from Bulawayo in November, of Mr. R. N. Hall, well known for his investigations of the ruins in Mashonaland, of the antiquity of which he was an enthusiastic champion. Mr. Hall, who was born in 1853, was son of Joseph Hall, J.P., of Dudley, Worcestershire. A solicitor by profession, he acted as political agent to various members of Parliament, including Sir Edward Reed, K.C.B. Going out to South Africa, he soon identified himself with the activities of the young British colony of Rhodesia, filling, among other posts, those of secretary to the Bulawayo Chamber of Commerce and editor of the *Matabele Times*. It was at Mr. Rhodes' suggestion that he first undertook the exploration

of the Zimbabwe and other ruins in Southern Rhodesia, the results of which he published, in conjunction with Mr. W. G. Neal, in the interesting volume 'The Ancient Ruins of Rhodesia' (1902; 2nd ed., 1904). This did much to arouse a popular interest in the ruins, besides bringing to light many sites previously unknown to experts. Subsequently, when the view was put forward that none of the ruins were of any great antiquity, or assignable to other than Negro builders, he vigorously contested this (to his mind) heretical doctrine, and returned more than once to the scene of his former work, in the hope of supporting his case by fresh evidence. The results of his further researches were embodied in 1909 in his 'Pre-historic Rhodesia.' Only last year his services were recognized by the South African Government by his appointment as 'Curator of the Ancient Monuments of Rhodesia,' including, besides ruins, such relics as Bushman paintings, to which he had also devoted some attention, and on which he was understood to be preparing a new work for publication.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Second Meeting, November 23, 1914.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*G. Anscombe; Miss Dorothy Barber; Mrs. William Nelthorpe de Vere Beauclerk; Captain Clive Behrens, late R.F.A.; Hilaire Belloc; Leonard Biddulph; Ralph Carpenter Blanchard; Lieut.-Comm. Francis G. Brickenden, R.N.; Miss Bessie Georgina Brown; Colin William Burnley Campbell; Frederick Taylor Campbell; Arthur d'Arcy Eugene Chapman, B.A.; Mrs. Lewis Chase; M. B. Dalal; Charles Edward Jesser Davis; George Dovers; Mrs. Charlotte Doveton; Percy James Drought; Robert Lewis Drouyn; Mrs. Charles Dummett; Charles Sumner Durst; Harry Walker Eastcott; Austin Eastwood; Reginald Ellis; Mrs. G. Foaker; Benjamin Apthorp Gould Fuller; Mrs. Gwendolen Gascoigne; Newton W. Gilbert; B. Cunninghame Graham; Mrs. Horace Egerton Green; Samuel Hugh Francklin Hole; Alfred Holt; Herbert Frank Howe; Arthur James; Sirdar Charanjit Singh of Kapurthala; Miss Elsie Kilvert; Captain L. N. F. I. King, R.E.; William Seaton King; Lady Eileen Knox; Miss Constance Lidderdale; Manoel de Oliveira Lima; Fortescue Long; Miss Mary Lumsden; Captain Malcolm Neynoe MacLeod, R.E.; Charles Campbell McLeod; Arthur J. Moore-Bennett; John Morgan; Rev. Gresham Wynter Morrison; Roy Norton; William Robert Patterson; Captain Albert William Pearse; Sydney James Pearson; John Percival; Miss Fanny A. Plowright; Mrs. Horatio G. Powell; John Pratt; James C. Renshaw; Miss Ethel Bradley Robinson; Hewitt Douglas Rodger; Rev. S. B. Rohold; Nicholas Romanoff; Captain W. H. I. Shakespear, I.A.; Charles Frank Smythe; Rt. Hon. Sir Cecil A. Spring-Rice, G.C.V.O., K.C.M.G.; Captain C. Steele, 13th Hussars; Mrs. Nancy Yulee Stigand; John Swift; Rev. Charles Samuel Tator; Edward Reginald Taylor; Captain O. H. B. Trenchard, R.E.; Cecil Wacher; Miss Eleanor Warne, B.A.; Langdon Warner; Charles H. Wells; Mrs. Arminel Werring; Lt.-Comm. Eric Lloyd Wharton, R.N.; Lady White; Rev. Walter G. White, M.A.; A. H. Williams; Richard Wilson; Lieut. Frank Arthur Worsley, R.N.R.; Otto Christian Zimmermann.*

The paper read was:—

"The Mental Training of a Traveller." By the Right Hon. Viscount Bryce, O.M.

Third Meeting, December 7, 1914.—DOUGLAS W. FRESHFIELD, Esq., President, in the Chair.

ELECTIONS.—*William David Elder; Rev. Frank Hutchinson; Mrs. Agnes J. S. McKinnon; Commander Frank Powell-Brown; Reginald A. G. Travers; Omar Asar Turvey, C.E., Ph.D.; Stanley Vandeleur Mills.*

The paper read was:—
"Types of Political Frontiers in Europe." By Prof. L. W. Lyde.

Fourth Meeting, December 9, 1914.—DOUGLAS W. FRESHFIELD, Esq., President, in the Chair.

The paper read was:—
"Frontier Work on the Bolivia-Brazil Boundary." By Captain H. A. Edwards.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic—Tides. *Ann. Hydrographie* **42** (1914): 220–225, 270–281. **Defant.**
Zur Theorie der Gezeiten im Adriatischen Meere. Von Dr. A. Defant. *Sketch-map and Diagrams.*

Albania—Early maps. *B.R.S.G.* (*Rome*) Ser. V. **3** (1914): 601–637. **Almagià.**
Le più antiche rappresentazioni cartografiche della regione albanese. By Roberto Almagià. *Facsimiles.*

Alps—Glaciation. *Z. Gletscherkunde* **8** (1914) : 226–262. **Klebelsberg.**

Glazialgeologische Notizen vom bayrischen Alpenrande, III. und IV. Von Dr. R. v. Klebelsberg. III. Der Ammergau und sein glaziales Einzugsgebiet. IV. Die Voralpen zwischen Loisach und Isar (Krottenkopf-Walchensee-Jachenau und das Vorland der Benediktenwand). *Maps and Illustrations.*

Alps—Mont Blanc. *Petermanns M., Ergänsht.* Nr. 181 : pp. vii. and 187. **Lucerna.**

Morphologie der Montblancgruppe. Von Dr. Roman Lucerna. *Maps and Illustrations.*

Baltic. **Ruppin.**

Beitrag zur Hydrographie der Belt- und Ostsee. Von Ernst Ruppin. (Aus dem Laboratorium für internationale Meeresforschung in Kiel. Hydrographische Abteilung, Nr. 10.) (Abhandlung 8 aus *Wissenchaftliche Meeresuntersuchungen*, Neue Folge, 14. Band. Abteilung Kiel.) Kiel: Schmidt & Klaunig, 1912. Size 12½ × 10½, pp. 209–272. *Sketch-map and Illustrations.*

Baltic—Tides. *Ann. Hydrographie* **42** (1914): 183–208. **Brehmer.**

Tiden von langer Periode im mittleren Wasserstande der Ostsee zu Swinemünde. Von Dr. Brehmer.

Germany—Harz—Gravity. **Galle.**

Das Geoid im Harz. Von Prof. Dr. A. Galle. (Veröffent. K. Preuss. Geodät. Inst., N.F. Nr. 61.) Berlin, 1914. Size 12 × 9, pp. 101. *Maps, Illustrations, and Stereoscopic Representation.*

Germany—Magnetism. **Wolff.**

Erdmagnetische Untersuchungen im Zobtengebirge. Von Hans G. Wolff. (Veröffent. K. Preuss. Meteor. Inst., Nr. 277, Abh. Bd. V. Nr. 1.) *Maps.*

Germany—Mecklenburg—Limnology. **Portmann.**

Tiefenverhältnisse von mecklenburgischen Seentypen. Von Wilhelm Portmann. (Mitteilungen aus der Grossherzogl. Mecklenburg. Geologischen Landesanstalt, XXV.) Rostock, 1913. Size 11½ × 9, pp. 35. *Map.*

Germany—Pomerania. *XIV. Jber. G. Ges. Greifswald*, 1913–14 (1914): 1–318. **Dreyer.**

Die Moore Pommerns, ihre geographische Bedingtheit und wirtschaftsgeographische Bedeutung. Von Dr. Johann Dreyer. *Maps and Illustrations.*

Germany—Pomerania. **Praesent.**

XIV. Jber. G. Ges. Greifswald, 1913–14 (1914): 333–356.

Beiträge zur Kenntnis des Greifswalden Boddens I. Vorläufiger Bericht über die hydrographischen Untersuchungen des Geographischen Institutes der Universität im Greifswalder Bodden. Von Hans Praesent. *Charts.*

Germany—Riesen-Gebirge. **Nafe.**

Die Schneegruben des Riesengebirges und ihre Entstehung. Ein Beitrag zur Theorie der Karbildung von Professor Otto Nafe. (K. Gymnasium zu Hirschberg i. Schl., Beilage zum Jber. Ostern 1914.) Size 11 × 9, pp. 47. *Chart and Diagrams.*

Iceland—Climate. *G. Ts.* **22** (1914): 204–216. **Thoroddsen.**

Islands Klima i Oldtiden. Af Dr. Th. Thoroddsen.

Italy—Lake of Lugano. **Ghezzi.**

Progetto per la Sistemazione del Lago Ceresio (Lago di Lugano) di C. Ghezzi. (Dipart. fed. Interno: Comunicazioni della Div. dell' Idrografia Nazionale, No. 4.) Bern : Rösch & Schatzmann, 1913. Size 8½ × 5½, pp. 48. *Diagrams. Also Atlas*, size 15 × 10.

Italy—Valtellina. **Saragat.**

B.R.S.G. (Rome) Ser. V. **3** (1914) : 403–427, 527–556, 638–662.

La Geografia fisica della Valtellina. By Aurelio Saragat. *Illustrations.*

Mediterranean. *B.R.S.G. (Rome)* Ser. V. **3** (1914): 670–680. **Vinciguerra.**

La Conferenza di Roma per l'esplorazione del Mediterraneo. By Decio Vinciguerra. *Sketch-map.*

Norway—Precipitation. ———

Nedbøriagttagelser i Norge. Utgit av det Norske Meteorologiske Institut. Aargang XVIII., 1912. [With supplement separate.] Kristiania : H. Aschehoug

& Co., 1914. Size 14 × 11, pp. 65, (suppl.) 49. *Maps and Illustrations. Price Kr.* 3.00.

Servia. *B.S. Serbe G.* 3 and 4 (1914): 1-23. **Cvijić.**

La Position Géographique de la Serbie actuelle. Par J. Cvijić. [In Servian; French *résumé*.]

United Kingdom—Somersetshire—Maps. **Chubb.**

A descriptive list of the printed maps of Somersetshire, 1575–1914. Size 9½ × 5½, pp. xii. and 230. *Maps. Price* 10*s*.

United Kingdom—Sussex—Place-names. **Roberts.**

The Place-names of Sussex. By R. G. Roberts. Cambridge: University Press, 1914. Size 9 × 5½, pp. xxxii. and 210. *Price* 10*s. net. Presented.*

ASIA.

Baluchistan—Fauna. **Zugmayer and Laubmann.**

Abh. K. Bayerischen A.W., Math.-phys. Klasse (1913): No. 6, pp. 35; (1914); No. 9, pp. 71.

Wissenschaftliche Ergebnisse der Reise von Dr. Erich Zugmayer in Balutschistan 1911. Die Fische von Balutschistan. Mit einleinden Bemerkungen über die Fauna des Landes. Von Erich Zugmayer. [The same.] Vögel. Von A. Laubmann. *Illustrations.*

Ceylon—Historical. **Pieris.**

Ceylon. The Portuguese era. Being a history of the Island for the period 1505–1658. By P. E. Pieris. 2 vols. Colombo, 1913. Size 9 × 5½, pp. (vol. 1) xxvi. and 590; (vol. 2) viii. and 628. *Maps and Illustrations. Presented.*

China—Travel. **Gaunt.**

A woman in China. By Mary Gaunt. London: T. Werner Laurie, [1914]. Size 9 × 5½, pp. xvi. and 390. *Illustrations. Price* 15*s. net. Presented.*

China—Travel. **Hosie.**

On the Trail of the Opium Poppy. A narrative of travel in the chief opium-producing provinces of China. By Sir Alexander Hosie. 2 vols. London: G. Philip & Son, 1914. Size 9½ × 6, pp. (vol. 1) viii. and 300; (vol. 2) 308. *Maps and Illustrations. Price* 25*s. net. Presented.*

China—Yunnan—Geology. **Brown.**

Records Geol. Survey India 43–44 (1913–14): *passim.*

Contributions to the geology of the province of Yünnan, in Western China. By J. Coggin Brown. *Maps and Illustrations.*

India—Cotton. *Asiatic Rev.* 5 (1914): 298–364. **Summers.**

Development of cotton in India: Sind, a second Egypt. By Dr. T. Summers, *Sketch-map and Section.*

India—Goa. **Mendonça and Telles.**

A. Sc. Lisboa, B. da Segunda Classe 4 (1910–1911): 50–76, 77–95.

Centenario da Tomada de Goa. Affonso de Albuquerque e Tristão da Cunha. By Henrique Lopes de Mendonça. Goa: Estudo de Geomorphologia. By Silva Telles.

India—Historical. **Foster.**

The English factories in India, 1646–1650. A calendar of documents in the India Office, Westminster. By William Foster. Size 9 × 6, pp. xxxii. and 362. *Illustrations. Price* 12*s.* 6*d. net. Presented.*

Japan. **Mabie.**

Japan: To-day and To-morrow. By Hamilton Wright Mabie. New York: The Macmillan Company, 1914. Size 8½ × 5½, pp. 292. *Illustrations. Price* 8*s.* 6*d. net. Presented.*

Japan—Earthquakes. **Omori.**

B. Imp. Earthquake Invest. Committee 6 (1914): 227–258; 7 (1914): 1–216.

The eruptions and earthquakes of the Asama-yama. III. and IV. (Remarks on the seismographical observations at Yunotaira in 1911–1912 and December, 1912, to May, 1914). By Dr. F. Omori. *Sketch-maps, Diagrams, and Illustrations.*

Malay Archipelago—Art. **Loebèr**

Textiele Versieringen in Nederlandsch-Indië. Door J. A. Loebèr. (Kolonial

Instituut Amsterdam.) Amsterdam: J. H. de Bussy, 1914. Size 8½ × 5½, pp. 79. *Illustrations.*

Malay Archipelago—Celebes. ———

Ts. K. Nederl. Aardr. Gen., II. Ser. **31** (1914): 475–500.

De Grensstreken tusschen Loewoe en Mamoedjoe in Centraal-Celebes. *Map.*

Malay Archipelago—Flores—Ethnology. **Stapel.**

Ts. Indische Taal-, Land- en Volkenkunde **56** (1914): 148–187.

Het Manggĕraische Volk (West-Flores). Een en ander over afkomst, geschiedenis, zeden en gewoonten, godsdienst, enz. Door H. B. Stapel. *Illustration.*

Malay Archipelago—Java—Volcano. **van Gent.**

Ts. K. Nederl. Aardr. Gen., II. Serie, **31** (1914): 518–521.

De G. Sĕmeroe. By L. F. van Gent. *Illustrations.*

Mongolia—Lamaism. *J.R. Asiatic S.* (1914): 847–900. **Binsteed.**

Life in a Khalkha Steppe Lamasery. By Lieut. G. C. Binsteed. *Plan and Illustrations.*

Philippines—Medical. *Philippine J. Sc.* **9** (1914): Sec. B, 199–218. **Calderon.**

Some data concerning the medical geography of the Philippines. By Fernando Calderon.

Russia—Caucasus. *M. Kaukasischen Museums* **7** (1913): 351–434. **Shelkovnikoff.**

Eine Reise nach Svanetien im Sommer 1911. By A. B. Schelkovnikov. *Illustrations.* [In Russian.]

AFRICA.

Abyssinia—Ethnology. **Rossini.**

Rendiconti R.A. Lincei, Cl. Sci. Morali, etc., Ser. V. **22** (1913): 397–463.

I Mekan o Suro nell' Etiopia del sud-ovest, e il loro linguaggio. By Carlo Conti Rossini.

East Africa—Historical. *United Empire* **5** (1914): 733–744. **Maugham.**

The early history of the East African coast. By R. C. F. Maugham.

Fernando Po. *B.R.S.G. (Madrid) Rev. G. Col. y Merc.* **11** (1914): 49–55. ———

El ferrocarril de Fernando Póo: I.–Anteproyecto de la red insular. II.–La zona del Noroeste de la isla.

See Monthly Record, *ante*, p. 78.

German East Africa—Railway. *Koloniale Monatsblätter* **16** (1914): 302–320. **Henoch.**

Die Tanganjikabahn. Von Hubert Henoch. *Portraits.*

NORTH AMERICA.

Canada—Historical. **Lescarbot and Grant.**

The history of New France. By Marc Lescarbot. With an English translation, notes, and appendices by W. L. Grant. Vol. 3. (The publications of the Champlain Society, vol. 11.) Toronto, 1914. Size 10 × 6½, pp. xviii. and 556. *Map.*

Canada—Nova Scotia—Geology. **Malcolm.**

Canada. Department of Mines, Geological Survey Branch, Memoir No. 20 E. Goldfields of Nova Scotia. By W. Malcolm. Ottawa, 1912. Size 10 × 6½, pp. xvi. and 332. *Maps, Plans, Illustrations, and Sections.*

Canada—Quebec—Geology. **Wilson.**

Canada, Department of Mines, Geological Survey. Memoir 39. Kewagama lake map-area, Quebec. By M. E. Wilson. Ottawa, 1913. Size 10 × 6½, pp. vi. and 139. *Map and Illustrations.*

Canada—Survey. **Department of the Interior.**

Department of the Interior. Annual report of the Topographical Surveys Branch, 1912–13. Ottawa, 1914. Size 10 × 6½, pp. 226. *Illustrations. Maps in separate case. Presented.*

Mexico—Texcoco Lake. **Schwarz.**

Mem. y Rev. S. Cient. "Antonio Alzate" **33** (1914): 251–254, 255–261.

Les travaux publics et l'agriculture au Mexique. Le desséchement du lac de Texcoco, par Manuel Schwarz. *Illustrations.*

United States—Colorado. **Kolb.**

Through the Grand Canyon from Wyoming to Mexico. By E. L. Kolb. With a foreword by Owen Wister. New York: The Macmillan Comp., 1914. Size 8 × 5½, pp. xx. and 344. *Sketch-map and Illustrations. Price* 8*s.* 6*d. net. Presented.*

CENTRAL AND SOUTH AMERICA.

Andes. **Colditz.**

Aus den hohen Anden Süd-Amerikas. Vortrag, gehalten am 5. März 1914 in der Aula der Kgl. Kriegsakademie zu Berlin von R. von Colditz. (Veröffentl. Deutsch-Argentinischen Centralverbandes zur Förderung wirtschaftlicher Interessen, Heft 10.) Berlin, 1914. Size 9 × 6, pp. 35.

Andes—Nieve penitente. **Keidel.**

Geol. Charakterbilde (Stille) 21 *Heft* (1914): 6 *plates with text.*

Büsserschnee in den argentinischen Anden. Von H. Keidel. *Illustrations.*

Some of the best representations of the phenomenon that have appeared.

Argentine Republic—Andes. *American J. Sc.* **38** (1914): 309–330. **Palmer.**

Geological notes on the Andes of Northwestern Argentina. By Harold S. Palmer. *Illustrations and Sections.*

Argentine Republic—Geology. **Bodenbender.**

B.A. Nac. Ciencias 19 (1911): No. 1, pp. 220.

Constitución Geológica de la Parte Meridional de la Rioja y Regiones Limitrofes, República Argentina. Por el Dr. Guillermo Bodenbender. *Map.*

Argentine Republic—Parana. **Repossini.**

B. Obras Públicas, República Argentina 7 (1912): 163–186; 8 (1913): 33–102.

Memoria sobre el rio Paraná. By J. Repossini.

Bolivia—Lake Titicaca. *B.S.G. La Paz* 11 (1913): 59–122. **Sans.**

Escursión á las Islas de Titicaca y Coati en Bolivia, por Fr. Rafael Sans.

Reproduces a document of which a few copies only were printed in 1884.

Bolivia—Potosi. *B.S.G. Potosí* 1 (1913): 6–17. ——

Relación del cerro de Potosí y su descubrimiento.

Brazil. **Roosevelt.**

Through the Brazilian wilderness. By Theodore Roosevelt. London: John Murray, 1914. Size 9½ × 6, pp. xiv. and 374. *Maps and Illustrations. Price* 18*s. net. Presented.*

POLAR REGIONS.

Antarctic—Ice. *G. Teacher* 7 (1914): 359–368. **Priestley.**

Antarctic ice. By Raymond E. Priestley. *Sketch-map, Section, and Illustrations.*

Antarctic—Meteorology. **Barkow.**

Vorläufiger Bericht über die meteorologischen Beobachtungen der Deutschen Antarktischen Expedition 1911–12. Von E. Barkow. (Veröffentl. K. Preuss. Meteorolog. Inst., Nr. 265. Abhandl. Bd. IV. Nr. 11.) Berlin: Behrend & Co., 1913. Size 13 × 10½, pp. 11. *Illustrations. Price M.*1.50.

Antarctic—Scott Expeditions. **Scott and Turley.**

The voyages of Captain Scott. Retold from 'The Voyages of the *Discovery*,' and 'Scott's last Expedition.' By Charles Turley, with an Introduction by Sir J. M. Barrie, Bart. London: Smith, Elder & Co., 1914. Size 8 × 5, pp. viii. and 440. *Map and Illustrations. Price* 6*s. net. Presented.*

Antarctic—Wilkes Expedition. **Feipel.**

The Wilkes exploring expedition. Its progress through half a century, 1826–1876. By Louis N. Feipel. (From *U.S. Naval Inst. Proc.*, Vol. 40, No. 5, 1914.) Annapolis, M.D., 1914. Size 9 × 6, pp. 1323–1350. *Sketch-map.*

An attempt to make the Wilkes expedition better known to the public.

Arctic—Geology. **Backlund and Tolmacheff.**

B.A. Imp. Sc. St. Pétersbourg, VI. Ser., 1914: 727–736.

Aperçu sur quelques roches recueillies en 1913 par l'Expédition Hydrographique de l'Océan Glacial du Nord. By H. Backlund and I. Tolmačev. *Map and Illustrations.* [In Russian.]

Arctic—Kara sea. **Lied.**

Steam Navigation of the *Correct* in the Kara Sea into the mouth of the Yenisei in 1913. By J. L. Lied. [N P., N.D.] Size 10 × 6, pp. 24. *Map and Illustrations.* [In Russian.]

Arctic—Meteorology. **Wegener and Brand.**

Meddelelser om Grønland **42** (1912): 115–122, 129–355, 453–462.

Meteorologische Beobachtungen während der Seereise 1906 und 1908. Von Alfred Wegener. *Illustrations.*

Meteorologische Terminbeobachtungen am Danmarks-Havn. By the same. *Map and Illustrations.*

Meteorologische Beobachtungen der Station Pustering. Von W. Brand und A. Wegener. *Map and Illustrations.*

Observations during the *Danmark* expedition to Greenland.

Greenland. *G. Ts.* **22** (1913): 85–92. **Bruun.**

Peary Land landfast med Grønland, belyst ved "Danmark-Ekspeditionen," Ejnar Mikkelsen og Knud Rasmussen. By Daniel Bruun. *Facsimiles.*

With facsimile reproduction of documents written by Mylius Erichsen.

Greenland. **Koch.**

Kaptain Koch's Rapport fra Proven. Den danske Ekspedition til Dronning Louises Land og tværsover Nordgrønlands Inlandsis 1912–13, under Ledelse af Kapt. J. P. Koch. (Copenhagen: Axel E. Aamodt, N.D.) Size 10 × 6½, pp. 8. *Maps.* [In German.]

See *Journal*, vol. **42**, p. 548. The detailed maps show the route near the east and west coasts.

Greenland. *G. Ts.* **22** (1914): 183–198. **Rasmussen.**

Foreløbig Beretning om "Den første Thule-Ekspedition," 1912–13. By Knud Rasmussen. *Maps and Illustrations.*

Some account of this expedition was given in vol. **42**, p. 546. One of the maps shows the surroundings of Danmark and Independence Fiords in detail.

Greenland—Archæology. *Meddelelser om Grønland* **51** (1914): 81–101. **Stephensen.**

Nye Fund af Nordboruiner i Østerbygden og Bemærkninger om nogle af de gammelkendten. Af K. Stephensen, 1913. *Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography. *J.R.S. Arts* **63** (1914): 6–17. **Holdich.**

First Ordinary Meeting. Inaugural address by Colonel Sir Thomas H. Holdich. Chiefly on 'The art of map-making.'

Star-maps. **Clancey.**

A series of monthly and general Star-maps, chiefly for use in latitude 20° N., with a brief explanatory introduction. Prepared by J. C. Clancey. Cork, 1915 [1914]. Size 10 × 7½, pp. 8. *Maps. Presented.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geological history. *G.Z.* **20** (1914): 197–208. **Arldt**

Zur Geschichte der paläogeographischen Rekonstruktionen. Von Th. Arldt.

Geomorphology. *G.Z.* **20** (1914): 185–197. **Hettner.**

Die Vorgänge der Umlagerung an der Erdoberfläche und die morphologische Korrelation. Von Alfred Hettner.

Geophysics. *Ann. Hydrographie* **42** (1914): 141–146, 209–219, 255–270. **Pettersson.**

Studien in der Geophysik und der Kosmischen Physik. Von O. Pettersson. *Diagrams.*

Physiography. **Tarr.**

College Physiography. By Ralph Stockman Tarr. Published under the editorial direction of Lawrence Martin. New York (London): The Macmillan Company, 1914. Size 9 × 6, pp. xxii. and 838. *Sketch-maps, Illustrations, and Diagrams. Price* 15*s. net. Presented.*

GENERAL.

Education—Text-book. **Franklin and Shearmur.**

The Atlas geographies: a new visual atlas and geography combined. Part IV. Commercial atlas geography. By Thomas Franklin and Ernest R. Shearmur. London: W. & A. K. Johnston, 1914. Size 10 × 7½, pp. 232. *Maps and Diagrams. Price 3s. net. Presented.*

Education—Text-book. **Taylor.**

The Oxford Geographies. Edited by A. J. Herbertson. A geography of Australasia. By Griffith Taylor. Oxford: Clarendon Press, 1914. Size 7½ × 5, pp. 176. *Sketch-maps. Price 1s. 6d. Presented.*

Photography—Diary. **Wellcome.**

The Wellcome Photographic Exposure Record and Diary, 1915. London: Burroughs, Wellcome & Co., 1915. Size 5½ × 3, pp. 280. *Illustrations. Presented.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles—Scotland. **Bartholomew.**

Orographical Map of Scotland. Reduced from the Ordnance Survey by J. G. Bartholomew, LL.D. Scale 1 : 253,440 or 1 inch to 4 stat. miles. 4 sheets, each 36 by 28 inches. Edinburgh: John Bartholomew & Co., [1914]. *Price £1 1s. Presented by the Publishers.*

An orographically coloured map of Scotland in four sheets, which, when mounted as one, give an excellent idea of the general relief and leading physical features of the country. Although intended for hanging on walls, there is nothing coarse or diagrammatic in its appearance, and close inspection is necessary to read the large amount of finely executed detailed information which it contains. The orographical tinting has been most carefully executed, but the map has a somewhat sombre appearance as the shades are darker than those usually employed, which as a rule now more or less follow those agreed upon by the committee of the 1 : 1,000,000 International map of the World.

The land contours in feet are as follows: 0–250, 250–500, 500–750, 750–1000, 1000–1500, 1500–2000, 2000–2500, 2500–3000, 3000–3500, and 3500–4000. From 0 to 750 feet shades of green are employed, then from 750 to 3500 shades of brown increasing in intensity with the increasing altitude. Purple is used for land between 3500 and 4000, and all land above 4000 feet is left white. The purple is perhaps a mistake, and it is satisfactory to learn that it is not to be admitted into the revised colour scheme for the 1 : 1,000,000 International map. Depths of the sea are indicated in the usual manner by varying tints of blue. The registration of the colour tints is excellent and the general production of the map most creditable.

Copies of the map may be had without the colour tinting, printed in black and blue only, for the representation of special features; and some copies have been printed showing only the orographical features in colour, without outline or lettering, for the use of teachers of geography.

Central Europe. **Bartholomew.**

Bartholomew's Orographical Map of Central Europe showing political boundaries. Scale 1 : 2,000,000 or 1 inch to 31·56 stat. miles. Size 32 by 40 inches. Edinburgh: John Bartholomew & Co., [1914]. *Price, on cloth, 4s. Presented by the Publishers.*

Extends from lat. 41°–30′ to 55° N. and from long. 5° W. to 22° E. The orographical features are indicated by tints of green, brown and purple at the following metre intervals: 0–100, 100–300, 300–500, 500–1000, 1000–1500, 1500–2000, 2500–3000, 3000–3500, 3500–4000, 4000–4500, and over 4500. The map contains a considerable amount of detail and many place-names. International boundaries are clearly shown in red lines. Plans of the environs of Paris, Hamburg, Berlin, Rome, and Vienna are given as insets.

Europe. **Bacon.**

Contour Wall Map illustrating Military Operations in the Seine and Rhine Basins. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. Size 36 by 27 inches. London: G. W. Bacon & Co., Ltd., 1914. *Price, on cloth, rollers, and varnished, 7s. 6d. Presented by the Publishers.*

Extends from London to Hamburg and from north of the Kiel canal to the Lake of Geneva. It is clear in style and not overcrowded with names. Relief is approximately shown by the colour layer system, the contour intervals in metres being as follows: below sea-level, 0–100, 100–300, 300–500, 500–1000. Depths of sea 0–20, 20–40, and below 40 metres. The contours have been considerably generalized, and in parts are not so accurate as they might be.

Europe. **Bartholomew.**

Bartholomew's General War Map of Europe and the Mediterranean. Scale 1 : 5,448,960 or 1 inch to 86 stat. miles. Size 25 by 32 inches. Edinburgh: John Bartholomew & Co., [1914]. *Price, on cloth, 2s. Presented by the Publishers.*

A clear and useful map for general reference. No attempt has been made to show relief.

Europe. **Gallois.**

Carte Murale du Théâtre de la Guerre. Par L. Gallois. Scale 1 : 600,000 or 1 inch to 9·5 stat. miles. Paris: Armand Colin, [1914].

A diagrammatic wall map of the western theatre of war, showing principal places in bold lettering; but somewhat obliterated by names of smaller places which might with advantage have been left out. Information of military importance, such as fortified towns and railways of various classes, is given by symbols and colours. German territory is tinted reddish-brown, and it is noticeable that Alsace and Lorraine are not included in this tinting, although a broad dotted international boundary-line parts them from France.

Europe. **Geographical Section, General Staff.**

Map of North-West Europe. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: 1, 2, 4, 5, each 20 by 29 inches. London: Geographical Section, General Staff, War Office, 1914. London agents: E. Stanford, Ltd.; Sifton, Praed, & Co., T. Fisher Unwin. *Price 3s. each sheet. Presented by the Director of Military Operations.*

This map will be specially useful at the present time, as it is on sufficiently large scale and gives enough detail for following the events of the war intelligibly. Sheet No. 2 includes the valley of the Rhine in the neighbourhood of Bonn, Cologne, and Düsseldorf, and extends west as far as Diest and Tirlemont, and south to Liége. No. 4 extends from Mons and Charleroi on the north, to Amiens on the west, and Compiegne on the south. No. 5 adjoins No. 4 to the east and gives Sedan, Luxemburg, Thier, with a small section of the Rhine in the north-east corner. The map is ruled into 2-inch squares, and is printed in colours, contours and roads brown, woods green, water blue, railways black; relief is shown by contours at intervals of 50 metres.

Europe. **Gross.**

The *Daily Telegraph* Display War Map. Scale 1 : 1,200,000 or 1 inch to 18·9 stat. miles. By Alexander Gross. Size 58 by 78 inches. *Price, mounted on rollers, 50s.*
—The *Daily Telegraph* War Maps, Nos. 1, 2, 3, 4. With Index. By Alexander Gross. *Price, mounted on rollers, 5s. 6d. each.* London: Geographia, Ltd., 1914. *Presented by the Publishers.*

Europe. **Johnston.**

The European War, 1914. Map illustrating "The Western Campaign." Scale 1 : 1,175,000 or 1 inch to 18·5 stat. miles. Edinburgh & London: W. & A. K. Johnston, Ltd., 1914. *Price 1s. 6d. net. Presented by the Publishers.*

Another of the numerous war maps now being issued. International boundaries are given by bold red lines, and relief is indicated approximately by colour tinting. A general map of Europe on a small scale, and enlarged plans of Berlin and Paris with their environs appear as insets. The map also contains a table giving area and population of the countries and capitals of Europe.

Europe. **Philip.**

Philip's Contour War Map of Europe. Scale 1 : 4,000,000 or 1 inch to 63 stat. miles. Size 28 by 39 inches. London: George Philip & Son, Ltd., 1914 *Price 1s. net. Presented by the Publishers.*

An orographical map showing relief in the coloured layer system, in shades of green, yellow, and brown, at the following contour intervals in feet: below sea-level, 0–600, 600–1200, 1200–3000, 3000–6000, and above 6000. The sea below 600 feet is shown by light blue, and below that depth by a darker tint of blue. The map does not include the northern parts of Norway, Sweden, or Russia. International boundaries are boldly drawn in red.

Europe. **Philip.**

Philip's Large-scale Strategical War Map of Europe, Western Area. With complete Index. Scale 1:633,600 or 1 inch to 10 stat. miles. Size 36 by 46 inches. London: G. Philip & Son, Ltd., 1914. *Price 6s. net, mounted on rollers and varnished. Presented by the Publishers.*

Shows clearly, by colours and symbols, means of communication, fortresses and fortified places, airship depôts, and other information useful for following the events of the war. Woods and forests are in green. General relief of the land is indicated by brown shading. Insets of the road between Verdun and Toul, and between Epinal and Belfort are given on enlarged scales, as are also plans of the environs of Paris, Antwerp, Metz, Strassburg, Cologne, Coblence, and Mayence. A useful alphabetical index to place-names accompanies the map as a separate pamphlet.

France. **Barrère.**

Carte Touriste de France. Dressée avec le concours du Touring-Club de France. Scale 1:400,000 or 1 inch to 6·3 stat. miles. Sheets: II. Lille; III. Bruxelles; V. Paris; VI. Nancy; IX. Dijon. Size 21 by 33 inches. Paris: Henry Barrère, 1914.

ASIA.

Malay Archipelago—Sumatra. **Topographical Bureau, Batavia.**

Overzichtskaart dan het eiland Sumatra. Scale 1:2,000,000 or 1 inch to 31·5 stat. miles. Size 27 by 25 inches. Batavia: Topographische Inrichting, 1913.

Malay Archipelago—Sumatra. **Topographical Bureau, Batavia.**

Schetskaart van Residentie Palembang. Scale 1:300,000 or 1 inch to 4·7 stat. miles. 4 sheets, each 26 by 32 inches. Batavia: Topographische Inrichting, 1914.

An official map of the Palembang residency in Eastern Sumatra, opposite the island of Banka. To a great extent this part of the island has not yet been accurately surveyed, and the mapping of considerable areas is based upon route traverses and more or less approximate sketches. However, such material as exists has been utilized in the production of this map, which, like others published by the same department, is clearly drawn and carefully printed in colours. Relief is shown by vertical hachures in brown, water blue, roads and tracks by red lines of varying breadth and style, according to their character. The size and importance of towns and villages, anchorages, fortifications, telegraphs, and other information is given by symbols and tables.

AFRICA.

German South-West Africa. **Government Printing Office, Pretoria.**

War Map of German South-West Africa. Scale 1:1,900,800 or 1 inch to 30 stat. miles. Size 33 by 27 inches. Pretoria: Government Printing Office, 1914. *Price 1s.*

A roughly executed map, evidently hurriedly produced for use in the present war. In addition to German South-West Africa, considerable portions of the adjacent parts of Bachuanaland and the Cape of Good Hope are included.

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1:250,000 or 1 inch to 3·95 stat. miles. Sheet 8 S.W., Manitoulin, Ontario. Size 27 by 20 inches. Ottawa: Department of the Interior, 1914. *Presented by the Department of the Interior, Ottawa.*

This sheet extends in latitude from 45° to 46° 30′, and in longitude from 81° 30′ to 83° W.

Canada—Saskatchewan. **Dept. of Public Works.**

Map of the Southern part of the Province of Saskatchewan. Scale 1:633,600 or 1 inch to 10 stat. miles. Corrected to January 1, 1914. 2 sheets, each 30 by 48 inches. Saskatoon: Department of Public Works, 1914. *Presented by F. McClure Selanders, Esq.*

United States. **Dept. of the Interior, Washington.**

Panoramic View of the Glacier National Park, Montana. Scale 1 : 187,500 or 1 inch to 29·5 stat. miles. Washington: Department of the Interior, [1914]. *Presented by the Department of the Interior, Washington.*

A somewhat roughly executed diagrammatic map, showing relief by green and reddish tinting, accentuated by shading.

AUSTRALIA.

Victoria. **Geological Survey of Victoria.**

Geological Survey of Victoria. Scale 1 : 31,680 or 2 inches to 1 stat. mile. Sheets: Myrtleford; Stanley. Size 20 by 18 inches. Geological Sketch-map of the Werribee Gorge and adjacent country. Scale 1 : 63,360 or 1 inch to 1 stat. mile. Size 8 by 9 inches. Melbourne: Geological Survey of Victoria, 1914. *Presented by the Geological Survey of Victoria.*

ATLANTIC OCEAN AND ISLANDS.

Madeira. **Power.**

General Map of the Island of Madeira, constructed by Charles A. Power from other maps, greatly improved, corrected, and brought up to date, 1914. Scale 1 : 100,000 or 1 inch to 1·6 stat. miles. Size 12 by 24 inches. London: Edward Stanford, Ltd., 1914. *Price* 1*s.* 6*d.*

A general map of the island, with hill shading in brown. Roads are shown by red and footpaths by black lines, while, amongst other information, pure-water springs are indicated by a special symbol. The map has been prepared to accompany Mr. Power's recently published book, 'The Island of Madeira,' and is accompanied by an index to place-names.

GENERAL.

World. **Philip.**

Daily Mail World Map of War and Commerce. Equatorial scale 1 : 36,000,000 or 1 inch to 568·2 stat. miles. Size 19 by 38 inches. London: George Philip & Son, Ltd., 1914. *Price* 1*s. net. Presented by the Publishers.*

A coloured map of the world on Gall's stereographic projection showing principal railways, steamer routes, cables, coaling stations, international boundaries, etc. Statistical information is graphically represented by diagrams.

CHARTS.

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, December, 1914. London: Meteorological Office, 1914. *Price* 6*d. each. Presented by the Meteorological Office.*

Atlantic Ocean. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, November, 1914. Ditto, December, 1914, January and February, 1915. Washington: U.S. Hydrographic Office, 1914. *Presented by the U.S. Hydrographic Office.*

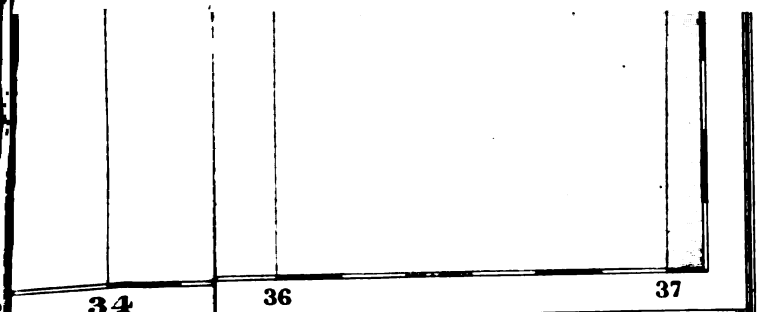
Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, December, 1914; January, 1915. Washington: U.S. Hydrographic Office, 1914. *Presented by the U.S. Hydrographic Office.*

Pacific Ocean. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, December, 1914; January, 1915. Ditto, South Pacific Ocean, December, 1914, January and February, 1915. Washington: U.S. Hydrographic Office, 1914. *Presented by the U.S. Hydrographic Office.*

N.B.—It would greatly add to the value of the collection of Photographs which have 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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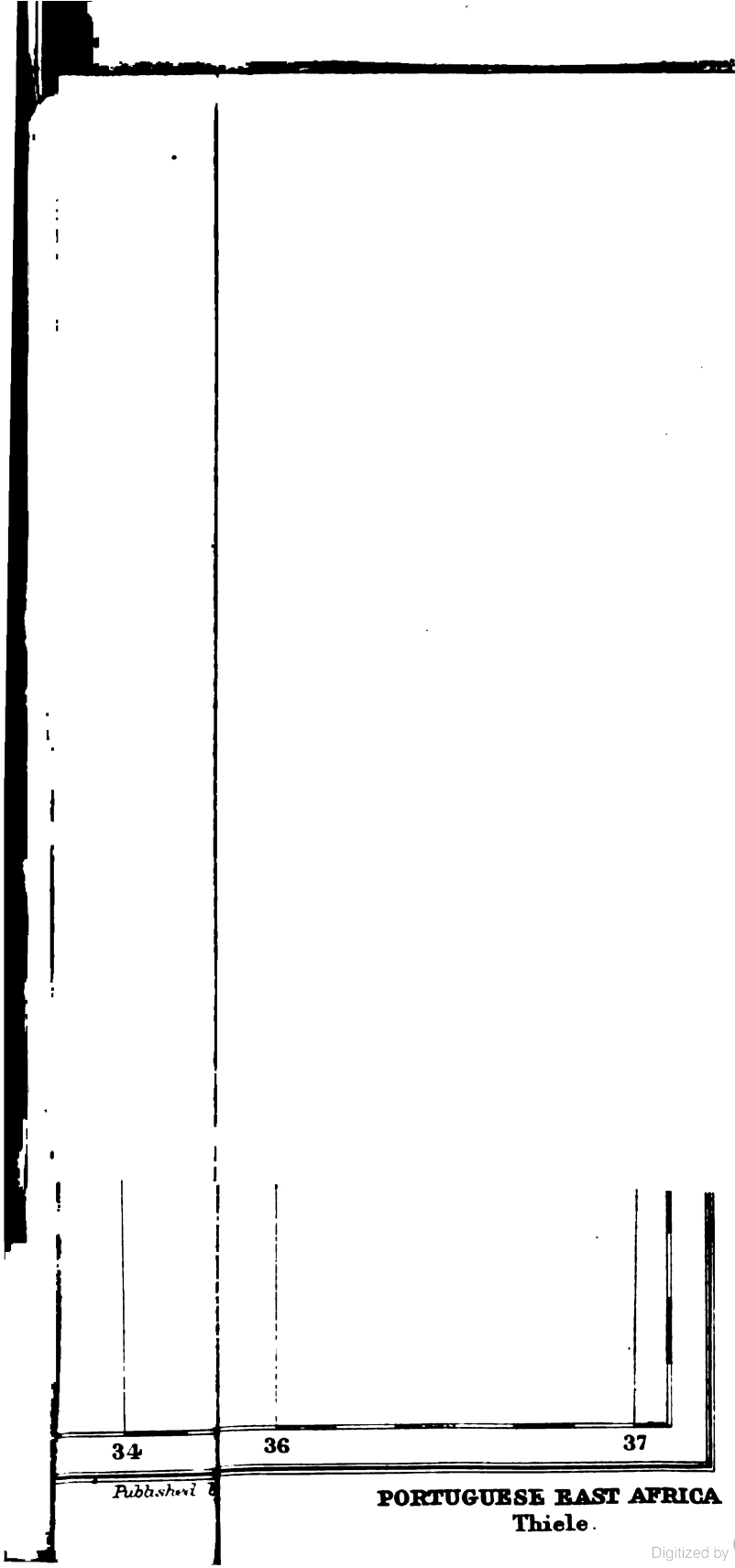

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A JOURNEY IN CENTRAL BRAZIL.*

By Colonel the Hon. THEODORE ROOSEVELT.

This has been something that I have looked forward to, and the President in his more than kind and courteous remarks, while mentioning that he wrote to me as soon as he heard that I had emerged from the wilderness, did not mention that I had written to him also. When I came out of Africa your then President wrote to me asking me to give an address before the Society, and I wrote back that I could not, because I had nothing to say; that I had merely followed well-travelled routes, my work having been that of a field naturalist and not that of a geographer, and that it would not be fair for me to take up the time of the Society by going over what they already knew. I wished, however, to make this address for two reasons: first, because I felt that something had been done by the expedition of which I had the honour to be head which ought to be known to you as the foremost geographical body in the world; second, inasmuch as this Society is the parent of all similar societies in the English-speaking world, and possesses a far-reaching influence that no other society possesses, I wished to tell you something of the work done by the Brazilian explorers in the hitherto unknown interior of western Brazil. It is a very extraordinary work which has not received proper recognition, either in my country or in yours, or in any country of Continental Europe. As the President has said, as Sir Clements Markham in his friendly and generous letter has said, much remains to be done in the basin of the Amazon. There are plenty of blank spaces on the map down there, and there are men and women now engaged in filling these blanks. For instance, here on the map is the Tapajos river, her

* Royal Geographical Society, June 16, 1914. Map, p. 180.

is another great river the Xingu. The country between is almost unknown. I met at Para the curator of the Museum of the Zoological Society at Para, a lady, Miss Snethlage, by birth a German, who has taken on foot the trip across this unknown hinterland from the Xingu to the Tapajos. When I was in Manaos I met Prof. Farrabee of the University of Pennsylvania, who had gone from Manaos up the Rio Negro and Rio Branco and then across on foot to the headwaters of the rivers going into British Guiana, he himself being for a short time on a stream that was entirely unknown. There is any amount of work to be done yet by men and women like Colonel Rondon, who was my associate, like Miss Snethlage, like Prof. Farrabee.

I undertook this exploring trip originally more or less by accident. I had wanted for some time to go to South America. When I went to Africa five years ago, Sir Harry Johnston urged me to go to South America on the ground that it was less well known. At that time the lion and the elephant exercised too strong an attraction for me to be able to resist them, but in 1913 I thought the chance had come when I could go up the Paraguay and across the central plateau of Brazil into the great Brazilian forest. When I began the trip it was in the interest of the American Museum of Natural History in New York. I took with me a couple of zoologists, intending to make the trip primarily a biological reconnaissance. When I reached Rio de Janeiro the Secretary of Foreign Affairs of the Brazilian Government informed me that the Telegraphic Commission of Brazil, which had been for years conducting a series of explorations into this highland region of western Brazil—the highland region from which the headwaters of the Tapajos and of the Madeira as well as of the Paraguay flow—had in the course of its work run across the upper courses of two rivers which it was of capital importance to explore. One of these rivers they had christened the Duvida, which means "the River of Doubt," because they did not know where it went. They felt equally in doubt as to the other and rather smaller river, to which they had given the more prosaic name of the "Pineapple" river. These two rivers flowed north. The Telegraph Commission could not tell where they came out, but from the lie of the land some of the members of the commission, including Colonel Rondon, were very doubtful about their going into either the Tapajos or the Gyparana, and believed that it was probable they emptied into the lower Madeira. If these streams ultimately entered into the lower Madeira, it meant that there was in that region a great river which was not only unknown, but the existence of which was unguessed at by cartographers, and incompatible with existing maps. Mr. Lauro Muller stated that the Brazilian Government would aid me in every way if I would undertake to be head of an exploring expedition to go down the river, clear up the doubt as to where it went, and thereby put it on the map. Up to that time I had been engaged on a biological reconnaissance in the interest of the American Museum of

Natural History in New York; after that time if I closed with the kind offer of Mr. Lauro Muller the expedition would become as proposed by the Brazilian Government, the "Roosevelt-Rondon Scientific Expedition." I, of course, jumped at the chance and undertook to start on the expedition as soon as I had made certain addresses in Southern Brazil, in the Argentine and Chile.

I have here a map, furnished me through Mr. Arthur Lee by this Society, as one of the best modern maps they could get. Its date is 1911, and it is published in Brazil. It represents the best modern information, and is substantially like the map which was furnished me by the American Museum—one of Bartholomew's maps, published in Edinburgh. Were this map accurate no such river as that which we went down could exist, because the course we actually followed, when put down on this map, is seemingly crossed by tributaries running direct into the Madeira river, and even by tributaries running into the Tapajos, not to speak of mountain chains. Moreover, the headwaters of the Tapajos are placed on this map with such incorrectness, that it is wholly impossible for me to put down the route we actually took with any degree of accuracy. I am not in any way blaming the mapmakers. None of the existing maps are materially better. But it is interesting to realize how inaccurate even the best maps of this great region still are.

When we started we knew of the existence of the upper stream of the Duvida. We also knew that in all probability the mouth through which its waters finally entered some known stream must be on some map, for, of course, the river went out somewhere, unless it was lost in a swamp. The point was that no one knew where this mouth was, or the course of the stream, or its length, or anything else about it. Where we actually did come out was on the stream known to the rubber men as the Aripuana. On this map there is no name given to the little bit of a dotted creek running into the Madeira which I suppose is meant for the Aripuana. On a few other maps, however, it appears, with its name as the Aripuna, as a very small creek indicated by a dotted line, entering into the Madeira. It is portrayed on these maps as smaller than several other insignificant tributaries, yet as a matter of fact, instead of being much smaller, it is very much larger. It is difficult to understand how it is possible that a great river, whose mouth and lower course were so well known to the rubber men, could have been left off the maps, or else put on as a tiny tributary with nothing to indicate its size or course.

Our trip was first up the Paraguay as far as we could go by steamer, and then up a tributary, the Sepotuba, in a launch with native trading boats lashed alongside. Then for thirty-seven days we went with mule-train and pack-oxen across the highland wilderness of western Brazil. The plateau was in places over 3000 feet high; it was a healthy country, although not a fertile agricultural country. It is sandy, with scrubby

forests, beautiful clear streams and cool nights, a country in which European emigrants can thrive and prosper, a country which I believe will one day be filled with a great industrial population, making use of the extraordinary water-power furnished by the rivers that break from that plateau down over the edge into the valleys. It will be tributary to the immensely rich, immensely fertile lowland regions to the south and north, the basin of the Paraguay and the basin of the Amazon. Just as the nineteenth century has seen the extraordinary development of North America, so I believe the twentieth will see the great development of South America, and up on this plateau the development has not yet begun.

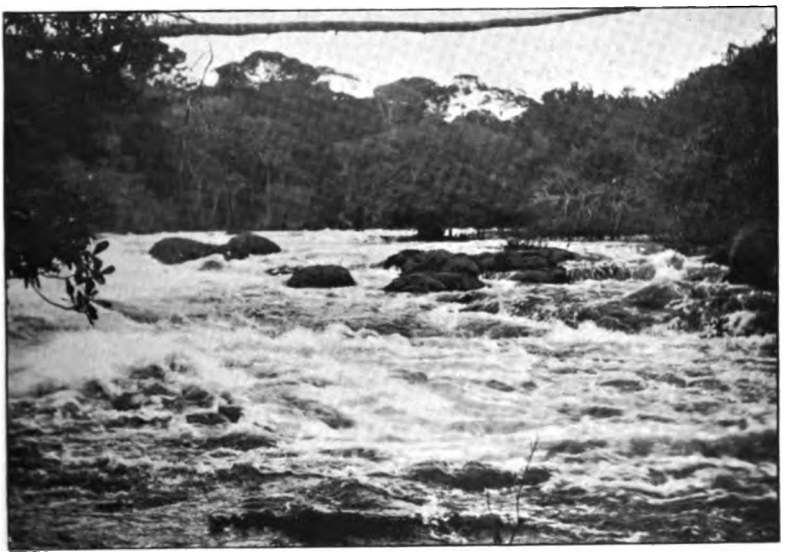
Let me parenthetically insert just one word to those who undertake to develop it. Let these men remember the disasters encountered by so many of the enthusiasts who, in the middle and early part of the last century, started to develop the western part of the United States, without any earthly understanding of what development of a raw frontier meant. Let all would-be emigrants remember that the frontier opens equally great chances for both success and failure.

As yet the country through which we passed is empty of settlers, but we found it interesting. We crossed, among others, two big rivers—I have not been able to find them on this map or the map that I took with me—the Sacre and Papagaio, which, within 10 miles of one another, fell over two great falls, one of close on 150 feet, the other of about 250 feet. In each case the whole river ran over a shelf of rock and then foamed away through a deep gorge. I do not know your European falls, but these falls can fairly be compared with the falls of the Yellowstone in the United States, one of them being, I think, with a larger volume of water and a higher fall.

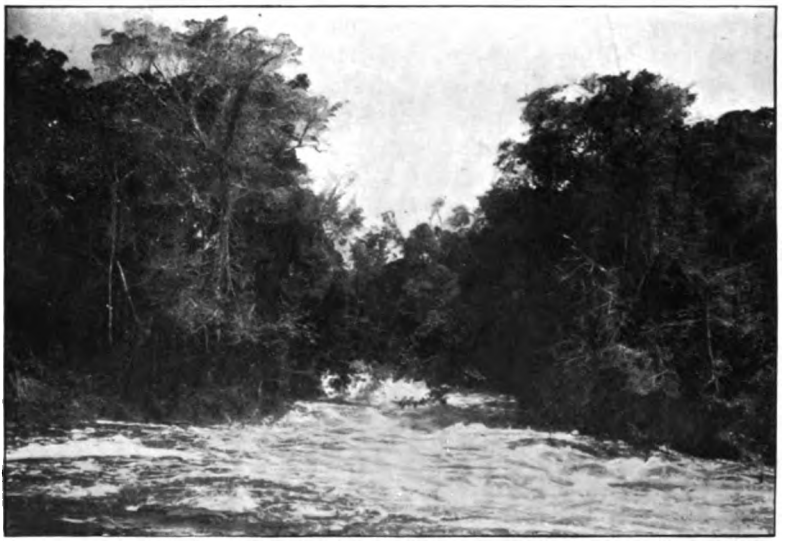
I am not an ethnologist, but even a layman could not but be greatly interested in the tribes of Indians that we encountered on this plateau. They belong to two big bodies, the Parecis and the Nhambiquaras. The Parecis are a very high-grade, intelligent set of Indians, on the road to being absorbed in the general population of Brazil, but as yet with strongly individual tribal customs. One of their games is noteworthy.

They have developed "Association football"—what you call "Soccer football"—but they play it with their heads. The two sides are ranged as in soccer football. The round, hollow rubber ball is placed on the ground between them. A man runs towards it, throws himself flat on the ground, and butts it. It rolls towards a man on the other side, who flings himself on the ground and butts it back. Usually he catches it so as to make the ball rise, and then the men on each side in turn run, catch it on their heads, and send it to and fro without throwing themselves on the ground. The ball is only touched with the head, and it travels almost as if from a drop-kick or punt. It is really an interesting game, and they are absorbed in it.

THE DUVIDA, TAKEN FROM THE TOP OF THE FIRST MOUNTAIN RANGE WHICH IT CUTS THROUGH, AND LOOKING TOWARDS THE SECOND WHICH IT CUTS THROUGH.



RAPIDS OF THE UPPER DUVIDA.



RAPIDS OF THE DUVIDA.

CHERRIE HOLDING HIS GUN ACROSS THE NAVAITE GORGE TO SHOW ITS NARROWNESS.

The Nhambiquaras are literally naked savages, wearing no clothing whatever. They sometimes, though not often, build curious beehive huts, not unlike those of the Bantu tribes in Africa, and they are fairly good cultivators of the soil; but they have no livestock, no hammocks, no canoes, no blankets, no clothing of any kind. They are good archers, and use a bow 6 or 7 feet long, almost as powerful as the old English yeoman's bow. They are a very wild tribe, as with most of the Indians I saw, but they are not warlike as the Iroquois or Sioux were warlike. Of course there are vicious ones among them, but what the traveller has to be afraid of is their fear of him; they attack him because they are afraid of him, because they are in doubt as to the intentions of the new-comer; and if he can make them understand that they are to be treated well and fairly, there is practically no danger from them—unless, as sometimes happens, an innocent party pays for the outrages committed by some other party.

Our canoe-party left the mule train at the point where the line of the telegraph crosses, by a bridge, the Duvida—the River of Doubt. We started at about lat. 12° 1′ S. and long. 16° 15′ W. from Greenwich. The party consisted of six men—myself; Colonel Rondon, of the Engineer Corps in the Brazilian army; Lieut. Lyra of the Engineer Corps, who made the actual astronomical observations and did the actual cartographical work; Doctor Cajazeira of the Brazilian army; Mr. George K. Cherrie, ornithologist from the American Museum of Natural History; my son Kermit, who had for a year been engaged in structural steel-bridge building in Brazil, and on whom we had to rely for the bulk of the rope and pulley-work in getting the canoes down the worst rapids. There were sixteen "Camaradas," or paddlers, very good fellows indeed as a whole.

Colonel Rondon is the head of the Brazilian Telegraphic Commission. Our descent of this unknown river was merely capping the pyramid of which Colonel Rondon and his associates had laid the foundations deep and wide in the preceding seven years. Beginning with 1907, he with various other members of the Engineer Corps of the Brazilian army—three or four of whom were with me on my trip in one capacity or another—pushed westwards from the settled regions into the unknown wilderness of Matto Grosso, going further and further year after year until they reached the great tributary of the Madeira called the Gyparana, of which I have already spoken, and descended it. They found that big river nearly 2° of longitude out of place on the maps as they then existed (and still exist). When Colonel Rondon made his final push westward across the high plateau he arranged for one of his subordinates, Captain Amilcar, to ascend the Gyparana so as to meet Rondon's party when they came down it; but owing to the mistake in the degrees of latitude on the map, Amilcar went up one stream and Rondon down another, so they never met. In spite of this failure, the

colonel deemed it wise to repeat the experiment in our case. Lieut. Lyra believed firmly that the Duvida entered the Gyparana: Captain Amilcar thought there was much possibility of its turning to the right and falling into the Tapajos; Rondon, however, while he knew that both of these were possibilities, yet, judging from what the rubber men had told him, believed that the Aripuana, the lower course of which had been known for years to the rubber men and had been ascended by the Amazonas Boundary Commission, was its most probable outlet. The rubber men had insisted that the Aripuana was the biggest river flowing into the Madeira, although it appears on the map as one of the smallest and most unimportant. Accordingly Colonel Rondon directed Lieut. Pyreneus to ascend the Aripuana until he came to the first big fork, its first big affluent running into it, and then to halt and see if we came down either branch. In what latitude this fork was no one had any idea. It proved to be in about 7° 34′; the steam launch was left below the first rapids, while Pyreneus come above them to the fork.

The first four days of our descent of the river were easy. We went slowly, because for the first month we accurately surveyed all the river. After four days we struck the uppermost rapids; this was in about lat. 11° 44′ S. From this point the rapids were almost continuous for about 150 miles of travelling. We spent forty-two days in covering 1° of latitude, making considerably less than 2 miles a day, on an average, in a straight line to the north. In that time there was no full day's journey between the rapids. Of course it is the rapids that make travelling on those rivers so difficult and so dangerous. The explorer also has to suffer from fever and from insects, which last are infinitely more formidable than any of the larger beasts. The danger of starvation on a river trip almost always comes directly or indirectly from the rapids; either because the boat is upset in the rapids and the provisions lost, or else because the time taken is so excessive that the party runs completely out of food. For various reasons we were not able to start with as much food as we ought to have had. We carried about fifty days' half-rations, which we eked out with what we could shoot, with the fish we caught, with a few nuts and fruits, and with palm-tops. Such a trip through a great forest is not favourable to hunting. Explorers have little time to hunt, and it is infinitely harder to get game in dense forests than on open plains. We did not get any big game. However, we killed a number of monkeys, which were edible, and some big birds, such as curassows, and also some parrots. The Brazil nut crop, upon which we had counted, failed, and for vegetables we had to rely mainly upon palm-tops. We at times caught a good many fish.

South America is a curious country; it entirely lacks the great beasts of Africa and India, but it possesses, in addition, its insect pests: bats no bigger than ordinary flitter-mice, which suck the blood of horses, cattle, and even of man himself; and fish no bigger than

trout, which on occasions kill swimmers. These fish are called piranhás; they are silvery in colour, with big and sharp teeth. In some places they are not dangerous to human beings, whereas in others they will assail any one who enters the water. In this respect they are like sharks and crocodiles, which, as most field-naturalists know, are dangerous in some waters and not in others. There were waters in which we could go swimming without regard to piranhás, and other waters where it was a matter of danger to venture away from the bank. Colonel Rondon had his little toe taken completely off by piranhás, and Cherrie, the ornithologist, was bitten in the leg. In one lagoon which the dogs went into after a tapir, two of them lost the tips of their tails, which were bitten right off. One extraordinary incident in connection with these fish occurred in the swamps of the Paraguay. The swamps were drying up, and the ponds in them contained quantities of fish, including piranhás, and numbers of alligators living on the fish. One of these crocodiles, when shot, was at once attacked by the piranhás, for blood appeared to madden them. The fish, ordinarily the prey of the crocodile, drove that crocodile right out of the water; it came up on land, preferring to face its human foes rather than to remain in the water under the attacks of the fish. The piranhás are themselves good to eat, and they were the commonest fish we caught. There were other fish—curious things; you have not got them in this country—what we in the United States call catfish. These are fish with a smooth skin practically without scales, a very broad and big head, and a great gap of mouth. We caught a catfish about 3½ feet long on one occasion, and it had a monkey inside it. I asked one of the camaradas, an Indian, how these fish caught monkeys. He explained that the catfish is a ground-fish, and that when the monkeys come to drink from the end of the branches of the trees overhanging the water the fish come right up from beneath and seize them. The crocodiles in Africa sometimes catch monkeys, baboons, and even birds in similar fashion. On the lower Madeira and Amazon we saw stockades of poles built into the river where the villagers got their water, because they were afraid both of the crocodile, and even more of a huge, marauding ground-fish with an enormous mouth. This is a kind of catfish about 9 feet long, which is said by those people to be more dreaded by swimmers than even the crocodile, because the crocodile can usually be seen on the top of the water, whereas the giant catfish lies on the bottom, and there is no indication when he will make his attack.

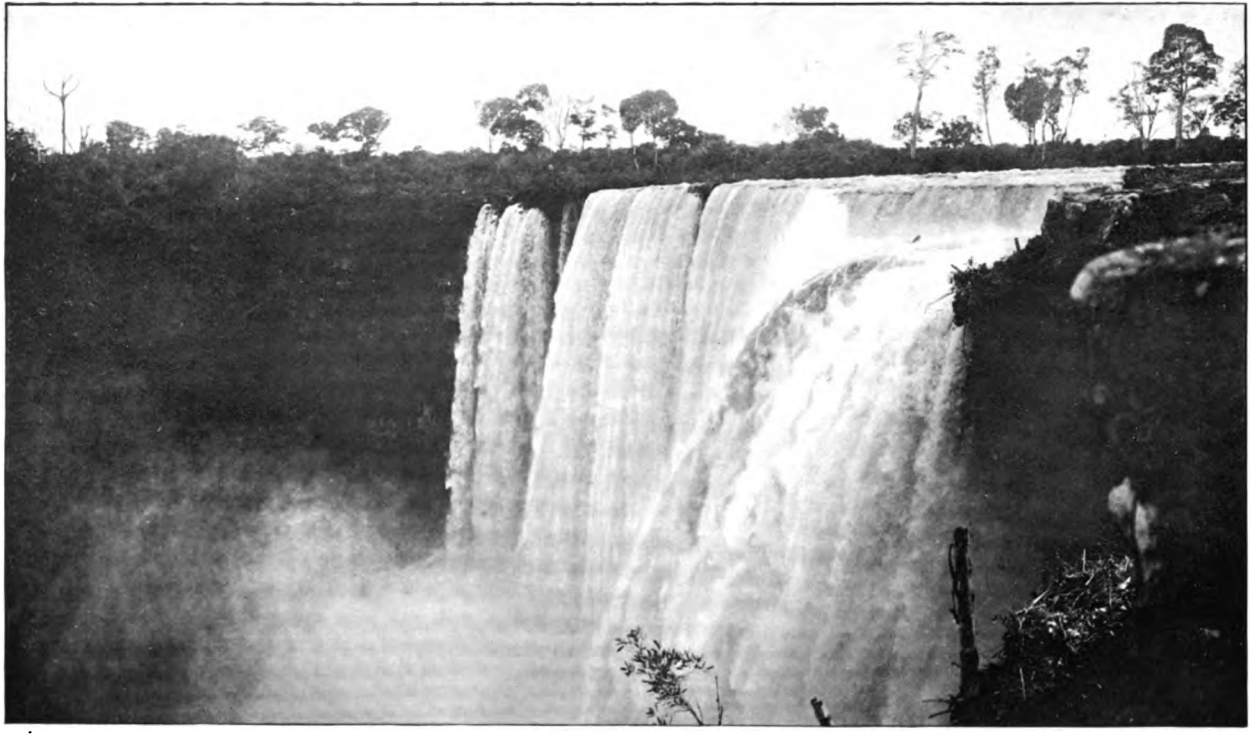
We did not get enough game and fish to give us full rations. However, we were able to keep our men and ourselves in fair condition until we got through the forty-two days occupied in descending the rapids after we first struck them, covering, as I have said, about a degree of latitude. During that time, of the seven canoes with which we started we lost five in the rapids. We built three others, and lost one of those. A stay-at-home man, or a man that has only been on rivers that have been explored,

will find it difficult to understand how canoes can be lost in such fashion. The difficulty comes from the fact that the river is unknown. An explorer comes to the head of a rapid: he does not dare to take too many chances; and yet if he doesn't take some chances, he will go so slowly that his food will be exhausted, and his party will be in peril of starvation. For instance, by the time we had been nearly six weeks in those rapids we were sure the river must find its exit somewhere well down in the lower Madeira, or even in the Amazon. We had used up four-fifths of our food, and we had only gone about one-sixth of the distance we had to go. We could not tell how long the rapids would continue. We had an aneroid, but we were not confident enough in its accuracy to feel sure what our elevation was, and moreover, as every man with experience in river work knows, the dangerous character of rapids depends just as much upon the conformation of the ground and the volume of water as upon the actual descent. If the bed of the river is smooth and the descent gradual, a fairly steep incline offers little real difficulty. On the other hand, a very slight incline, if there is a great volume of water and many rocks, is dangerous, exactly as a tidal bore is dangerous if it surges among the piles of a dock or among rocks. We lost three men; one man was drowned, my son being almost drowned at the same time, their canoe being upset in a bad stretch of broken water. Under the strain of the toil, danger, and uncertainty one of the men went completely wicked, stole food, murdered another man, and fled into the wilderness. We were obliged continually to lighten the canoes in every way. We had begun with rather too heavy tentage; all six of us ended by sleeping under a light fly that had been brought down by the naturalist from New York. We threw away everything except what we had on us. One change of underclothing, including socks and six handkerchiefs, was my spare baggage; and the day after I had thrown away the rest the ants ate up all my spare underclothing, so that I was reduced lower than I had expected to be; and they also ate up my hat. The ants, by the way, are a perfect curse, the white ants in particular, not to speak of the poisonous fire ants and the driver ants, which try to eat the man instead of the clothing.

The worst time we had was in about lat. 11° 12′, where the river went through two low mountain ridges only a couple of miles apart. I do not know the height of any of the British Islands mountains, so I cannot compare them with these ridges; roughly, they are like the lower ridges of the Alleghanies. They were only 400 to 500 feet above the channel, but they were steep, and the river cut through each in succession in what we in the Western United States would call a canyon; that is, a chasm with sheer walls. It was, of course, physically impossible to drag the heavy dug-outs over the mountain-tops. At first we thought we would have to abandon the canoes and make new ones below, which would have taken time we could ill spare in view of our shrinking food-supply.

COLONEL ROOSEVELT AND COLONEL RONDON ON A CURIOUS ROCK FORMATION AT NAVAITE FALLS.

SALTO BELLO FALLS.



UTIARITY FALLS, KERMIT RIVER.

However, we decided to make the attempt to pass and we succeeded, Kermit's work with rope and tackle being what enabled us to get through. The passage of each mountain chain cost us one dug-out. When we finally got out from the last of this long series of rapids, in about lat. 10° 45′, our difficulties were over. We ran a couple of days on the great broad stream, through magnificent equatorial tropical forest. Then in lat. 10° 24′, we came on the little house of the first rubber man, and from that point everything was easy. A dozen more days in the canoes took us down over three degrees of latitude to where we met the launch of Pyreneus. The rapids from this point came at long intervals, and we were able to hire rubber men as guides. No man can appreciate until he has actually tried it the infinite difference between descending even a dangerous river which is known and descending one where the man has to pioneer his own route.

We found that the rubber man called the stream we were on the Castanho. Every day or two we came to a rubber man's house, and on several days we passed two or three. They were always most kind and courteous, and gave us out of their poverty anything they could afford. Of course by this time we were having a good deal of fever, and I was rather laid out myself. But we had plenty of food, we usually camped in or near houses, we were much better able to protect ourselves against the insect pests, and we had no anxiety as to the future. In lat. 10° 58′ we passed the mouth of the first big affluent. It entered on the right; we named it the Cardoza. Three or four small rivers had already entered; but the Cardoza was nearly as big as the Duvida. In 9° 38′ the Rio Branco entered from the left. In lat. 7° 34′, the upper Aripuana joined from the right; it is of about the same size as the Castanho. The launch was reached in another day's swift running. We had then been sixty days in the canoes, to about lat. 7° 15′, then thirty-six hours' steaming took us to Manaos.

Let me define and illustrate what I mean when I say we put this river on the map. I am using the term as it would be used, to compare a small thing with a big thing, in describing what Speke and Grant and Baker did with the upper portions of the Nile. The river we descended is now on the map in the sense that the Victoria Nile and White Nile were for decades after their discovery and location by the three men I have mentioned. From the time of Ptolemy the great lakes of the upper Nile were vaguely known; but they were first "put on the map" by Speke and Baker, and the actual surveying was not done until many years later. The headwaters of the Niger and Congo were known long before it was known where or how these waters went to the ocean; but they were not put on the map until their course was, not surveyed, but located by a number of astronomical observations when the explorer actually went down or up the rivers. The Columbia was "put on the map" by Lewis and Clarke, although its mouth was already known, and

although it was not surveyed for many years afterwards. On the Duvida we made a survey for about a degree after we started; then it became impossible to delay if we were to get out at all with our food supply, and we mapped the course day by day by compass, and took astronomical observations every degree or half-degree. We were in canoes for about 500 miles. The distance below the point where we left the canoes down to the Madeira, which we entered in nearly lat. 5° 7′ S. and long. 60° 23′ W., added to the distance of the non-navigable stream above where we embarked, would make a total length of about 870 or 930 miles, that is, a river about the length of the Elbe or Rhine.

As we came down, it seemed extraordinary enough that the part of the river which no civilized man had ever traversed should be absolutely unguessed at as far as any cartographer was concerned, but it was more extraordinary still when, lower down, we were on a stream practically of the volume of the Rhine which had been known for years to the rubber gatherers, and realized that on no map was there a hint of this great river's existence, except in so far as there appeared on some maps an inaccurate indication of the mouth. Whether the name applied to the new river includes the whole stream between the source and its entrance into the Madeira, or whether it ends at the junction of the Castanho and upper Aripuana, is a mere question of terminology. Precedent for one course is supplied by the principle followed in naming the Rhone and Saone; precedent for the other by the principle followed in naming the Mississippi and Missouri.

Before starting down the Duvida, we passed the headwaters of the Pineapple; I made preparations to descend the Pineapple if, as Lyra thought, it turned out that the Duvida in three or four days flowed into the Gyparana. The necessity did not arise; and the Pineapple has not been descended, and no one knows its course. It is not on the map, and will not be "put on the map" until some one goes down or up. It is possible that it empties into the Tapajos or the Canuma. It is more likely that it enters the Castanho in lat. 10° 58′, as the river Cardoza or, as is perhaps more probable, that it is the headwaters of the Aripuana proper. Now, if either of these probabilities is the fact, I went by its source, and by its mouth; but I did not "put it on the map," nor has it been "put on the map" by the rubber men who have probably ascended its one course. It will first be "put on the map" by the man who explores it, who shows where it really runs and by what mouth it actually enters some known stream.

On no existing map is there so much as a hint of the existence of this great river—this river as large as the Rhine—save as above indicated. It was not accurately surveyed by us excepting for one degree. As regards the Pineapple, which may be its main tributary, we do not know anything positive. There is ample work to be done in putting the Pineapple on the map, and in finishing the survey of the Duvida. If this

Society will guarantee any man as fit for the work I will give him letters, and I think I can say that the Brazilian Government will also give him letters, which will ensure his having every facility, either to go down the Duvida more at leisure and map it carefully, or to go down the Pineapple and see where it comes out. Any man whom this Society will recommend to me I will put in the way of making, with less difficulty than we encountered, either expedition. If the man only wishes to ascend the lower two-thirds of the Duvida, or Aripuana and Castanho, the work will be simple, rather easy, and free from danger. I will give letters to the big rubber men which will enable him to purchase the proper canoes and provisions, and hire proper guides so that he can go up to the foot of the rapids in lat. 10° 44′ without any serious difficulties, and return to Manaos probably in about two months. Such a trip will need but very little preparation in advance and will not be unhealthy. If, on the other hand, the man wishes to ascend or descend the upper part—the hitherto unknown part—he will encounter some difficulty, perhaps some slight hazard to health and life; but nothing like what we encountered, for he will know, in the first place, exactly what is ahead of him, and in the next place he can probably procure as guides some of the men who went with me. If possible, provided he can get transportation I should advise him to take four big Canadian or American canvas and cement canoes. They are infinitely better than the dug-outs.

The PRESIDENT (before the lecture): In the presence of this large and distinguished assemblage, and after the greeting you have just given our guest, it can hardly be necessary for me to assure Mr. Roosevelt of the very great pleasure it gives us to see him here to-night. As soon as I heard he had emerged from the wilderness, my first act as your President was to invite him to come over and talk to us about his river. We are all deeply gratified that he has found himself able so promptly and so cordially to respond to the invitation sent across the Atlantic. Our only regret, the regret of the Council, is that, owing to a curtailment of Mr. Roosevelt's visit to England, the arrangements we had carefully made for the Queen's Hall fell through, and it was found impossible at short notice to obtain any large hall for any of the three nights, which were all he could place at our disposal. If any Fellows have suffered inconvenience they may rest assured it has been through no fault on the part of the Council.

No citizen of the United States, I believe, feels himself a stranger in London, least of all can Mr. Roosevelt be a stranger among us here, for in our Society he shares with a very limited number, I believe only eight others, the distinction of being one of our Honorary Members. But Mr. Roosevelt has other links with us in London. As a traveller he made what I at least consider a very good beginning, a bold start in life, by climbing, somewhere about 1880, the Matterhorn and the Jungfrau. He was promptly introduced by Leslie Stephen into the bosom of the Alpine Club, where he has ever since been my fellow-lodger. More recently we have watched him fresh (I think fresh is the right word) from years of the greatest responsibility, rush off for relaxation from his battles with politicians to encounter the hardly less formidable denizens of the wilds of East Africa. Latterly, as a prelude possibly to fresh struggles in the political arena, he has been facing perils by water and by fever in the unknown centre of South America.

I shall not say, as some of my predecessors have, that we have nothing to do here with politics. I trust that in the present and in the future politics may not be so much divorced from geography as they have unfortunately sometimes been in the past. I would rather say we have nothing to do with *party* politics at home or abroad. Yet we may assuredly recognize in Mr. Roosevelt, not only the traveller and explorer, but the man whose boundless energy, as he has just proved, unabated by years, in whatever quarter it is spent, has always been spent in the study of nature, in the pursuit of knowledge, or in honest efforts for the betterment of his country and the world.

Some time ago I took occasion to point out that the upper region of the Amazons, in which our guest has been exploring, shares with the heart of Arabia and the interior of New Guinea the distinction of being one of the least thoroughly explored and the worst-mapped portions of the Earth's surface. It has been left as one of the refuges of the imagination. It is there that Sir Conan Doyle, in search of a field for romance, planted his ingenious tale of 'A Lost World.' It is there that in 'Westward Ho' Kingsley made his hero disappear for years. Its mysteries have been gradually revealed, the veil has been lifted in great part, but still more remains to be done. The work of Chandless and the American travellers who have given us accounts of the courses of the Madeira and Tapajos rivers, which are on either side of the river which Mr. Roosevelt has discovered, have enabled us to fill up with authentic detail portions of the map, but there have been regrettable gaps left: our raw material has been defective. The modern mapmaker does not, like his more picturesque predecessors, fill up such gaps with elephants and castles, with griffins and mermaids. His fancy hardly goes beyond hairy caterpillars and wriggling worms. The caterpillars and worms represent mountain ranges and hills, and these survive until the real explorer and surveyor comes along and says the map is all wrong, and substitutes reality for invention. He may dispel romance, but he gives a more vivid picture of the world, and opens up new fields to human enterprise. The scene of Mr. Roosevelt's adventures, the country discovered in his remarkable journey, touches on that made familiar to most of us, endeared to the memory of many of us, by the labours of our late Secretary, that most brilliant naturalist, a friend of Darwin and Wallace, Henry Walter Bates. We elders who still remember him cannot but wish he could have survived to be here to-night. What pleasure it would have given our old friend to hand down the title of "The Naturalist of the Amazons" to a worthy successor in Mr. Roosevelt! There is another of our old friends and officers, happily still with us, who is one of the greatest living authorities on the Amazons, Sir Clements Markham. I regret very much, and so does he, that his advancing years and the state of his health forbid him from coming here to-night, but he has addressed to me and asked me to communicate to the Meeting his appreciation of the arduous journey undertaken by Mr. Roosevelt, his sense of its geographical importance in filling up a considerable gap in our knowledge and our maps, and his warm congratulations to Mr. Roosevelt and his companions on their safe return. Had he been able to be present he would have been glad to point out in detail how little was known before Mr. Roosevelt's journey of the stretch of land between the Madeira and the Tapajos and its shy inhabitants. In his absence I will read you the concluding sentence of his note: "Mr. Roosevelt is right in saying that existing maps are quite misleading, for they appear to take the tributaries of the Madeira right across the region from near the left bank of the Tapajos, excluding any river flowing from south to north. It appears, then, that Mr. Roosevelt has made a very important addition to our geographical knowledge by discovering this longitudinal valley between the Tapajos and the Madeira, and he must have overcome great difficulties in making the discovery."

To sum up, Mr. Roosevelt's claim to be the discoverer of this tributary river stands much on the same footing as that of Stanley's to a much greater river, the Congo. In both cases the head and the lower portion of the river were more or less known. Mr. Roosevelt, like Stanley, has been the first to pursue the stream through its whole or the greater part of its course, and to fix its position by observations. It is, therefore, as proper to speak of Roosevelt's river as of Stanley's river. And as to maps, they, like the curate's egg in *Punch*, are apt to be "good in parts." When it is said that a map is "all wrong" (and I have had to say it often myself), what is generally implied and understood is that it is wrong in the part the traveller has had to deal with.

I will not detain you longer, but will call upon Mr. Roosevelt to address us.

Viscount BRYCE (after the lecture): I rise in obedience to your President, but without any knowledge that the honour was going to be assigned to me of moving a vote of thanks to our most distinguished lecturer. Fortunately, very few words are needed to convey to him what you have already conveyed by your close attention and by your expressions of applause of the pleasure with which you have listened to his account, and the admiration you feel for the extraordinary enterprise and skill with which he carried through his exploration. As Mr. Freshfield has told you, I was never in that part of South America which Mr. Roosevelt has explored. I only visited the upper waters of some of these mighty streams, where they begin to descend from the great plateau of Peru and Bolivia, which he followed in their lower course. I have seen a little, and many here present must have seen much more of what are the difficulties which a tropical forest presents to the explorer, how closely intertwined are the creepers beneath and the climbing plants which hang among the trees and weave a dense web between their great trunks; how dense is the undergrowth; how often there are thorny and prickly bushes catch and tear the traveller, what a profusion of aggressive insect life exists there, and how many dangers the unhealthy conditions threaten to all but the most vigorous constitutions. It is an immense pleasure to Mr. Roosevelt's old friends, of whom there are many here, though I dare say hardly any one whose acquaintance goes back as mine does, to see that a man who has given such ample and such varied evidence of his intellectual gifts and dauntless courage in discharging the highest functions of statesmanship, should also display the gifts of an explorer and a naturalist, and should possess that physical strength without which all these brilliant capacities would have been of little use. I will venture to ask you, in passing a vote of thanks to Mr. Roosevelt for his extremely interesting lecture, to congratulate him not only on the important additions he has made to geographical knowledge, but the fresh proof he has given of his wonderful powers both of body and mind.

The PRESIDENT: In putting this vote, which I am sure will be passed unanimously, to the meeting I shall detain you but a few minutes. I must, however, say that Lord Bryce has a little disappointed me. Mr. Roosevelt made a distinct offer to any one who would follow in his footsteps and explore the other great tributaries of the Amazons. I had great hope that Lord Bryce would be the person to accept that offer—an offer made in the most liberal spirit and without reference to the Monroe doctrine. I think one useful point has been impressed upon us by the lecturer, it is this—that it would be a very good thing if cartographers were more often ready to confess ignorance. One of the great hindrances to good maps is the abhorrence of a blank in the ordinary cartographical mind. It is apt to insert or leave out glaciers in the most inappropriate manner, and it appears that with regard to rivers it is not less fantastic. I would add that nothing could have been more graphic than the picture of the hardships which Mr. Roosevelt and his party went through—hardships of the most disagreeable nature from their monotonous multiplication and

daily recurrence over a month and a half. The journey described would have been a great trial to the hardiest explorer; that it has been accomplished by an eminent statesman like Mr. Roosevelt, who has reached middle life, is a most remarkable feat. I am sure we all congratulate Mr. Roosevelt upon it, and we hope that when he next undertakes a similar journey he will come here and give us an account of it.

Mr. ROOSEVELT: I wish to add one word. It would be more technically accurate to say that we were the first explorers, not the "discoverers," of the river, just as was true of those who first explored the upper Nile and Congo. We "discovered" the mouths of the various tributaries, which we did not explore; we explored the main river, of which the head and mouth were known, although there was no knowledge that they were the head and mouth of one river.

THE MENTAL TRAINING OF A TRAVELLER.*

By the Right Hon. VISCOUNT BRYCE, O.M.

WHEN the President asked me to give you an address this winter, I felt it impossible to refuse a request coming from so old and valued a friend as your President has been to me; but I did feel some little difficulty about a subject, because it occurred to me that on an occasion like this you might naturally wish that every address should be connected in some way with the geography of the war which is now proceeding in different parts of Europe and Asia, and, indeed, in Africa and the Pacific also. But he observed to me in reply, and it seemed to me his answer carried sense and reason with it, that it was not desirable that, when we were doing nothing but talk about the war on every other occasion from morn till night, the meetings of the Geographical Society should also be occupied with that subject only. In fact, he observed it is better that now and then our minds should have a little respite and rest from the one engrossing topic. So it struck me that since we cannot travel ourselves this winter, perhaps not even next spring or summer, we might, at any rate, occupy ourselves by thinking about travel. You recollect how Tennyson says that the Knights of the Round Table, when they were not engaged in a tournament, used to "walk about the gardens and the groves at Camelot and delight their souls with talk of knightly deeds." So we may occupy ourselves this winter at the rare moments when our minds can have rest from the obsessing topic in thinking about travel, in recording what we have gained through travel, and in suggesting to one another what it is that travel has to give. Hence I have chosen a topic which rose out of my conversation with your President, namely, how it is that we ought to prepare ourselves to get the maximum of enjoyment and of benefit from our habits of travel. And in speaking of travel I am not to-night thinking of exploration. It is, of course, primarily for the encouragement of exploration, and for hearing the accounts of exploration which the explorer is able to give, that this Society exists. Its most famous deeds have been those done in encouraging travel, and its most

* Royal Geographical Society, November 23, 1914.

brilliant evenings have been those in which some man, returned from a journey of discovery in remote and dangerous regions, has recounted his achievements. All I propose to do to-night is of a very much humbler kind. It is to suggest how we may best fit ourselves and equip ourselves, to get the greatest possible pleasure and the greatest possible profit out of journeys which are not journeys of exploration—or only here and there journeys of exploration—but which in the main pass over ground that has been traversed before, but is susceptible of some little further cultivation, and, at any rate, of yielding something of value to ourselves as individuals. There is, indeed, not very much exploration on a large scale left to be done now, though it might surprise you to hear that there are places within the British dominions which no foot has ever traversed, and which may remain untraversed for a long time to come. Curiously enough, I struck two such places two years ago in New Zealand and Tasmania. They told me that there are parts of the west coast of New Zealand where the natural difficulties of precipices and profound gorges are so great that nobody has ever crossed from east to west, and that passes remain to be discovered by the daring climber which may prove to be practicable methods of getting through from some valley in the west coast to a valley on the eastern slope. Still more in Tasmania, a little bit of an island with no mountains of great height, there are tracts lying along the west coast which nobody has ever traversed. There are, here and there, stretches of 30 or 40 miles, measured north and south, entirely unknown, tracts that have remained unexplored ever since we took possession of the island. So even in regions close to civilization something new still remains to be done.

What I wish to dwell upon to-night is the way in which we may study and learn with a view to travel, in such wise as to derive a greater amount of benefit from our travel than it is possible for any one going without any previous preparation to obtain. It is very much like going into a picture-gallery. If a man enters the finest picture-gallery in Europe knowing nothing at all about the painters, whose work is there stored, their dates, the schools they belonged to, or the subjects they painted, he will derive very little benefit, and will carry away a most confused impression; but a little preliminary study will enable him to appreciate and enjoy pictures in a way which will be profitable all the rest of his life.

So it is when we enter the vast gallery of Nature. If we start to travel with a certain amount of preliminary knowledge, our travels repay us more and more at every step. The three things we ought to carry with us in order to learn and to profit are these: first of all, we ought to know what to look for; secondly, how to observe; and thirdly, how to reflect upon the things we do observe. Thus, also, the pleasures of travel are three: in the first place, the pleasure of observation, that which arises in the exercise of the faculty of observing; secondly, the pleasure of reflecting upon and generalizing from what we have observed; and thirdly,

the pleasure of memory, because it often happens that the pleasure of travel is greater in recollection than at the actual moment. The traveller may be under a severe stress; he may be suffering some grievous hardship, or even sickness; he may have what is even worse, the disappointment of being forced to hasten on when he desires to examine some spot more carefully. But long afterwards he can recall what he has seen and done; he can call up the impressions and meditate upon them; he can visualize a long series of scenes, and, still better, can talk them over with, and draw further light from, those who have had a similar experience. Now, the observing faculty which one exerts in travel naturally applies itself to two things. One is Nature, and the other comprises Man and all the works of man. Let me begin with the observation of nature, and you will pardon me if I run very rapidly over a number of things which it is interesting and profitable to observe, because every traveller has his own tastes, and there are many different sorts. I should like to cover as many fields of taste as possible, in the hope of striking now and then a more specially responsive chord.

Let us begin with the Stars, because one has much more opportunity of observing stars in travel than at any other time. We have more time, and whereas our own skies are familiar, the constellations visible when we are away from our own latitudes have the charm of novelty. There were of old, in the days when men sought for Final Causes, many lines of speculation as to the use of the stars, and why they were planted where they are. The oldest, which you will find in the ancient Greek poets, is the agricultural theory that they were created in order to tell men of the passage of seasons, and to indicate when the cultivator should sow and when he should reap. The second theory was they were set on high in order to furnish a means of foretelling the fate and fortunes of mankind, and upon this basis there was reared the science of Astrology, not yet quite extinct, for it is practised as a gainful art in San Francisco. The third theory was that they were useful for navigation, and this view has continued to hold its ground, for the stars are almost as valuable for navigation to-day as they were to the primitive Phœnician navigator who set out from Sidon in his ship bound for distant Tartessus or the tin-bearing coast of Cornwall. And lastly, we have within our own time discovered a new use for the stars, for by means of solar chemistry and the employment of the spectroscope we have discovered for the first time elements which chemistry has been subsequently able to identify as present in our own Earth. A fifth use the stars have is to add to the pleasures of travel, because when a voyage takes one down to or across the equator, or when in the southern hemisphere one traverses such a wilderness as the African Karroo, or passes over the deserts of South America, both of them exceedingly dry regions, where the air is exceptionally bright and clear, the pleasure of regarding the stars is one of the greatest pleasures travel can give.

You recollect, I dare say, that in the account which Dante gives of the imaginary southward voyage of Ulysses the only geographical indication is that the son of Laertes and his companions when they started on that voyage of discovery which ended the career of the famous hero, came, after a time, to a part of the ocean where other stars began to appear. "And now," says the hero to the poet in the nether world, "now all the stars of the other pole appeared, and our own was sunk so low that it rose no more above the surface of the sea." * There the poet, without any experience himself, for he had never been south of his own Italy, felt with the instinct of genius what would be for any one who penetrated far to the south, one of the most striking features of the journey.

Next comes meteorology, and with it we may think also of ocean currents as being phenomena which it is a great and novel pleasure to study in the course of a long voyage. As many of you know, such a voyage is apt to be a little monotonous; but if you have the opportunity of passing through parts of the ocean where you have never been before, and where you find the phenomena both of air currents and of water currents different from those of our own North Atlantic, there is a constant interest in observing these phenomena, and of making the acquaintance of the captains and officers of the ship, who are able to give you information on these things, information which seems far more fresh and vital than when you read it even in the best book. However, I need say the less about this because in the volume called 'Hints to Travellers,' to which you, Mr. President, have made valuable contributions, you will find these subjects very fully and clearly treated, and indications given of the kinds of thing one ought to observe. I was very much struck, in making a voyage along the coast of South America, by encountering a current whose enormous importance I had never realized until I found it obliged passengers to wrap themselves in great-coats on the equator—that is the great Antarctic or so-called Humboldt current, which drifts up from the south and runs along the west coast of South America. We are all familiar with our old friend, the Gulf Stream, who is, indeed, so familiar that now, we are told, it is the fashion to say that quite too much has been made of him; but very few of us have realized that the importance of the Antarctic current is almost as great, although its effects are not so directly perceived to be beneficent as are those of the Gulf Stream.

Now I approach the most important part of our subject, because it is one which admits of very various forms of observation. It is the study of the surface of the Earth and of scenery. Whatever else we travel for, we all do so, at least in part, for the sake of observing scenery, and few can appreciate scenery to the full, or get the real enjoyment of it, without a strong desire to understand the elements of which scenic beauty consists. Of these elements the chief are those given by Geology. When

* Dante, *Inferno*, canto xxvi. l. 127.

I name that science, do not suppose that I am going to suggest to any of you that a scientific knowledge of geology is in any way essential to the traveller. I am thinking of something far simpler and more easy of attainment than the scientific mastery of geology. It has become now a very elaborate science, which has ramified out into many branches, and grown quite large enough to occupy the whole of a man's energies. What I mean is very much less than that. I refer to those elements of the knowledge of the structure and formation of the Earth which are directly connected with scenery: what one may call the composition of the Earth as regards its substance and materials, and its structure as respects the succession of strata and the forms of the rocks which rise in eminences from the surface. These things interest the naturalist because the character of the surface and the rocks affect the vegetation and, indirectly, the animals; they interest the painter because it is his business to portray beautiful and varied landscapes; they interest the climber because his object is to get as high as he can upon mountains, and in order to know how to climb any particular kind of mountain, he will profit very much by his knowledge of the particular kind of rock of which it is composed, as I shall try to explain to you presently. And lastly, apart from all these specialists, there is the lover of beauty, and the poet, who desires to derive inspiration from nature. From all these points of view, whatever enables us to increase our power of grasping the quality and charm of scenery and carrying it in our memory is an addition to our capacity for enjoyment. I am not suggesting anything that requires a great amount of study. What the traveller needs is something like the gift for catching the type of scenery which a great painter possesses. Many of you are familiar with the landscapes of Turner. Has it ever occurred to you that Turner is one of the very few landscape painters from whose landscapes you can generally perceive what is the rock he is painting? If you go to his pictures you can almost always tell whether the mountain he is delineating is a limestone, or granite, or sandstone, or a slate mountain, because he had the gift of precise discriminative sight, and took pains to catch the exact character of the rock and render it faithfully in respect both of colour and of line. The same is true of Titian. Any one who had ever seen one of the dolomitic mountains of Southern Tyrol would be able to recognize them from Titian's backgrounds. If you were set down before one of these Titian landscapes and did not know where the scene represented was situated, any one who had climbed among the valleys between the Pusterthal and the plains of Venetia would recognize the scene as belonging to the Dolomite country. Now the basis of this sort of knowledge which geology can give to help our appreciation of scenery may be said to reside in four things. In the first place, in a knowledge of the substance of the rock of which the hills are composed; secondly, in a knowledge of the series or succession of the different strata one above another; thirdly, in a knowledge of the processes by which

the hills and mountains were raised; and fourthly, in a knowledge of the later process by which, after the raising had been completed, the mountains and hills were carved into the present shapes in which we now have them; that is to say, the processes of elevation and denudation. These four things are pieces of knowledge which a limited amount of geological study would be sufficient to give, and they would suffice to help a man to appreciate and enjoy the scenery of a mountainous country. One might acquire the elements of such knowledge in a course of five or six lectures. It is not always easy to find just these elements in the treatises. If you go to a manual of geology it tells you an enormous number of things which tax your memory and intelligence, and which you want explained to you by a teacher—in fact, there is much which it is hard to grasp unless you go out on geological excursions and see the natural sections and examine the rocks. Without that you cannot follow what the manual gives you. But the kind of knowledge I suggest might be got from a few lectures illustrated by views and by sections to show the way in which one rock is superimposed upon another, followed, if possible, by some excursions with guidance. Turner, however, discerned the character of mountain scenery without any geological knowledge at all by his inborn gift of seeing the actual and exact nature of things.

What I desire to convey may become clearer by showing you at this stage a few slides which the President has been kind enough to look up for me. From these you will see what are the characteristic forms which particular rocks assume in mountains. [A number of slides were here shown to illustrate the varieties of mountain form which are characteristic of certain rocks, especially those characteristic of gneiss, of granite, of mica schist and slate, of sandstone, of limestone, and of the more modern volcanic rocks. The views were taken from Ruwenzori in Central Africa, from the Caucasus, the Himalayas, the Alps, Greenland, Snowdon, in Wales, North America (the Grand Canyon of the Colorado river), South Africa (Table mountain), East Africa (Mount Kenia), Japan (Fujiyama), and the Hawaiian islands (crater of Kilauea). Remarks were made on the comparative difficulties of rock-climbing in gneiss and in limestone, the former rock often looking easier, and the latter looking more difficult than each respectively proved to be. Some account was given of the Colorado canyon and of the remarkable volcano of Kilauea, with its constantly boiling lake of liquid lava, out of which there rise frequent jets which appear as fountains of fire, but are really gigantic bubbles of steam spurting out red-hot lava.] Thirty years ago one could sit on the edge of this lake and watch its glowing surface broken by these fountains rising into the air, but now it is said that the level of the liquid lava has sunk into a pit, so the sight is less striking. It is quite possible, however, that it may rise again, for Kilauea has frequently changed since it was first observed more than a century ago.

Many are the ways in which the character of rocks and mountains has affected history, and before quitting this part of the subject I may mention one or two which bear upon the operations of war. The great wars have usually been fought in level countries, such as Lombardy and Belgium, and such is the case to-day, except as regards the Russian campaign in Armenia, and the skirmishes we hear of between Russian and Austrian troops in the passes of the mountains between Galicia and Hungary, usually called in our maps the Carpathians. A study of campaigns carried on in mountain countries leads to conclusions which are not generally known, but become obvious enough when the physical conditions are realized. It is not usually the highest ridges or the central watershed which an army preparing itself to resist an expected attack finds it most necessary to hold or most easy to defend. The lower slopes and the points where the valleys open out from the mountains are really of more consequence. It often happens that the main central ridge of the mountain and the watershed where passes cross it are comparatively easy and open, and over and over again ridges not reaching the line of perpetual snow have been scaled up pretty steep slopes and across the high ridges, and the defending party has been driven back. On the other hand, when a mountain mass has in the slopes where it descends towards the plains narrow gorges with precipitous walls, gorges hollowed out by streams and which are so narrow as to be easily defensible, they become points which it is essential for the defending army to hold, and where the invader may not only be stopped, but stopped to his own great inconvenience and possible danger, because he may find himself in the difficulty of being unable to obtain supplies in a waste and thinly peopled region. The best illustration of that maxim was to be found in the campaign of the famous Russian general, Suvarov, in 1799, when he, coming up from Italy, attacked the French and drove them over the pass of the Gothard and down the valley of the Reuss till he came near the Bay of Uri where the Reuss enters the Lake of Lucerne. There he found that the precipices which enclose the lake checked his advance, for the French had carried off all the boats; he was obliged to turn up a lateral valley to the east. He crossed the comparatively easy pass of the Kinzig Kulm and penetrated into the valley of Schwyz. There he became again entangled in the lower gorges, was met and stopped by the French, and could not fight his way through. He then turned east again and crossed a third pass, the Prägel, to the valley of Glarus. There again he was met by a French force guarding the narrow exit from the valley and was unable to break through. At last he was obliged to turn back southwards and cross a high pass where he was not opposed at all because nobody was guarding that side. So he got into the broader valley of the Vorder Rhine, where he was able to halt and rest his sorely reduced forces, because no Frenchmen were looking for him there. The campaign had failed, because while he had successfully forced his way across the main chain of the Alps he had been unable to force the exits from the valleys. A general who was

content simply to look at the map might naturally think his chief difficulty would be to cross the highest ridges, but in fact it is not there that the pinch generally comes. Thus a knowledge of rocks and their structure and of mountain forms may become of importance to the military strategist as well as to the painter or the lover of scenery.

May I give you one curious other little instance of the way in which geology comes in to explain a remarkable incident in a famous war. Those of you who have read the account given by Thucydides of the siege of Syracuse by the Athenians will remember how he mentions that when the Athenians determined to try to storm a line of cliffs which formed a natural defence of the city upon the north side, there was only one place where they could get up the precipitous face. Whoever walks along that line of cliffs, which is singularly continuous though low, as is often the case with a limestone cliff, will find there is still only one place where a large attacking party could mount. There are several places where a single active climber can scramble up, but only one where there is a fairly wide break in the line of cliff available for a body of men. Now that particular point at which the only easily passable breach in the cliff occurs is the point where the cliff has been cut through by what geologists call a dyke of intrusive igneous rock. There is a great deal of igneous rock all over Eastern Sicily. Now this intrusive dyke has itself become decomposed. Nearly all of it having rotted away, there has been left a comparatively gentle and easy passage upwards from the slope below the cliff to the plateau above which gave access to the city behind. It was my luck to see in South Africa a place where the same thing had happened. There is a sandstone mountain in Basutoland, in South Africa, called Thaba Bosiyo, which some eighty years ago was the great stronghold of the Basuto chief, Moshesh, who for a long time defied the armies of the Dutch farmers of the Orange Free State. They waged long wars against him, and in one of their invasions the commander determined to storm the heights of Thaba Bosiyo where Moshesh had his kraal. The mountain is a long tableland encircled by sandstone precipices, but through these precipices there is just one practicable passage up to the top of the hill. The Dutch Free State commander led his storming party to that passage. It was rather steep and very narrow, and only two men could mount abreast, and it so happened that one of the Basutos, taking cover behind a rock just above this narrow place, was able to shoot the leading soldier at the head of the column endeavouring to make his way up. The soldier fell, and in falling knocked down the man behind him. That gave a temporary check to the column. The Basutos above, taking courage, rushed forward, and, by their impact, drove the Dutchmen down. Thaba Bosiyo was saved, and with it the independence of the Basuto nation was saved. Otherwise it would have fallen under the power of the Free State. This incident prolonged its life as an independent native community until in later days Moshesh put himself and his people under the protection of England. They are now the most contented and flourishing

native people in South Africa. That breach in the sandstone precipice was made by a dyke of igneous rock which traversed the cliff and then, like the dyke at Syracuse, proceeded itself to decay, and in decaying left a free passage from the bottom up to the top of Thaba Bosiyo.

I pass away from the subject of geology to call your attention to the fact that some knowledge of botany provides another fertile source of interest to the traveller. He who has even an elementary acquaintance with geographical botany and with the classification of the various families of plants will find such acquaintance adds a great deal to his pleasure in travelling. Some families of plants are most frequently found under certain conditions of soil and climate; some are richer in species useful for food, or for other economic purposes. When one has learnt to know these and become familiar with them in his own country, he will derive no small enjoyment, when he visits other countries, from recognizing his old friends in their flowers and trees and in making new friends among their flora, and also in fitting these new friends of the vegetable kingdom in among the families, other members of which he knows already. To find new types akin to but a little different from the types of the flora he has known at home is one of the keenest enjoyments the naturalist can have in travelling abroad. What has been called "The pleasure of Recognition" is a very real pleasure. It gives a zest to every excursion, especially to mountain excursions, and opens an inexhaustible field for fresh observation. Neither will I venture to say anything about zoology, except to observe that what has been said about botany holds true of the animal kingdom also. If you have already some knowledge of the families of animals and their relations, it becomes very instructive to see the wild creatures of other countries. Unfortunately, the great mammals are becoming rather rare, and it was quite time that strenuous efforts should be made, as they have recently been made, to preserve the rare and large fauna of those parts of the world in which we hold control, such as Central Africa and South Africa. Some of the most interesting species were on the point of being extinct when these laws were introduced. There is a department of zoology to which it is not necessary to refer in detail —a department which we have not to go and look for, because it comes to us: it is that of the very small insect fauna, whether they have wings or not, and whether the latter class progress by creeping or by jumping. We have now learnt that they play a great part in the dissemination of disease.

From the field of nature we may now pass on to the other department in which a man can prepare himself by study for travel, namely, the things which belong to man and to the works of man. The relation of nature to human development, the influence which natural environment has upon the progress of civilization and on all the arts which belong to civilization, is an enormous theme on which one might discourse for days or even weeks; I only indicate to you what profit the historian, and especially the historian who has devoted himself to the

study of the earlier stages in man's growth and development, finds in examining in one country after another the relations which exist between natural environment and the progress of human communities.

Every art, every science, every form of political life, every kind of industry, can be brought into connection in some way or other with the natural aptitudes or features of a country, except perhaps two. No philosopher, or man of science, or geographer seems to have succeeded in establishing a true organic relation between geographical conditions and the development in a nation either of metaphysics or of music. These two things seem to be entirely independent of anything natural conditions can do for their rise or progress, as you may find by observing that they flourish in very few countries and in countries presenting dissimilar conditions. Very few nations have produced musical composers of the first order, and very few are rich in executants of brilliant talent. In Germany, one used to be told that all the good musical bands, both military and civilian, came from Saxony, and that neither the Bavarians in the south nor the Prussians in the north had anything like the same gifts as executants. Some great composers have, however, come thence. In the Austrian Empire, the military bands consist, so one used to be told, almost entirely of men from Bohemia, probably most of them Czechs, not Germans. In Hungary, the wandering bands which supply music to the nation are neither Magyars nor Slavs, but almost entirely gipsies.

He whose journeys lead him among savage or semi-civilized peoples does well to acquire, before he sets out, some knowledge of primitive folk-lore, for he will find opportunities both of discovering how much of it still remains, and of adding to the stock of information already collected. Even now, after all that has been done by the distinguished author of the 'Golden Bough,' you can find for yourself little new pieces of antique superstition that strike you with surprise and that give one almost the pleasure of discovery. I remember in South Africa, when our party was going to cross a district supposed to be very full of lions, a kindly native came up and pressed upon us a charm. It consisted of a small rude figure of a lion. The remedy was to act homœopathically by keeping off the attacks of possible lion enemies. To collect the traditions of native races and compare them with those of other races, to induce them sing or chant their ancient ballads or legends, is one of the delights of travel, though it is one now seldom attainable and likely ere long to disappear as the legends pass out of memory. I do not think I ever enjoyed any incident in travel more than when once on the shores of the island of Tahiti a local chieftain brought together for our party a large number of the natives of the neighbourhood who sang in a sort of recitative some of the ancient chants recounting the exploits of warriors of old time, long before any European touched the island. Such vanishing relics of a departing world leave a profound impression.

And this brings me back to one of the many lights which travel enables

us to throw upon history, if the traveller carries enough history in his mind to observe the facts of to-day with a historic eye. The folklore and the social usages of Kafirs or Polynesians often throw light on early European customs and superstitions. The racial changes in progress to-day illustrate the process by which races were formed in prehistoric times. The ancient races and their customs and their habits are in many regions vanishing and in others suffering change. There are processes going on in the Pacific islands which will probably have in forty years completely altered them and destroyed half their charm. In many isles diseases brought by Europeans are exterminating the native stock. In others the Chinese have come in; they are intermarrying with the natives, and in two generations more there will hardly be such a thing as a pure native left if the Chinese migration continues at its present rate. Fortunate is he who arrives still in time to see the remains of those ancient races still living as they lived before either the European, with his masterful ways, or the restlessly active Chinese broke in upon their genial easy-going simplicity.

However, I must pass on to the last topic for which I have time this evening. It is the profit and pleasure that may be derived from the study of architecture in travel. A little preliminary study, for no great amount of knowledge is needed, of the history of architecture, of the various styles and of the processes of transitions through which architecture has passed, adds enormously to the enjoyment of journeys in most parts of Europe and in Western Asia—one might almost say in all the old countries. In the new countries, Siberia, Australia, and the two Americas, there is, of course, very much less of interest to be seen. I am going to show you a few slides to illustrate the growth and progress of architectural design from the older forms of the ancient classical world down to times comparatively recent, though I regret not to have any slides to show how the typically ponderous grandeur of the earliest buildings we know, the temples of Egypt, has been reproduced in the most imposing recent building of the New World, the huge station of the Pennsylvania railway in New York.

[The slides shown were as follows: Interior of the ancient church of San Clemente at Rome, a basilica church of the early type (the oldest part fourth century); the church called the Abbaye aux Femmes at Caen, supposed to have been built by the wife of William the Conqueror (early Romanesque type); Fécamp Abbey Church in Normandy (Romanesque); the Temple Church in London; Cathedral of Laon in France (later Romanesque); Cathedral of Chartres in France (Pointed, fourteenth century); Cathedral of Burgos, in Spain (Pointed, fourteenth century); Interior of Notre Dame, Paris; Belfry tower of Bruges (fifteenth century); Church of S. Maria Della Salute (Venice); Pisani Palace (Venice); Antwerp Town Hall (all three Renaissance).]

The interest of the views just shown you lies in the fact that each style is associated with the character of the people that raised the building at the time when it was raised, and that you can trace in the changing

styles the change in their material conditions and in their taste. One can usually determine (within a few years) the date of a church or a town hall from its style, until we come down to the nineteenth century, when styles got mixed and men began to build in the styles of past ages, having none of their own.

There are many other points connected with the history of architecture, and the light which it throws upon history, I should gladly have dwelt upon if time had permitted. For instance, it is very often the most visible indication of the relations that historically existed between different countries. Those of you who know the architecture of Scotland know how constantly the French forms reappear in the Scottish buildings of the (late) fifteenth and sixteenth centuries. And in the same way, architecture often reveals in the most direct and effective way the character of a race. There is in all the churches and many of the castles which the Normans built, whether in England or in France or in Sicily, the same character—an indication of indomitable force and strength which belonged to the Normans conspicuously above every other race of Europe.

It only remains to say that besides all these sources of pleasure which a man may derive from carrying along with him as he travels some knowledge of history, some trained power of observation, and some elementary knowledge of the sciences of nature that are easiest to learn, besides all these there is the instruction and stimulus to thought which one may derive from studying the temper and mind and ideas of the peoples with whom one comes in contact. First of all great travellers is the hero of the Odyssey. The poet says of him that he was one who "saw the cities and knew the mind of many men." * To know the minds of many men, that is to say, to study the character and idiosyncrasy of nations through individuals, is the most interesting of all the things travel enables us to do, and for that study we require two preparations—some knowledge of history and some knowledge of languages. When one goes into the remoter regions linguistic knowledge is a thing hard to obtain. For most of us life is too short to learn Arabic or Chinese or Japanese, or even an easy tongue like Hindustani, and, of course, one suffers proportionately in travelling in the countries where these are spoken. Every one, however, may with a little trouble get a working knowledge of Italian and Spanish and German. Russian, however, takes a good deal of labour, though it repays the labour. To get really acquainted with the mind of a people one must travel slowly. Little is learnt by him who is whirled about in a train or motor. Far better travel on foot or on a bicycle or in a light carriage—an excellent mode of locomotion, staying at the small country inns, and stopping on the road to talk to the peasants and getting into some sort of touch with their lives. I am afraid that in the modern passion for haste, we are losing that greatest benefit of travel which consisted of knowing how to enter into the thoughts and tastes

* πολλῶν ἀνθρώπων ἴδεν ἄστεα καὶ νόον ἔγνω.

of other peoples, how to see them sympathetically, and understand the lines on which their minds move. That extreme swiftness and ease of communications, which we value because it enables us to go so far and see so much in a limited time, has its inevitable drawbacks. It makes us live in hurry, and to be in a hurry is to be superficial. You may remember that in a lecture the Society had the pleasure of hearing some eight months ago from Mr. Rudyard Kipling, he observed that travel would in the near future be very much swifter, because transportation to places far away would be chiefly by aeroplanes. If we have not reached that stage yet (and some of us do not desire to reach it) we are at any rate all getting into the habit of travelling so fast that a good deal of the old pleasure and profit is being lost. Perhaps we must look forward to a time when the world will become so thoroughly well known that most of the mystery and romance which it has been our own privilege to enjoy, and which our forefathers enjoyed even more fully, will have disappeared. In the next three generations the world will have come to seem very small. When a man has crossed the Atlantic ocean twice or thrice it no longer strikes the imagination with the same sense of awe and wonder as it used to do when he gazed out over its heaving billows from some height in Cornwall or the rocky heights of Ireland, knowing nothing of the shores that lay beyond. Even the vast Pacific is not quite solemn and does not seem quite so vast to those who have traversed it in several long voyages. When we think how enormously our own knowledge of the world has grown during the last three centuries we may well suppose that two centuries hence there will be hardly any part of the Earth which will not have become as familiar to everybody who cares for travel as France and Italy are to us now. And, therefore, we may feel inclined to pity our successors, to whom travel will give fewer of the charms of novelty. Yet, on the other hand, it may well be that our successors will have different tastes and different sources of joy from those which we possess. If they discover new sources, new fountains of delight, they will not have to regret those that have been ours and will be less completely theirs. One way or another, some enjoyment there will surely always be in travel. Some human capacities and powers do remain unchanged. What we see and hear every day proves that human courage is as great and human firmness in facing death as unshakeable as ever they were in previous ages, and thus, amid the sadness and strain of these months of effort and of mourning there rises in us a fresh sense of the inexhaustible virility of an ancient race So also may we feel sure that the love of beauty and the love of knowledge will always remain to be a source of delight to mankind. They are as strong now as they were thirty centuries ago, and they may remain so for ever.

The PRESIDENT (before the paper): It is very pleasing to me to think that my task to-night is virtually a sinecure, for to introduce Lord Bryce to any assembly of Englishmen is quite unnecessary; and the same thing might be said of any assembly

of citizens of the United States. Lord Bryce has made himself a link between our two great countries: one of the most valuable links. I believe if you were to ask Americans what European they would best like to come over again to see them, they would all answer, Lord Bryce. But we are not here to estimate the high qualities he has shown in that political career to which a strong desire to serve his country has condemned one who was, I think, born for better things. Lord Bryce was meant by nature to be a great traveller. To-night, for a few moments, I should like to point out how his taste for travel has overborne all impediments. Our common friend, the late Leslie Stephen, on one occasion said, or wrote, that when you were estimating a man of talent or genius, if you treated him like an artichoke, and stripped off one after the other the various layers, you were sure to find at the core something primitive. I feel with regard to Lord Bryce, that when I have stripped off the historian and the Member of Parliament, the statesman and the diplomatist, I come on the wandering nomad! I am not going to try to run through all his travels; you know them, probably, already. He has roamed not only from China to Peru, but from Australia and New Zealand to Iceland and the Lofoten islands. I will promise him I will not descant on a feat which as long as Sunday schools exist will not be forgotten—his ascent of Mount Ararat—nor will I run through even the titles of his most valuable works of travel; on the Caucasus, on South Africa, South America, and, above all, on the United States. I shall prefer to point out in one or two instances how his love of travel and scenery and mountains has broken out when his main interests and occupations were of a very different order. In the first place, while he was a Member of Parliament, we most of us recollect how he did his best to open out to us the only inaccessible portions of the British Islands, by promoting year after year (unsuccessfully, alas!) an Access to Mountains Bill. When I went to Ireland I found the local officials still panting with the remembrance of the pace at which the late Chief Secretary had made them climb up the steep hills of the Atlantic coast, quite regardless himself of the relaxing character of the climate. I crossed to the United States, and I was credibly informed that the only person, with the possible exception of Mr. Roosevelt, who had been, and spoken, in every State of the Union was the British Ambassador. I went on, and I hoped to have had a meeting with Lord Bryce on the Trans-Siberian railroad, but it failed because after a strenuous fortnight of arduous sight-seeing at Pekin, which had left our Legation in a state of collapse, he and Lady Bryce had gone off for ten days in the Altai mountains. Scarcely back in this country, Lord Bryce found an excuse for a visit to Jerusalem and Petra, and it is only by the greatest good fortune that we have him here to-night, and that he is not a hostage either in the Tower of David, or the Arabian desert. I have one more recollection—a very remote one, and not altogether a happy one—of my friend. Something like half a century ago Lord Bryce was a Fellow of Oriel, and an Examiner in the School of Law and Modern History. I had the misfortune to be one of the examinees, and I perfectly remember he asked me several questions about the lower course of the Danube, questions which I could not answer, and which I flattered myself at the time he might not have been able to ask had he not just returned from a tour in the Carpathians. But Lord Bryce is equally good at answering as at asking questions, and I hope that to-night he will preach to us what he practises; that he will help us to profit by our travels more than we do at present. I will ask him to give us his lecture.

Sir Francis Younghusband (after the paper): I must, in the first place, apologize for being here at all to-night when I ought to be across the water with my old comrades. But I can assure you it is for no lack of asking that I am not there, and my presence here can only be explained by the idiosyncrasies of the War Office. It has been a peculiar

pleasure to me to listen to what Lord Bryce has been good enough to tell us, and it has made me, and I dare say most of us, feel how extremely deficient we are as travellers. When we hear the long catalogue of qualifications which we ought to possess, and which we quite acknowledge we ought to possess, most of us must feel we are singularly deficient. Lord Bryce referred to the pleasures of mental equipment for travelling, the pleasures of observation, and the pleasures of reflection, and the pleasures of memory. And it is the case that in very hard travelling the strain is so great that while we were observing we do not always get that pleasure which we do afterwards from the reflection and from the memory of what we have seen. And these days of fog and heavy cloud and dulness in London, are incentives to us which make us peculiarly appreciate the beautiful things we have seen during our travels. At any rate, it certainly is so in my case. This very morning I happened to take up the American *National Geographical Magazine*, in which there was a magnificent photograph of the Grand Canyon which Lord Bryce has also showed us this evening, and which took me straight away to that most striking object of nature and all the wonderful distances and sunny scenery to be admired there. Lord Bryce referred to the effect of mountains on warfare, and it is interesting for us to remember that in Tibet we crossed the Himalayas in the middle of winter, and on January 8 crossed a pass of 15,000 feet into Tibet. Some of those Indian soldiers who accomplished that task are now fighting in Belgium. I quite agree with Lord Bryce—certainly it was our experience in Tibet—that fighting takes place, for the greater part, at the foot of the mountains, on the passes, and not on the mountain summits; but perhaps that was explicable when you realize the mountain summits in Tibet are something like 24,000 and 25,000 feet in height. The fighting sometimes took place at a height of 18,000 feet above sea-level. I heartily agree with the President as to the privilege and pleasure which it has been to receive Lord Bryce here this evening, and we are all most grateful to him for the exceedingly interesting lecture to which it has been our pleasure to listen.

Colonel Sykes: Listening to Lord Bryce and looking at the slides he showed, carried one back to the people who built those cathedrals, and so to the old English travellers. The earliest English traveller we know of who went to Asia was a pilgrim, St. Willibald. He started off to see that "delectable city of Jerusalem." When he landed in Syria he was arrested as a spy and put in prison. He was taken before the Calif and was examined. He said that he came from a country beyond which there was only water and nothing but water. Whereupon the Calif said: "This man cannot be a spy, so let him go." All these old travellers went with one idea, namely, to find sacred relics of some martyr, and, if possible, to secure one of his teeth or a lock of his hair. The pilgrimages of those days led up to the crusades. The crusades failed in their immediate object to recover Palestine for Christendom, but they led up to the trade-adventurer, the greatest of whom was Marco Polo, the father of modern geography, who went out with his father and uncle to the East to sell jewels. Gradually from Marco Polo's day down to now we have improved until we come to the lecturer of to-night with his manifold qualifications.

Mr. D. G. Hogarth: It is ill following Lord Bryce at any time. It is very ill when you have had no knowledge beforehand of what he was going to say, and most ill when what he has said is so admirably true and so aptly expressed that there is nothing whatever for you to pick holes in. And I am not quite sure that on the one point on which I felt disagreement I am not setting up a man of straw for myself and throwing stones at him; but I did think Lord Bryce seemed to draw a distinction in the beginning of his lecture between the explorer and the traveller. I should myself draw a distinction only in degree. There seems to me to be in the ordinary traveller, the tourist if you like, and the explorer, the same quality of mind, and that is really

the most essential thing. Without that particular quality of mind, no one can be either a good explorer or a good traveller. This quality of mind I can only express by the word "alertness." You must all know the essential difference between those people who have wandered through the streets of a perfectly unfamiliar foreign town and can find their way back and the people who cannot. The people who can are those who have been alive to everything on their road, to everything, that is to say, within the ordinary range of vision. But there is also the kind of person—who is not that kind of person. It is, of course, absolutely the same quality, whether the field is small or great, whether the observer is a tourist or a traveller. I do not mean for one moment to deny the enormous value of previous preparation—the great value, for example, of knowing the language of a people, or enough of its language to talk, and, to some extent, to get into the nature of a people. But not only is it becoming difficult to find anything in the world that is absolutely new, but also increasingly difficult to be at all well prepared in a considerable number of subjects. It was so much easier about a century ago. Those old travellers who used to go out with a knowledge of botany, zoology, and geology quite sufficient for their day are to be envied now very much. Studies have become so specialized, literature so overwhelming, that we cannot hope to do what they did. But perhaps the most essential thing for the enjoyment of the tourist—and I am not at all sure it is not equally essential for the success of the explorer—is that his curiosity should play equally over everything—that he should not be so much obsessed by any one interest that he disregards others. Possibly a certain cynicism—as your enemies will call it, but you, no doubt, will say you have a sense of humour—is one of the most useful qualities of mind a traveller can have. Lord Bryce has taken you to-night over a great deal of country in one way or another, and has drawn largely on the resources of a mind which is extremely well furnished by autopsy of a very great deal of this world. Very few people have retained anything like his alertness of mind, and very few people have had the same opportunities of seeing different parts of the world and different people under the best possible conditions. I am sure you will all join me in thanking Lord Bryce for having given us a most delightful evening.

The PRESIDENT: In winding up the proceedings to-night I feel somewhat in the position of a Royal Prince who, at one of our meetings, turned round to me and said, "My brother has said all I was going to say; what am I to do?" Mr. Hogarth to-night puts me in a similar embarrassment. I had made a certain number of notes of what I might say with regard to the lecture of our modern Ulysses, but I think he has covered them all. Twenty years ago I wrote a short preface to our Society's 'Hints to Travellers,' in which I inserted some words of warning against the specialist who has only one pursuit, and I urged that it was an advantage to a traveller to cultivate as many and varied interests as possible. My criticism apparently went home, for I am amused to find that a succeeding editor, after I had left the Council, cut out that preface! I therefore repeat its substance to-night. There is one remark Lord Bryce made which I should like to qualify a little. He talked of Turner's great fidelity to landscape. I entirely agree with that as far as type of scenery goes, but I think you can seldom identify the exact locality in Turner's pictures. You can tell what the region is, but cannot feel at all sure of the place, or that it is any place. Mr. Hogarth said mental alertness was needed in travel. That is very true. But there is besides a topographical instinct that is inborn in some people and entirely lacking in others. We are not all pathfinders. It is an instinct probably primitive, and not at all intellectual. But I have found it very useful. We have been given plenty to think about and plenty to profit by in Lord Bryce's lecture, and we are very much obliged to him for coming here. I am sure you will all join me in passing most heartily a vote of thanks to him.

TYPES OF POLITICAL FRONTIERS IN EUROPE.*

By Prof. L. W. LYDE.

THE frontier, in its earliest unconscious conception, seems to have been the extreme limit of the area from which the people living within it could obtain the necessary supplies of food. In what may be called its ideal illustration, on the steppe, survival of the little semi-political unit depended on an adequate minimum of area. But security was as essential as size to this survival, and prescriptive rights of pasture were apt to be pushed up to some conspicuous natural features as its lines of trespass. About the position of these features there could be no doubt or dispute, and some of them were soon found to be a real protection to the land within them. Indeed, their character was calculated to be protective in a double way: they prevented intrusion from outside, and they focussed concentration on the full use of all resources inside them. But the area within them tended to be relatively small, and therefore, the frontier became a definitely racial agent, so that we may call a natural frontier also a national one. For the absence of intruders and the presence-of considerable in-breeding tended to the production of a marked physical type and a marked group-consciousness or clannishness, while there was bound to follow—however slowly—some advance from a natural to an artificial basis of supply. Ethnic differences, both physiological and social, were to some extent, therefore, associated with marked physical features as frontiers; and the influence of region on race supplies an argument for the universal adoption of politico-ethnic frontiers.

Up till comparatively recent times, then, the essential object of a natural or national frontier has been protection of the land within it, *not* the land on *each* side of it, so that—to misquote Mr. Chesterton—"if a bully tried to blunder into your room with a horsewhip, he might tumble over the door-mat." Where natural features did not guarantee this, the gap had to be filled by a fortress, such as Liège or Belfort.

The essential object of an artificial or international frontier has been somewhat similar, but there has been some attempt to consider the land on each side; *e.g.* in the San Stefano Treaty there is the definite statement, "the frontier will be rectified in order to put an end to the perpetual conflicts between Montenegro and Turkey;" and there is an obvious expectation that this object will be furthered by the frontier following "the chain of mountains by Shlieb and north of Albania by the crests of the Kopaonik (and other heights named) to the highest peak of Prokleti." But surely the object would have been better attained by a "scientific" frontier, giving Montenegro a union of natural and strategic advantages which would have compelled the stronger power to fight for the *approach* to the line of greatest natural strength as represented by the "crest."

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* Royal Geographical Society, December 7, 1914. Map, p. 131.

In the evolution of states, the strength and stability of a unit, however, would vary with the extent to which the ethnic area coincided with the political area. And this coincidence of the ethnic with the political involves the question of expansion. The natural growth of the ethnic unit justifies geographical expansion only in primitive times and places; but, as all empty spaces must some day be fully occupied, territorial expansion is only a temporary means of shirking obligations. And in a mature civilization natural growth can be legitimately met only by intensive, not by extensive development.

The most conspicuous features available as frontiers were mountains and rivers, and the latter were in several ways the more effective; for instance, what we call the "primitive" river-frontier has been so useful in half-explored areas because it was practically indisputable, it needed no mathematical plotting, and it had certain military merits, *e.g.* of delaying an enemy and concentrating his energies on such points as fords and bridges. "Navigable" rivers were just as great a hindrance to the primitive man, especially if purely a landsman, as they are now a help to the civilized man, and the fact that they did encourage some movement *parallel* with their course has been much exaggerated. But a river frontier approximated to the nature of a line, while deserts, seas, and swamps were in the nature of a belt; and the latter made the better frontier. The loftier mountains are, of course, also a zonal barrier; but the lower mountain plays an intermediate and special part; it offers often a geological, always a climatic, change from the lowland at its foot; and the consequent differences of human physique and economic occupation increase with distance from the political core and with nearness to the frontier line, the geographical control encouraging close similarity of type on both sides of the line. For similar reasons there must be mixture of racial type along almost any political frontier; and there must be compromise over the impossibility of drawing a purely ethnic line, *e.g.* in Transylvania. We must recognize that there has been a real value in a natural frontier, and that—though "nationality" may cover legitimately great variety of race and speech, of creed and outlook—there must be a balance on the side of community, *e.g.* a community of freedom and good government in Switzerland. Where, however, there is a very dominant partner, success must depend on the power of that partner to attract the others—to make them submerge their political, religious, linguistic, and other diversities; to offer a substantial national gain for the diverse sectional self-denials.

The essential object of statesmanship in the delimitation of a frontier, therefore, ought to be to effect an equilibrium along it, so that peoples could meet peacefully, and so that ascendancy should not be able to intrude across even by fair means, still less by foul means; and no doubt the difficulty of effecting this must vary with the remoteness of the frontier from its own political core, with the character and density of

any population along it, and with the differences in profile of the opposite sides of the frontier. For instance, one difficulty in the past—and it is still felt in parts of south-east Europe—has been the tendency of the lawless and the criminal to congregate at the farthest possible distance from the central arm of authority.

Under all the circumstances of political life hitherto there has been perhaps only a choice of evils; and probably the least evil was to draw a frontier line as far as possible through wide, not only uninhabited, but actually uninhabitable areas. Such areas have tended not only to defend from actual attack, but also to keep the peoples on each side of them from coming into contact, and so far they have minimized causes and chances of friction; but civilization is essentially progress in the art of living together, and the rubbing off of racial and other "corners" by constant friction with others is the greatest agent in that. Whatever the value, therefore, of an uninhabitable frontier belt, it does not favour progress in civilization, though it is obviously better than an inhabitable frontier zone in which racial and cultural antagonisms are allowed, if not encouraged.

It is, however, not the destiny of the world to be for ever at war, and the conception of the *rôle* of a frontier is already changing, so that in the future—perhaps not the nearest future—the principles underlying the delimitation of a frontier will be such as involve all possible aids to the peaceful meeting of nations, not to their parting.

Three points are of vital importance: (1) That the racial unit should as far as possible coincide with a geographical unit, especially if the racial unit has proved incapable of assimilation, *e.g.* the Albanians; (2) that in choosing a new political owner of any inhabited area first consideration should be given to the capacity of that new owner to assimilate others; and (3) that the feature used for the frontier should be one where men naturally meet—which is not on waterpartings and mountain crests.

First, then, let me give you some instances of zonal frontiers in Europe—a river through an uninhabited peneplain with a climate approximating to that of cold desert, a plateau scarp with a climate approximating to that of hot desert, and a mountain range of sierra type linking a 5-foot to a 10-inch rainfall.

The frontier between Norway and Russia involves a reference to the geographical control of the fiord, as the nursery of a race of fishermen and as having given the Viking race a natural extension along the fiorded north coast of Scandinavia to the limit of open sea, *i.e.* practically to within sight of the place where the Arctic ocean shallows to the 100-fathom line off the Kola peninsula. When Russia, after conquering Finland, spread to the Northern ocean, she soon realized that part of her hinterland was isolated by this Norwegian coast-strip, and eventually she demanded that the Russian Lapps should have not only fishing rights, but actual territory on the Varanger fiord. Russian attention was diverted from

the question by the Crimean war, and during the war Norway concluded a Treaty with both England and France, by which the two countries guaranteed assistance against any encroachment on the Norwegian territory. Hence this curious *détour* of frontier to include the essential hinterland of the Varanger fiord.

As a matter of fact, the land in this district is of very little value; the population is not two to the square mile; and therefore there was no question of disturbing any natural associations or activities except actually on the coast—which remained Norwegian. The one great need was simply for an indisputable frontier which did not need artificial and expensive demarcation; and this was to a large extent provided by rivers—towards Norway by the Tana and towards Sweden by the Tornea, a tongue of Russia being inserted to separate Sweden from Norway. The one really weak spot is where the Swedish and Russian frontiers meet at the head of the Bothnian gulf, for it is the point from which a railway runs through a rich mineral and timber area to the ice-free port of Narvik on the Norwegian coast. And the building of Russian railways towards this point and to the terminus of the natural bridge of the Åland islands has been interpreted by the Swedes in the light of Russia's political and economic treatment of Finland.

For the other two illustrations we will go to south-west Europe.

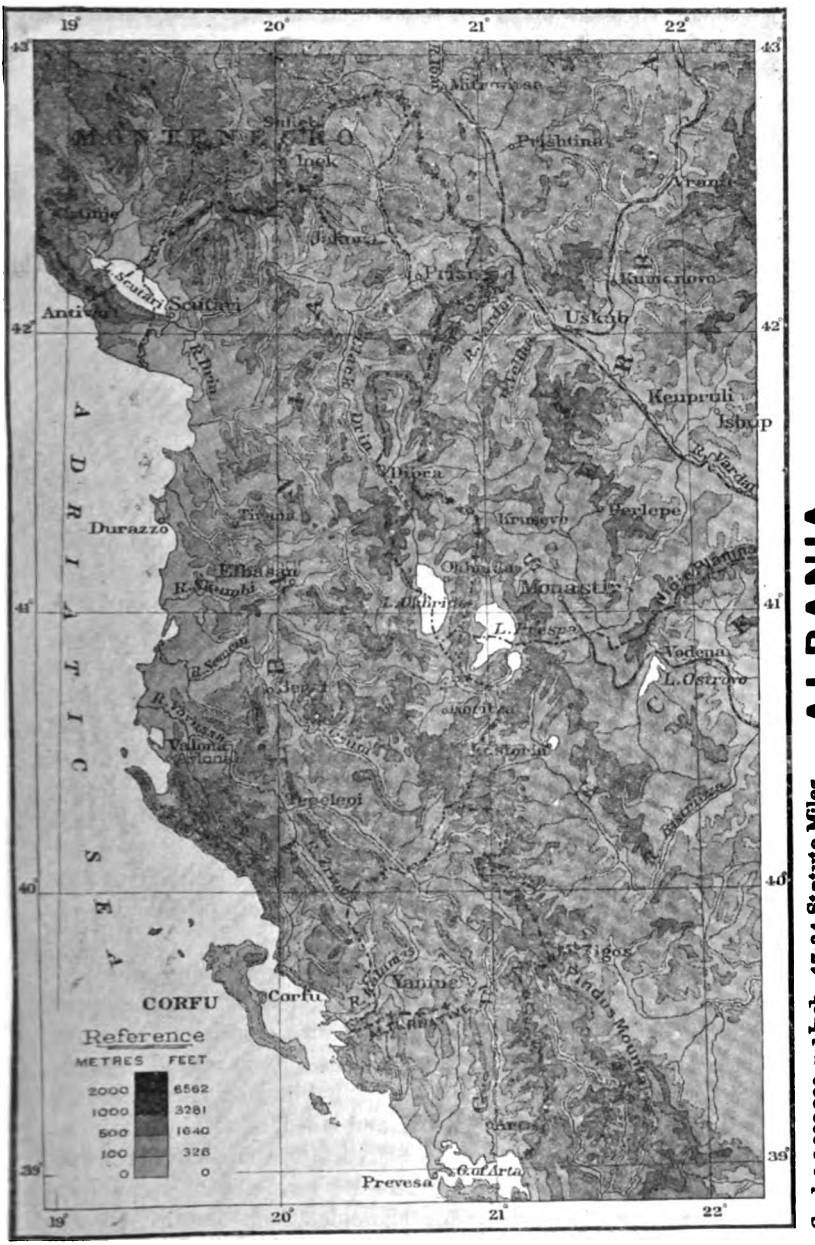
France has in the south the nearest approach to an ideal frontier, if that implies a complete physical barrier. For the Pyrenees have a sky-line as even and level as that which made the Norwegian fishermen compare the Kiolen range behind them to the "keel" of an upturned boat, and the reason is that they are of typical sierra character, any deviation from the even sky-line being only little notches comparable with the teeth of a saw. The range, therefore, became a linguistic and cultural barrier such as made in the past the best political frontier; and to this day no railway crosses it, partly, perhaps, because the more abrupt scarp faces the more enterprising nation. Of course, the strips of comparatively low land where the range was abruptly truncated at each end, have been the scene of terrible fighting, Gerona having been besieged no less than twenty-five times; and the comparatively easy route across to the centre of the plateau by the pass of Roncesvalles, at a height of 4000 feet, enabled Aragon or Navarre, when holding the southern flank of the western end of the Pyrenees, to dominate the steeper northern flank. But the frontier, from the old point of view, has proved almost ideal, and this is suggested by the fact that its recesses still hide the independent Republic of Andorra.

I would like in passing just to refer to the assertion that "the frontier between Spain and Portugal has no geographical basis." As a matter of fact it illustrates the truth that the old axial core of the plateau runs north and south, so that about longitude 7° W., it blocks navigation in every navigable river common to the two countries. Further, the larger

rivers—Minho, Douro, Tagus, and Guadiana—in passing through this belt of old core, plunge down from the plateau through profound gorges, so that there would in any case be a great breach of continuity in the distribution of population. This was accentuated by King Alfonso I., who deliberately devastated the belt of steppe between the kingdom of Asturias and the Saracens, and devastated it so effectively that the approach to the frontier along the Guadiana is still through what is practically desert. Of course, the very gradual reconquest of the country from the Moors tended towards the institution from time to time of separate political units, each including a definite area of the recovered ground; and the physical conditions referred to above gave to the Portuguese area the best natural chance of remaining a separate political unit, as being the particular part of the coastal area of the peninsula which was least able to co-operate with the plateau core.

The Franco-Italian frontier, with its Alpine alternation of peak and pass, presents strong contrasts to the Franco-Iberian, with its relatively even sky-line of typical sierra. Perhaps the strongest contrast is shown by a road or railway map of the two areas; but even so it must be remembered that the great Alpine tunnels only run under passes which have been in constant use for hundreds of years. To the Alpine characteristics of peak and pass, however, must be added the fact that the old Cevennes and Bavarian blocks forced the uprising Alpine folds into a broad bend concave towards Italy, and these subsequently weathe ed much steeper on the sunny Italian than on the non-Italian slope. These two facts made it always easier to defend the Italian side than the French or Austrian side, for the passes converged *e.g.* on Turin or Milan, but also easier to invade Italy from France or Austria than to invade either from Italy. In peace, for instance, French influence climbed easily up the gentler slope of the Western Alps, as up the gentler slope of the Vosges; in war the same principle held good, and was explained by the ease of moving by several routes at once. For, as the passes converge on Italy, the nearer the various foreign units got to Italy, the nearer they got also to one another; but for Italy increased distance from the base involved increased distance between the exits of the routes on the French side. Both from France and from Austria, too, there was a sea approach, which turned the land approach. Here, therefore, though there has always been a certain amount of protection given to Italy, the Alps have not isolated like the Pyrenees, nor have they been such a marked linguistic or cultural barrier. All this was bound to be reflected in the natural frontier line.

From the southern extremity of the Maritime Alps to the head of the Val Leventina below the St. Gothard the frontier towards both France and Switzerland is practically the crest of the Alps; but by crest here is meant the outer limit of the *Italian* watershed from the Stura to the Ticino, a line which sets natural limits to normal movements of population, still



ALBANIA

to illustrate the paper by
PROF. L. W. LYDE.

Scale 1:3,000,000 or 1 Inch = 47·34 Statute Miles

10 0 10 20 30 40 50 Miles

Boundaries .....

Boundary of Albania suggested by author ...+-+-+-

Railways ———

more to settlement, and which at the same time gives Italy sole control of the source of the water that is so essential to its northern plain and to the manufacturing towns of the surrounding piedmont.

But two special phenomena need attention. On the one hand, the position of Savoy astride of the highest ridge of the Alps was so dominating that it enabled a Savoy king to take the first step towards giving unity to modern Italy by taking advantage of political trouble on the outward flanks of the Alps; but, for that very reason, it was made the price that had to be paid for French help towards that unity in 1860. On the other hand, the departure of the frontier line from the obvious line of least resistance to the sea, which should be reached at Turbia, may be associated with the Savoyard history of the county of Nice, but it had much better be pushed back to its fundamental basis in the essential continuity of the Alps with the Apennines and the consequent wedge of "lowland" driven eastward into Italy. There is, therefore, a so-called "lowland road" into Italy from France; and perhaps the best site for the terminal stretch of frontier must be where this road is narrowest. But even here the general frontier remains roughly parallel with, if it is not the actual water-parting of, the one great river of Provence, the Var; and historic causes which pushed the Christians farther east into the mountains, *e.g.* the Saracen settlement in the Var basin; the intimate relations of the country to both France and Italy, between which it had a separate administration; and the fact that its last count bequeathed it to France, though in the laws relating to the country the kings of France had to add to their royal title that of "Count of Provence"—decided that the Franco-Italian frontier in following the old eastern frontier of Provence and Nice should encroach on what was linguistically and culturally, if not also quite racially, Italian territory. It did, however, also encroach on French territory, where the Savoy king, who was an ardent hunter, was allowed to retain certain famous chamois grounds. And it must be counted righteousness to the French that, though they held the gentler reverse slope of the "frontier" 50-mile belt of mountain, their encroachments were so slight.

Now let me draw your attention to the three conditions which I suggest as essential in delimitating our frontier to-day. First, the need for the racial unit to coincide with a geographical unit, especially where the former is incapable of assimilation. For instance, Romans and Byzantines, Serbs and Bulgars, Venetians and Sicilian kings of the House of Anjou, all tried to assimilate the Albanians, and failed.

Take then Albania, the land of the Shkypetars, "Sons of the Rock Eagle," or simply "Rock-dwellers." Here we have the most ancient existing race in Europe, speaking a language older than Classical Greek, steeped no doubt in ignorance and superstition and blood-feuds, but probably second to none in the world for fidelity to their word and to their own ideals. Bismarck's sneer that there was "no Albanian nationality"

showed crass ignorance, or was a characteristic mis-statement. These Shkypetars are the indigenous and autochthonous owners of the land, which they had ruled for 1000 years before the Slav had ever crossed the Danube, and which they protected from Goth and Hun and Avar. The Bulgar was a still more modern intruder than the Slav, not there till the eighth century; and the modern Greek has the slenderest connection with the old Greek. But the Shkypetars *are* the old Thraco-Illyrian strain, of the same tall and fair type as conquered the Persians and built the Parthenon; and they have been friendly with the Turks only because the Turk too hated the plausible and dramatic Serb; because the Turk left them practically independent; because the Turk—if not "the only gentleman in the peninsula"—had certainly, like his soft and musical language, the most attractive personality. The fact that the Northern Shkypetars or Ghegs, "the Giants," were Moslems did not make them Turks, though it gave them the much-desired right to carry arms; the fact that the Southern Shkypetars or Tosks were Orthodox did not make them Greeks, although their destiny is undoubtedly bound up with that of Greece as a rival of the Slav. Yet on this filmy excuse, accepted from Bismarck of all persons, that there is no nationality, the Powers gave Albania a frontier which will perpetuate discord in the peninsula until it is rectified. By every claim of original ownership, of a vivid nationality, of survival against Slav and Bulgar and Turk and Greek, and of incapacity for being assimilated, this ancient nation has a claim to a frontier which shall as far as possible compromise between ethnic and strategic considerations —for the standard of civilization in the area forces us here to take in part the older view of a frontier.

The obvious meeting-place in the north-west is the Scutari lake; and from here the line should run westward to the nearest point of the coast, thus restoring Antivari to the Shkypetars, and eastward along the most direct line of mountain crest to Shlieb; then it should follow the Drin-Ibar water-parting to Shar Dagh, restoring Ipek, Jakova, and Prisrend to their old owners and their rightful ethnic relation; then it should follow the Drin-Vardar water-parting on to the crest of the Drin watershed east of Lake Okhrida, and so along the crest of the Pindus system to the nearest point on that to the Gulf of Arta. The only doubtful portion at all is here in the south, where a defensible, though not the best, line would run from Mount Zigos along the south-east crest of the Voyussa and Kalamas watersheds to the Corfu strait, thus at least restoring Yanina to its builders and proper owners. By all means let the Serbs have access to the Adriatic, but through the land of ethnic and political friends, not through that of ethnic and historic enemies. The natural expansion of Montenegro is northward over the "Montenegrins"—as they essentially are—of the Herzegovina, and the natural railway access from Servia to the Adriatic is *already* working from Novibazar *viâ* Sarajevo and Mostar.

This racial point can be well illustrated again from Rumania. One

may freely admit that the dour and stolid individualist of the Bulgarian plateau is not attractive, any more than his language is; but he is of sterling type—patient, persevering, enduring, democratic. And, as the latter, he has been relatively just and tolerant. It was a crime that the Jews and Turks of the Bulgarian Dobruja, after years of relative toleration, should be flung back into the social degradation and political slavery of the Jews and Turks—and now the Bulgars—of the Rumanian Dobruja. But there is another question. The 1,500,000 of Rumanians in Transylvania have certainly suffered from the Prussianization of Hungarian methods of government, but partly from their own racial incapacity for plateau life. They are essentially plainsmen, and long to get back to the loess lowland. The ideal solution of the difficulty would be the retention by Hungary of the Carpathian frontier, and the restitution by Russia to Rumania of all the land between the Carpathians and the Dniester.

The question of capacity for assimilating involves the whole question of the French and the German frontiers, but the Franco-Iberian and Franco-Italian frontiers have been already dealt with.

The permanent neutrality of Switzerland makes it immaterial whether its frontiers are natural or not; and the extension of the Thirteen Cantons after 1798 outside their natural frontier was, therefore, a matter of little political importance or difficulty. The country is too small to be dangerous to any of its neighbours; it is too strong by natural features and human type for any of them to be permanently dangerous to it; and most of its frontier features are strategically admirable. For instance, the porous limestone and multitudinous parallel folds of the Jura are such an obstacle on the Franco-Swiss frontier that even in times of peace normal traffic has always had to go round them.

The Belgian and Luxemburg frontiers, when neutrality is maintained and respected, are of no importance; and as Belgian sympathies are naturally with France, *as the Power with the genius for assimilating*, the absence of marked physical features is a great economic advantage, while the topographical vagaries of the arbitrary line are mementoes of hostility only between France and Spain, not between the French and the Belgians.

From Basel to the sea the western water-parting of the Rhine basin, like the eastern, forms scarcely anywhere a marked physical obstacle or barrier. In the past, therefore, all attempts to make it a separate political unit have failed; and, so long as separate political existence depended on, or has been closely associated with, an easily defensible frontier, they must have failed. In the future, however much human characteristics may be modified, the shape of the basin will be entirely adverse to its forming a good political unit.

Historically, its banks from the Alps to the sea have been held by people of the same Teutonic type; its basin from north to south has been divided into separate political units; and it has been for centuries a bone of contention between its western and eastern neighbours.

Geographically, there is little more justification for its being politically partitioned from south to north than from west to east; and, as a bone of contention, it would be best divided appropriately between the two claimants. What does one mean by appropriately?

Besides its natural advantage as the chief waterway of Europe, the Rhine inherited a Roman organization, and bequeathed to the French a belief in its *rôle* as a Romance frontier. Because it had been a useful line to the Romans in an unknown land, at once a natural defence and forming a frontier without need of demarcation and without possibility of dispute, it tended to become an ethnic frontier *in sentiment*, if not in fact. The partition of Charlemagne's empire confirmed this by giving the first step towards the separate nationality of France; and Lothar retained, with the Imperial title, what we may forthwith call the French bank. The western Rhine-bank territories presently split up into an upper and lower duchy, which we may call provisionally Lorraine and Belgium—using the latter word in the sense in which Cæsar would have used it; but both remained Roman and French in essence. On the other side of the river, where the Alpine type of man was in force, the land was parcelled out characteristically into a number of small, mutually hostile and practically independent principalities.

The Alpine type spread down the outliers of the Alps—from Bavaria, through Alsace and Luxemburg, to Walloon Belgium; but wherever it came into contact with the insinuating and attractive personality, if I may so speak, of France, it was assimilated, as easily as the insinuating French tongue crept down the Alpine passes into Piedmont, and became the basis of a natural political bond between Piedmont and Savoy. For wherever any object lessons gave opportunity for comparison, *e.g.* the trail of the rival armies through the land, the one influence attracted, and the other repelled. It was because Southern Belgium became a highway in peace and in war, that its sympathies became French, not German; in Lorraine the Post-Reformation acquisition of the three bishoprics by France only converted people who were German by race and by speech, into worshippers of France; in Alsace the barefaced robberies of Louis XIV. did not change the speech or the creed of Protestants who traced down an unbroken German descent from the deadliest enemies of Rome, but it made them French to the core in sentiment. Does any one need more proof of the power of France to assimilate? If the proof is sufficient, change of frontier eastward in the middle basin of the Rhine will cause no permanent sore.

Here I would like to interpolate my third condition—that the frontier should be a line where men naturally congregate.

Now, in all this area the only good frontier, appropriate to modern conditions of life, is the Rhine. With its island-fringed banks it is not a good military front, and still less is it a political barrier; but it would make a good political frontier, because, as I have said, the whole population

from Bavaria through Alsace and Luxemburg to Walloon Belgium is of a single general type—blessed with a rounded skull inside which the brain seems to have perfect freedom of development in all directions. Wherever that is found, you have a people who are naturally idealistic, artists and dreamers, willing to fight—and to die—for an idea such as honour or freedom. The river is the natural line of least resistance to which human activities, like running water, *gravitate;* and to make the river the frontier would be using the best geographical means of drawing the dwellers on its banks together. Ancient Alsace, with its military points of vantage, would thus become a natural frontier of France, but under conditions where, we may hope, its military merits would cease to count, except so far as they imply economic possibilities of trade and industry, of human health and lovely scenery, under the influence of a Power with a genius for assimilating alien types. And the French would again be on the river for which historically they did so much, *e.g.* in improving its waterway and organizing its commerce.

Considerations of the German frontiers will give us some glaring contrasts to this, and the Dutch frontiers have one or two points of special interest. The obvious encroachments of the Prussian territory seaward, where the frontier crosses the great rivers, is an eloquent tribute to the historic importance of the Dutch harbours, although to-day Zwolle and Kampen have not a tithe of their historic value as ports. A second point is the change in value of the Bourtanger frontier since the draining of the Bourtanger marsh. Now that the natural barrier of marsh is no longer present, the right line is the Ems itself; and this raises the question of the estuary of that river. German map-makers lately, following the German Staff map of 1911 (sheet 172), have printed the international frontier on the Dollart as a *land* line along the coast of Holland, thus making the whole estuary Prussian. Of course, in International Law and usage the estuary is "an arm of the sea," open to all nations without restriction—which minimizes the strategic value of Emden—and the frontier is the centre line, the fairway; and, as a matter of fact, the Dutch pay exactly half the total cost of lighting it. The German claim is denied by Holland, and the matter is at present under discussion between the two States.

Reference to the Germano-Danish frontier emphasizes the unpleasant impression left by the cartographic manipulation of the Germano-Dutch frontier. For the Danish frontier is politically quite artificial, geographically most appropriate, historically very significant. For the Schleswig isthmus was of great importance in the earliest times, being, for instance, the gate through which Christianity entered the country, and being farthest from the danger zone of the Baltic. The North sea coast of Jutland, by structure and by climate, has always been very dangerous; and in early times the safest approach from the south was in the lee of the North Frisian islands, *i.e.* to the old port of Ribe. With the development of Prussia, Denmark was bound to be dislodged from the right bank

of the Elbe; and, as the Eider valley had been a scene of constant struggle for nearly a thousand years, it was difficult to draw a frontier through it. Bismarck, as you know, proposed to leave the decision to the "free vote of the Schleswig people;" but before the vote could be taken, he had flooded the area with so many Prussians that its inclusion in Denmark became impossible, although to-day the majority of the population in the Duchy of Schleswig speak Danish. Under the circumstances the best compromise was to draw the frontier where the Prussian influence died out—on the barren heath of Ribe, which happened to be also almost the narrowest reach of the peninsula, some 36 miles across; but the seaward ends of the frontier had to dip southward far enough to include on the North sea the old port of Ribe, and on the Baltic the entrance to the very narrow Fredericia strait by which Jutland is linked to Fünen.

In the east of Germany the line of the Vistula is comparable to that of the Rhine, but we cannot apply the same principles, because of the incapacity of the Prussian to assimilate—a fact which must make all experiments from that point of view unstable and temporary and certain to fail eventually—and because of the survival, *owing to persistent persecution*, of an alien nationality. Practically the whole Vistula basin is Polish and Roman Catholic, and a homogeneous mass of Roman Catholic Poles has occupied the Warthe basin. The forested lake-strewn wilderness of morainic plateau, running roughly east and west through the elbow of the Vistula near Bromberg, would make an admirable politico-ethnic frontier for a Polish kingdom; and to the south-west the frontier should be, as it was for South Prussia in 1793, the water-parting between the Oder and the Warthe, as towards Russia it should be along the water-parting of the Vistula and the Bug in their great northward reaches. Ideally, no doubt, it would be better to exchange the Warthe basin for East Prussia, but the former is as purely Polish and Roman Catholic as the other is Prussian and Lutheran.

Just as the Prussians have failed, then, to keep a purely German type true to type in Alsace and Lorraine, so they have failed to make Danish and Polish types German in Schleswig and Posen. And there seems to be no hope of the Prussians proving an Imperial people, like the French and the Russians, because they are temperamentally incapable of assimilating other peoples—a fatal defect which we may trace back to their origin and their training. It is useless, therefore, to base any scheme of frontier-delimitation on the hope that change of political control to Prussian would lead to any assimilation, *i.e.* any permanent peace and progress in civilization. And, that being so, we are surely bound to look for some means of making ethnic and political frontiers coincide as far as possible, especially where—as in Poland—nationality was crushed by brute force, and therefore the strongest national sentiment must be expected to survive.

Exactly the same lesson is taught by a comparison of the Italian frontier towards Switzerland with that towards a Germanized Austria. For there are some real defects of the Italian frontier in the Ticino and the Adige basins. The two former are linguistically, culturally, economically, and ethnically Italian—135,000 out of 140,000 in the Swiss territory being Italians. And though they have long forgotten the harsh treatment which they received from the Uri highlanders in the early days of their annexation, the fact that this wedge of linguistically, culturally, economically, and ethnically Italian population coincides with a well-marked geographical unit should seem sufficient justification for its being politically Italian. The only defence of the present arrangement is that the valleys of the Reuse and the Ticino may be considered to make a single land-form, which may be called the St. Gothard "bridge," and which has its termini on such natural meeting-places of peoples as two great lakes, Lago Maggiore and the Lake of Lucerne. Along such a natural trade-route frontiers are always difficult to draw; they can only cross it at right angles; and they should do so with minimum disturbance of human associations and activities in times of peace. The fact that the Swiss had the reverse slope slightly favoured them; the lake is a natural meeting-place; and the frontier approaches the lake on both sides through a belt of minimum population. Again, the fact that the Swiss depend on foreign nations on every side for access to the outside world guarantees their permanent neutrality, so that it matters little whether they do, or do not, own the Ticino basin; but, theoretically, there is not a shadow of doubt that the whole Val Levantina should be Italian politically, as the whole area west of the Arlberg should be Swiss. And the piece of bravado by which the Swiss intruded across the Lake of Lugano so as to command the route along the Lake of Como has been a very serious inconvenience to the local population.

Even more than the Ticino valley has the Adige valley been a great thoroughfare, and the Brenner is still the first pass eastward *over* which a railway can be used in winter; but, of course, the terminus of the river route is not on Lake Garda. Economically, therefore, one accepts the Austrian frontier crossing the lake, especially as it approaches the lake on both sides through a belt of minimum population; but politically one cannot accept its frontier in the Adige valley. Here, as in the Ticino valley, the ethnic, linguistic, cultural, and even economic type is essentially Italian as far as the limit of navigation at the confluence of the Eisack, represented by Botyen, and such a natural head of traffic is a natural meeting-place. And every conceivable strategic consideration demands that foreign rulers of part of the Adige basin should not have access, by the Val Sugana, to what ought to be the purely Italian basin of the Brenta. As a matter of fact, the Austro-Italian frontier of 1866 was settled to run along the old frontier of the Lombardo-Venetian province. From the Italian point of view this was a distinct improvement on the frontier laid down by the Treaty of

Zurich in 1859, which ran down the centre of Lake Garda, and then due south immediately *west* of Mantua to the Po; and it was a fairly correct hinterland for Venice, though the actual frontier was stupidly kept inside the "Venetian" water-parting in both the north-west and the north-east in spite of the Commissioners having been instructed to pay special attention to "operations which might render the State separation more manifest." Here again, however, the general frontier lies parallel with the water-parting of the Isonzo, as in the west with that of the Var; and the nationality of the relatively few Italians of the coast east of the Istrian karst could not reasonably weigh as much as, still less more than, that of the vast non-Italian population of a hinterland which could reach the sea only on the Gulf of Trieste or the Gulf of Quarnero. Physical, climatic, and ethnic causes demand that the Italian frontier should include the Isonzo basin, and run along the Karst proper to the apex of Monte Maggiore (4600 feet) on the Gulf of Quarnero, thus giving both Trieste and Pola to Italy.

I will conclude by a single reference outside Europe. The essential incapacity of the Prussian to assimilate would of itself bar him from any hope of permanent empire, even in Africa, and to this incapacity is added a fatal political defect based on geographical causes. By origin and history a rigid patriarchal and military organization was imposed on Prussia, and the Prussian is normally, even on his utmost frontier, in the grip of the Government machine. On the scarp of an Asiatic plateau, or in the heart of an African jungle, the sentinels of our own far-flung frontier have been for generations beyond the paralyzing grip of the machine, and have learnt and handed down the lessons by which Empire is given to man—lessons of conciliation as well as courage, of initiative as well as industry, of patience as well as precision, of sympathy with local cultures as well as a serene conviction of racial superiority, and of self-control sufficient to prevent you even wishing to impair any genius loci, still less wishing to impose a political idolatry on alien and unwilling worshippers. Such lessons are not easily learnt by a patriarchal machinist trained within telephone reach of the headquarters of the Government machine.

The PRESIDENT (before the paper): It was announced, as you may remember, in the November *Journal* that we should have a lecture to-night by Miss Gertrude Bell on her recent adventurous travels in Arabia. Miss Bell has written to me saying she has gone to France to join in the search for the Missing. Under the circumstances we must excuse her, and Prof. Lyde has very kindly stepped in and offers to give us a lecture on a subject which is suggested by the great war: "The Types of Political Frontiers in Europe." Prof. Lyde is Professor of Economic Geography at University College, London. He is also the author of several excellent text-books, the most recent of which is one for advanced students on 'The Geography of the Continent of Europe.'

It may be suggested that a time of war is also a time of examination in geography, both for the public and for its teachers, the Press. I am afraid I cannot say we come out altogether satisfactorily. I have found in the last fortnight in Metropolitan

newspapers of reputation three statements which, I confess, surprise me. The first was that the action in which the *Goeben* was injured, which was fought a few miles off Cape St. George, in the Crimea, was fought off the coast of Anatolia—that is, on the opposite side of the Black sea. The second was a flight of quite oriental imagination. We were told that the Turkish fleet had bombarded Batum and Baku. That is to say, it had sailed across the Caucasian isthmus into the waters of the Caspian! The third was that Batum is "within easy reach" of Tiflis. These towns are more than 200 miles apart, about the same distance as London from York, but with a mountain range thrown in between. Such vagueness seems to indicate that the editor in Fleet Street does not always follow the excellent advice Mr. Rudyard Kipling gave us recently at the Queen's Hall and have an atlas at his elbow.

In our subject to-night we may seem to be trespassing on the field of politics. We have here nothing to do with party politics, but when we come to the question of world-politics, and more especially to the facts and the principles that should underlie political action, it may be expedient that the opinions of experts should be put before the public. There is obviously a question which within the next few years, we would fain hope within the next few months, must come before statesmen, the re-settlement of political frontiers all over the world. To enter into details with regard to any particular frontier would be premature. But in any such discussion it is obviously desirable we should realize the facts to be considered and the principles which ought to be applied. We are most of us aware that in our own history political frontiers have often been laid down in very strange ways and not to the national advantage. We have known cases where a parallel of latitude or a degree of longitude has been taken for a political frontier before it had been ascertained where that line lay on the surface of the globe, *e.g.* in Uganda. We have known other cases where a river has been taken as a frontier before it had been agreed which of its headwaters was to be regarded as its true source. In other cases, either physical features or racial distribution have been disregarded. It is surely desirable that in these matters we should try to do better in the future than we have done in the past, and if Prof. Lyde can tell us anything to-night which will help to create an atmosphere in which such discussions may be carried on, with, on the whole, satisfactory results, he will not have wasted his evening, and we shall have spent a profitable one.

Prof. SPENSER WILKINSON: I came here to-night to learn, not to teach, and I have listened with the greatest interest to the lecture which we have heard, having also read it carefully beforehand. I am bound to say I think Prof. Lyde is a little bit theoretical. That is to say, when I approach the problem of how, in the future, which none of us exactly foresee, the map of Europe is to be redrawn, I think the question is much larger than one of mere geographical theory in the sense in which Prof. Lyde has laid down certain principles. It seems to me that in the reconstruction of frontiers the main consideration which ought to occupy the Governments concerned must be that of convenience or stability, and that the principle which one would wish to see adhered to is, that as far as possible the frontiers, the boundaries of states, should be so drawn as to distinguish between nationalities or nations, which, as you know, it is very difficult accurately to define. You will remember many years ago the famous French pamphlet of which the title was the question 'What is a Nation?' and the answer was that you could give no single criterion. You cannot lay down that merely community of speech makes a nation. There must be something more. I think, broadly speaking, we all understand what nationality is, and I think we should wish that if there are to be new borders in Europe they should be so drawn as to bring into one fold, under one Government,

those people whose whole desire and wish is to form a single nation together. This makes me disagree, until I have had further conversation with Prof. Lyde on the subject, with some of the suggestions he made. He showed us an admirable map of the Rumanian nationality, showing us Rumanians not merely in the two countries which used to be Moldavia and Wallachia, but also in that country between the Pruth and the Dniester which was, unfortunately, after the last Russo-Turkish war, annexed by Russia, as well as a Rumanian population extending into and covering a great part of the east of what is now Hungary. Several millions of Rumanians live in that region, and visiting that country I was amazed to find the strength of the Rumanian feeling of that population. Prof. Lyde would leave them out of Rumania and have the boundary at the Carpathians, because he sees in them the tendency to prefer to live on the plain rather than in the mountains. When travelling through Macedonia a few years ago, I had the pleasure of travelling a whole day with a Greek lady, with whom I discussed for a long time the question of the proper place of Macedonia, and she asserted that a very large part of Macedonia, and a much larger part than I could believe, was Greek, that the population was Greek, and that their country ought to belong to Greece. She referred to the peasants on her father's estate as being Greeks who talked Bulgarian, and I said, "Surely people who talk Bulgarian are Bulgars." "Not a bit," she said; "the test of nationality is the will of each"—la volonté de chacun—and I am bound to say I could not answer her. I assert with regard to those Rumanians who live in Transylvania that we must regard their will. I am not convinced by any of the principles which Prof. Lyde lays down, except the first, that it is of vital importance that the racial unit should coincide with the geographical unit. As soon as you get Professors of Geography talking about race they may take us a very long way further than we want to go. I am not prepared to follow the second part, as to the case when the racial unit is incapable of assimilation. The frontiers are going to be drawn, I hope, in a congress of the Great Powers. Whether you have a congress of a certain number of Great Powers or of all of them, is it possible for practical statesmen to say, "We shall draw your frontiers such and such a way because you are incapable of assimilating other people?" Nor am I quite convinced about the desirability of the frontier being the place where men naturally meet, nor altogether convinced, for instance, that it is a statesmanlike proposition at the present time that the future frontier of France should go up to the Rhine. I can see that in many ways it would be very desirable, but we have to be practical. At this moment I think we are rather in the air if we talk about frontiers at all, because, if we want to see such frontiers as we should like, the first thing we have to do is to be the victors, and I should like to see my way to that before I began to discuss frontiers. Has not it been a cause of very great trouble to Europe that for forty years a piece of territory, which, no doubt, was to a large extent German-speaking—Alsace-Lorraine—has been included in the boundary of Germany, and the Germans could not assimilate its population? Is it not desirable to avoid a repetition of that sort of thing in either direction, and though we may think it right, if we are able to carry it through, that France should recover her former boundary in regard to Alsace and Lorraine, should not we rather be disposed to warn our French friends against taking into France any considerable area of German territory with a German population?

I shall end with a small detail which for many years has interested me personally rather deeply. I have always been struck, in travelling on the border between France and Italy near the sea-coast, with the very peculiar and, I think, unfortunate line which was taken when, in 1859, not only Savoy but Nice was annexed. The frontier line at one point crosses the river Roja on to the eastern side, so that there is a little triangle of French territory, including the town of Saorgio, interrupting

what seems to me naturally an Italian valley, and I have always felt, if there were to be a redrawing of frontiers at all, it would be a gracious act on the part of France to agree to the cession to Italy of the very few square miles which would give Italy the whole valley of the Roja without giving France a frontier less defensible than that which she now possesses.

Mr. MACKINDER: I agree with Prof. Spenser Wilkinson in thinking that it is premature for us to be discussing frontiers. There are only certain things which one can say at the present moment with any advantage, and one of them, I think, is certainly that we shall not be able to settle the map of Europe according to our insular and more or less detached views. In his very interesting paper, may I venture to say that Prof. Lyde has neglected to point out the process by which frontiers actually are fixed. They are fixed by a process of bargaining. Now, there are some people—I don't say that Prof. Lyde is one of them—who think that at the end of this war you are going to set up a new Europe in accordance with scientific ideals. I am not so sure. I think you will find that the old idea of the balance of power will assert itself again in any congress of Europe, and that means that you will fix boundaries by the old process of bargaining. I always feel that there is no greater lesson in history than that of 1814. That year, at Vienna, there was a defeated Power, France, and there were two salient victors, the victor by sea, Britain, and the victor by land, Russia. But when they got into congress, Britain and France found themselves as one party in the bargaining, and Russia was supported by Austria and Prussia. The curious thing is that the parties were led, not by the chief victors, but by Talleyrand, the Frenchman, and Metternich, the Austrian. The result was the map of Europe which has, on the whole, held during the past three generations.

Just consider what the end of this war may be. You are not going to crush out the German nationality. That is impossible; nor would it be desirable, if it were possible. You have sixty-one or sixty-two million Germans in the German Empire, and you have to add to them, I suppose, some eight or ten million German Austrians. A nationality of seventy millions in the centre of Europe, with an intensely national character, will have to be dealt with. It will still be so strong a power that I question whether there will be very much of ideal map-making. If you conquer that power, the object will be to clip its wings for the future.

Let me point out two of the problems which, it seems to me, are bound to be before us. They will probably drive a coach-and-four through any of your theoretical settlements. One deals with the case of Poland. The region inhabited by the Poles lies wholly inland, but, as Prof. Lyde told us, all nations now strive for access to the sea. The sea-coast is the meeting-place of the world. It is probably because Servia had no coast-line that we have been plunged into this great war. Are you going to give Poland an approach to the Baltic, or are you not? If you are, then you will have to give her German land, and will set up a new Alsace-Lorraine. If you are not going to give her an approach to the Baltic, you are going to leave a sore, and, if she becomes strong, she will try to break the bars of her cage, in order to become the neighbour of the whole world, and not merely of the two or three Powers around her.

Or take the case of the enlarged Servia, the Servia of the Servians, including, let us say, Montenegro and Bosnia. Is Servia to include the Dalmatian coast and islands, or is it not? Ethnically it should include them. I am told that about 3 per cent. of the Dalmatian population is Italian, and the remainder are Slavs. But if you give that coast-land, so rich in harbours and sailors, to Servia, what will Italy say? She will be surrendering the control of the Adriatic. Italy cannot be oblivious of the strategical importance of the Adriatic any more than we can be of

that of the Persian gulf. These things will have to be settled practically by bargains in which strength will count.

My feeling is that Prof. Lyde has done a valuable thing in putting on record a number of factors which will have to be considered among others. No doubt there is a feeling in our country that we would like to remake the map of Europe according to certain principles which we think will make for peace in the future. If that is to be achieved, there will have to be sacrifices on the part of some far-seeing foreign statesmen. No bigger thing was ever done by Prussia than when, under Bismarck, she refused to annex Bohemia. Her present alliance is the consequence. No worse thing was ever done by Germany than when the military party forced the annexation of Alsace-Lorraine, and made the lasting enmity of France. Think what the Hungarians could do at the present moment were they to place themselves at the head of a great movement for the federation of South-Eastern Europe. They would have to start by surrendering the Rumanians of Transylvania to Rumania, and by coming to terms with Italy in regard to the Adriatic. By their example they might induce Servia and Rumania to act generously towards Bulgaria. In the end, Hungary would lead a great federal state, which would count in the bargaining of Europe, because it would be able to throw real weight in the scale. Then we might have some hope of a European settlement of frontiers which would be stable.

May I conclude by saying that I think there has of late been a tendency which seems to me rather deplorable in the teaching of geography? There are two kinds, of subject and of generalization. You may take fifty terms, and you may deduce a scientific law from them, and you may predict as to the fifty-first. That is possible in purely physical geography. But when our geographers go on to apply scientific generalization to human geography where human initiative comes in, the result is to make Colonel Close and others blaspheme and say that there is no such thing as geography in the large sense, but only map-making. To me the title of the paper this evening savours of this heresy. But let us not lose sight of that other type of generalization and of subject whose object is to tell you where you are in time and space, and to give you a sense of proportion and perspective. The result is to give judgment in practical conduct. If we try to obtain laws from our human geography, and especially laws which will guide our action politically, we are attempting that which I believe is doomed to failure. We shall cause both the scientific men and the historians to throw stones at geography.

Prof. Lyde: There are one or two things I should like to say. First of all, with regard to Prof. Spenser Wilkinson. I understood him to say that there are several million Rumanians in Transylvania; but that, I think, is wrong. In Transylvania, which is the only one I was discussing, my slide included about 1,500,000 Rumanians —*i.e.* four-sevenths of the whole population. Then as to the "cloven hoof," which peeped out in the words "a defensible frontier." That gives away the whole position; we are not looking for defensible lines, but lines along which men would meet naturally and peaceably. In any case, what about the other three-sevenths of the population? Mr. Mackinder also ignored them, and ignored the question of where the frontier is to run if it *has* to be inside the present Hungarian frontier. I quite agree with him about a bargain—you will have to bargain, but with the land as well as with the peoples. I spent days and days over that point, to see if I could not find an appropriate frontier; and there is none. You must have a line where peoples can meet naturally and in peace, and it is the business of a geographer to say what geographical feature makes such a line. Mr. Mackinder himself has, in his books, worked that very point out better than any one else; and his objection now is only academic. The Great Powers in the Berlin Treaty laid frontiers along features which

they not only could not name or describe, but which actually proved to be non-existent! In the face of such criminal stupidity or colossal impudence, I say that it is their business to consult geographical societies about frontiers. Such societies would say that there are certain lines all over the world along which people tend naturally to meet in peace, and a navigable river is one of them. Mr. Mackinder said our discussion was premature and presumptuous. But how can we give an answer when the practical settlement comes up, and we are appealed to, unless we have previously discussed the matter? I was, therefore, not wrong in suggesting the subject for discussion to-night. Again, Mr. Mackinder spoke of a single German empire of seventy millions at the end of this war. Whatever else there is, there will not be that. I believe that there will be four German kingdoms. Then he asked whether, sea-coast being so important, we would give the Poles the whole area to the Baltic. No. The Poles never were marine, and don't want to be; their objective is Cracow, not the sea. The same principle answers Prof. Wilkinson's question, "Who will decide the capacity for assimilation?" The answer is—an indisputable history. One final point. Supposing the Rumanians got Transylvania, would they be content? No, because half their grievances are really due to their own incapacity to assimilate themselves to their geographical environment. I half thought Mr. Mackinder to imply that I was looking at the question with political prejudice. I can assure you that I have really no politics. If I have any leaning, it is towards the Labour Party, and that is only because they are not run by lawyers.

The PRESIDENT: Where eloquent and learned professors differ I shall not be so foolish as to rush in. To-night, while very greatly interested, I have been in one sense a little surprised, because I thought we were going to discuss the principles which ought to underlie the selection of political frontiers rather than the actual frontiers that may be settled a few years hence. I quite agree with Prof. Wilkinson that it is premature, and not a little presumptuous, to discuss in detail what may be desirable frontiers after the war. There is another difficulty I feel, it is this: There are two ideals of frontiers, and the question is whether in laying down our plans, or conditions, for an ideal frontier we are to look to the past, when they have been either defensive lines or aggressive outposts, or to a problematical future, when they will be convenient parting-places between friendly nations, more or less racially and linguistically homogeneous, like the Italians, or held together by bonds of common interest, like the Swiss. I cannot follow Prof. Lyde when he recommends commercial meeting-places as boundaries, because it seems to me it would be extremely inconvenient to have the meeting-place between two nations with different laws and custom-houses running through a populous mart. It would never do, for instance, if the frontier between Italy and Switzerland, instead of running along the top of the Alps, ran through Turin and Milan, which are the natural meeting-places for all commercial purposes.

It may well be—and it is an ideal to be striven for—that military aggression between states may go the way of assault and battery between individuals, may become obsolete. State morality, though it limps sadly behind private, does, on the whole, advance. When this comes to pass strategic considerations will no longer take a foremost place in the delimitation of frontiers.

I had thought of running along the Alps, in order to point out how, in history, that great natural frontier has failed, from various causes, to remain a political frontier, but it would take too long. I must, however, confess that I was somewhat shocked at one thing in Prof. Lyde's paper—when he spoke of Lotharingia being divided in the ninth century into Lorraine and Belgium. The latter country only came into being in the nineteenth century, and, if one were to go into detail, we should find that part of it, that where the fighting is going on now, belonged not to

Lotharingia but to the West Frankish kingdom. The relation of Belgium to Caesar's Belgæ is, I think, too remote and academical for any but sentimental use. I also felt that were the ghost of Mr. Freeman with us, he would ask, how about Burgundy? Burgundy, like Savoy in later times, was one of the powers that spread right over the Alps. The reason why Switzerland still holds part of the Milanese is no doubt that the inhabitants of that region have realized that lesser taxation and a freedom from foreign military service, combined with very exceptional facilities for smuggling, render their present position economically advantageous. Smuggling is an important frontier incident which has been left out of sight to-night. Living in a county which lost its main occupation when smuggling to France ceased, the omission has naturally struck me.

In conclusion, I would suggest that the story of the Alps may lead us to the following reflection: While making allowance for certain minor divergencies between the political frontier and the water-parting which I have not time here to mention, and also for the two great exceptions of the Ticino and Trentino referred to by Prof. Lyde, we find that the tendency has been for the political frontier of Italy to approach the natural, for the national frontier to coincide with the racial. As wars cease, and dynastic influences decline, and democracy grows, this tendency is likely, I think, to be found at work elsewhere in Europe. There must, however, be not a few regions where the complex distribution of race will tax statesmanship to the utmost. In such cases large concessions of local government may prove the best solution of problems at first sight insoluble. Anything that geographers can do to foster and encourage this tendency will be a benefit to the future. Perhaps not in our time, but in our children's time, there may be a tribunal set up in Europe which will have the will and also the power to prevent such an extravagant waste as war. The lecture has raised extremely interesting problems, and has given occasion for a very bright and interesting discussion. I am sure you will all wish to join with me in passing a vote of thanks to Prof. Lyde for the trouble he has taken in preparing it and coming to us to-night.

THE EARTHQUAKE IN CENTRAL ITALY ON JANUARY 13.

By CHARLES DAVISON, Sc.D. F.G.S.

THE earthquake which destroyed Avezzano and the neighbouring villages on January 13 visited a district in which shocks have been rare and of no great strength in the past. Dr. Mario Baratta's history of Italian earthquakes * includes all those known during the first 1898 years of the Christian era, but he mentions only one strong shock (that of April 10, 1885) as having originated in the neighbourhood of Avezzano, and two (those of August 19, 1777, and May 9, 1891) in the district including Sora and Isola Liri. This is no doubt one of the reasons why the loss of life was so serious, for the old and wretchedly built houses (they were merely stones without mortar) have escaped destruction by former earthquakes. The narrow streets and the sudden onset and brevity of the shock also contributed to raise the death-rates, which, if the figures given be correct, are the highest known for any earthquake, in Italy or elsewhere.

The report issued by the Central Office of Meteorology and Geodynamics

* 'I Terremoti d'Italia' (1901).

states that the earthquake was recorded at Rome at 7.53 a.m. (that is, at 6.53 a.m., Greenwich mean time), and that the shock lasted from 15 to 20 seconds, the maximum intensity occurring about the middle of the time. It was, of course, registered at all the Italian observatories, also at those in this country (the first tremors reaching West Bromwich at 6h. 56m. 25s. a.m.), and at Washington. The exact extent of the disturbed area is not yet known, but the shock was felt at Ancona, Grosseto, and Perugia on the north, and at Naples, Civita Vecchia, and Potenza on the south—that is, over a land-area at least 300 miles in length. A few buildings were damaged in Rome on the west and Chieti on the east, places which are 110 miles apart. The epicentral area was also of considerable magnitude, and included both the seismic zones of Avezzano and Sora, though its centre must have been within a few miles of the former town.

When the earthquake is studied, as it will be by many capable seismologists, many features of great interest will doubtless be revealed. For the present, with the scanty records so far available, the most important evidence is that which the earthquake provides with regard to the continual migration of seismic activity in Italy. We may study such migrations in two ways: either in detail, or on a large scale. Inquiries in detail, such as those on the after-shocks of the Mino-Owari (Japan) earthquake of 1891,* throw light on the laws according to which individual faults grow. But, in the history of a mountain range, a few years are as one day. We have rather to group together the earthquakes of several centuries, and, for such a purpose, there is no region for which the materials are so abundant as the Italian peninsula. Thus, a glance at the four maps given by the late Prof. Mercalli † shows that seismic activity was predominant in northern and central Italy in the first two periods, 1303–1499 and 1503–1631. During the third period, 1632–1737, northern, central, and southern Italy were about equally represented. In the fourth, 1750–1849 (and the period might be continued to 1908), activity was almost concentrated in southern Calabria. The recent earthquake would seem to be one indication of the return of seismic energy to the central portion of the peninsula.

A HISTORICAL PORTUGUESE WOOD-CARVING.

By Sir MARTIN CONWAY, M.A.

THE photograph here reproduced represents a remarkable wood-carving which measures 9 feet 9 inches by 4 feet 7 inches, and is thus of unusually large dimensions. It came out of the Marine Arsenal at Lisbon, and was

* *Quart. Journ. Geol. Soc.*, vol. 53, 1897, pp. 1–15.

† 'Geologia d'Italia,' b G. Negri, A. Stoppani, and G. Mercalli, vol. 3 (1883), plate 18.

A HISTORICAL PORTUGUESE WOOD-CARVING.

sold by auction in November, 1897, along with a quantity of rubbish. A friend of the present owner, Mr. P. C. C. Francis, purchased it on his behalf, and it has been in his possession in London ever since. It probably formed part of the carved decoration of a Portuguese man-of-war in the days when sculptors and naval architects worked hand in hand. The subject commemorated is the discovery of the Cape of Good Hope by Vasco da Gama. This carving was to have been included in the commemorative Exhibition held by the Royal Geographical Society on the occasion of the Vasco da Gama centenary in 1898, but owing to the size and delicacy of the work it was judged inexpedient to subject it to the risk of removal. A good photograph of the carving having now been taken, the omission of seventeen years ago can be in some measure made good by the present publication.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

By JOHN McFARLANE.

Of the various sections of the British Association probably none benefited more, both directly and indirectly, by the visit to Australia than Section E; and it is, therefore, only fitting that the thanks of those geographers who participated in it should be expressed to the Government and people of Australia for all that they did to make that visit a success. The arrangements made for our transport from one state capital to another, and for our reception in each, showed much careful organization, and to all who took part in it congratulations may be extended on its complete success.

The official proceedings of the Association began at Adelaide, where the majority of the members arrived on August 7 and 8. The President of Section E was Sir Charles Lucas, K.C.B., K.C.M.G., while the Vice-Presidents were Prof. Guido Cora, Prof. T. W. Edgeworth David, C.M.G., Captain J. K. Davis, Prof. W. M. Davis, Sir John Forrest, and Prof. A. Penck. Italy, the United States of America, and Germany were thus represented, and Australia supplied noteworthy representatives in Professor David and the veteran explorer, Sir John Forrest. Mr. H. Yule Oldham, M.A., acted as Recorder, and Mr. J. McFarlane, M.A., as Secretary.

The presidential address, which has already appeared in the *Journal* (November, 1914), was delivered before a large audience at Adelaide on August 12.

The Association arrived at Melbourne on the morning of August 13, and on the following day the work of the section began in earnest. The first paper read was by Sir John Forrest, who gave an interesting account of exploration in Australia, and of the part which he himself had taken therein. Mr. H. A. Hunt, Commonwealth Meteorologist, followed with a paper in which he discussed the causes determining the distribution of rainfall in Australia. He concluded that the climatic history and prosperity of the last ten years or so contradicted emphatically the preconceived notion that Australia is a peculiarly drought-stricken and precarious area of the Earth's surface. He pointed out that the rainfall of Australia is generally ample for pastoral and agricultural industries over two-thirds of its area; on the other hand, that the continent is subject in part, but never in whole, to periods when the rainfall is short of the seasonal average. Mr. Hunt also pointed out that here apparently exists an oscillatory movement of the seasonal rains throughout Australia about a centre which lies in the vicinity of Forbes, New South Wales;

and that it is, perhaps, a natural coincidence that what appears to be the centre of oscillation is approximately the centre of gravity of the Commonwealth's population, and is not far from the site of the new Federal capital. To illustrate this oscillatory movement, he showed an ingenious rain-clock, a model of which may be seen at the Society's house. In the centre of a piece of cardboard a map of Australia is cut out with a die. At the back of this another piece of cardboard indicating the rain area, is manipulated on a swivel. By moving the second piece of cardboard backwards and forwards with an amplitude of oscillation of one-fifth of a circle, the land area of the continent affected by dry or wet conditions at any time of the year is approximately indicated.

An interesting account of the Mallee country of North-West Victoria was given by Mr. A. S. Kenyon, C.E. In this region, which embraces over 11,000,000 acres, the prevailing feature is the regular occurrence of sand-ridges of no great height, generally less than 30 feet. They are more or less parallel, and run from west-south-west to east-north-east. With an increase in their height, the soil becomes poorer, the parallelism is almost completely masked, and they form a jumble of sand-hills, locally known as "desert." More or less extensive expanses of level land, with low, irregular, undulating rises, are termed "broken" country. The surface soils are almost wholly æolian or wind-redistributed. They vary from rich red clayey loams in the "broken" country to pure white sand in the sand-hills, and, except in the latter class, are all suitable for agriculture. Limestone nodules occur almost everywhere, and in places become almost massive. The climate is arid. Rainfall varies from 19 to a little under 11 inches per annum, and averages about 14 inches. In summer the days are intensely hot and the air excessively dry; consequently there is frequently a considerable drop of temperature at night, the range being over 70° F. There are at present five and a half million acres under settlement, of which about one and a half million acres are under cultivation annually, supporting a present population of over 40,000.

The subject of a paper by Mr. T. S. Hart, M.A., was "The Central Highlands and 'Main Divide' of Victoria." These highlands extend through almost the whole length of the state, and consist of a peneplain carved out of Palæozoic rocks, subsequently elevated in blocks to varying heights and dissected. The general effect produced by this elevation has been a broad belt of highlands, falling away to north and south, and higher at the eastern end. In detail this area consists of numerous fault-blocks, more or less tilted, and unequally elevated, producing original crests and valleys. As the crests of the blocks are often transverse to the east and west trend of the whole highlands, the two ends of a relatively low strip may be occupied by streams flowing to the north and south respectively. The main water-parting or main divide between the north and south streams varies in its relations to the fault-blocks, being determined in part by crests of tilted blocks or by relatively high blocks, in part by the position of the divide at the heads of streams flowing in opposite directions in the same low area, and in part by volcanic accumulations.

Mr. C. R. Long, M.A., Inspector of Schools, explained the steps taken in Australia to commemorate its great explorers. In the schools the physical features of the continent are always taught in connection with the names of those who discovered and explored them, and the towns in connection with their founders and early residents. In Victoria and elsewhere the exploits ofexplorers and pioneers are made the sole subject of instruction on one day in each year. Numerous tablets and other memorials commemorate the activites of such men as Cook, Flinders, and Mitchell.

An admirable series of excursions had been arranged for the week-end, and most members of the section were able to take advantage of the facilities offered for the study of some aspect of geography in which they were specially interested. Some

went with the geologists to Bacchus marsh, others to the gold-mines at Bendigo or Ballarat. A few had an opportunity of spending an interesting afternoon at Coranderrk aboriginal station.

On Tuesday, August 18, the sectional meetings were resumed, the morning being devoted to a joint discussion with Section C on the "Physiography of Arid Lands." The chair was taken first by Sir Thomas Holland, and afterwards by Sir Charles Lucas. The first contribution to this discussion was by Prof. J. Walther, which was given on the afternoon of Monday, the 17th, in order to allow him, owing to his change of plans, to leave for Java. He called attention especially to the extreme rapidity of desert erosion, which he attributed to the ground not being protected either by a cover of vegetation or of snow, so that rock disintegration is rapid, and every particle is quickly removed by the occasional showers of rain. Prof. A. P. Coleman, of Toronto, showed from the evidence of early pre-Cambrian rocks in Canada that deserts are not a modern feature, as they existed on the Earth in very early geological times.

Prof. Gregory referred to the definition and causes of deserts, and to some characteristic features of their soils. He pointed out that the term "desert" could not be precisely defined. It originally meant an unoccupied land, but now meant a land that was unoccupied owing to an arid climate. No precise limits of deserts can be given on biological, morphological, or climatic grounds. Attempts have been made to fix numerical limits which vary from a 10-inch rainfall by Sir John Murray to 20 inches by Macdonald. But the desert is not determined by any fixed minimum of rain, but by the balance between the conditions which control the utilization of the rain. Deserts are most easily developed in plateau lands where rainfall is low, temperature high, wind strong, and there is free drainage to adjacent lowlands. Some districts have a desert aspect owing to special conditions of the soil. Prof. Cherry has shown that most Australian soils contain less than the accepted minimum of phosphoric acid required for cultivation; and his conclusion is confirmed by a great series of analyses which show that in most countries there is more phosphoric acid in the soil than in the sub-soil. Owing to the poverty of mammals in Australia the usual phosphoric enrichment of the soil has not taken place, and areas which were once regarded as hopeless desert have been brought into cultivation by treatment with phosphoric manures.

Dr. W. F. Hume illustrated the development of arid lands from the geology of Egypt. He explained the characteristic features of desert topography as the sweeping of all fine material from the plains to the hollows by the wind, the corrosion by wind-blown sand of the surface thus left bare, the breaking up of the rocks, and the flaking off of angular fragments by sharp variations in temperature; the formation of sand-dunes, of mushroom-shaped pillars by undercutting by sand, of sand-worn angular pebbles, and of desert crusts due to the evaporation of the surface of water that has leached soluble constituents from the underlying rocks. Mr. Fermor referred to the geological evidence for deserts and for changes of climate, and showed from the conditions of Egypt that the interstratification of a desert deposit between two freshwater beds is no proof of a change of climate.

At the last meeting of the Session, held at Melbourne on the following day, Dr. T. Ashby, Director of the British School at Rome, gave an account of the earliest map of the environs of Rome. This map, which dates from the year 1547, is due to one Eufrosino della Volpaia, of Florence. It is being published by the Vatican authorities, with a text by Dr. Ashby, as part of a series of facsimiles of plans of Rome which are preserved in the Vatican library. Mr. Yule Oldham described and illustrated an experimental demonstration of the curvature of the Earth's surface which he had conducted on the Bedford level. Prof. Penck spoke on recent advances in the

international map of the World on the scale of 1 : 1,000,000, and strongly advocated that steps should be taken for the preparation of the Australian sheets. Among other papers read was one by Prof. Woolnough on the "Northern Territory." Mr. Mackay spoke on "Forest Climate and Rainfall."

The Association left Melbourne on Wednesday, August 19, and arrived at Sydney on the following morning. Sectional meetings were resumed on Friday, when Mr. E. C. Andrews, Geological Surveyor, New South Wales, read a paper on "The Development of the Natural Order Leguminosæ." From his study of that Order he inferred that Australia had been isolated from Asia for a great period, and that the Leguminosæ of the fertile tropics of the island continent are not comparatively recent and derivative, as had been stated, but are examples of types once cosmopolitan, whose development had long been arrested; while the great majority of the endemic types are younger and vigorous Xerophytes induced by the altered geographical conditions.

Mr. R. H. Cambage, Chief Mining Surveyor, New South Wales, discussed the relations between the topography of Eastern Australia and its flora. In general, the eastern face of the highlands is fairly steep and high, and differentiates the humid climate of the east from the drier climate of the west. In Victoria and New South Wales the effect of the mountains is to create three climates, a humid one on the east, a dry one on the west, and a cold one on the summit, which acts as a barrier between the floras of the east and west. In Queensland, on the other hand, a generally lower summit of the plateau, and an increase in temperature owing to the more northerly position of the range, permit the western or dry influences to cross the mountains in various places and allow many interior types of plants to thrive on the eastern watershed. Such passages occur between Toowoomba and Brisbane and between Jericho and Rockhampton. It ought to be noted, however, that in such cases the east coast flora does not pass to the west.

In a paper dealing with the discovery of Australia, as evidenced by ancient charts, Mr. George Collingridge, basing his argument chiefly on the Dauphin Chart, maintained that Australia must have been discovered by Spaniards and Portuguese prior to the years 1530–36. An interesting and well-illustrated account of Southern Alaska and the Klondyke was given by Prof. E. S. Moore. Mr. Yule Oldham described a recently discovered manuscript which he believes to have been the property of James Cook, and Prof. W. M. Davis discussed the physical history of the coast of New Caledonia.

As at Melbourne, the week-end was devoted to excursions. Most members took advantage of the facilities offered to visit the Blue mountains, and a number went on from there to the Jenolan caves. A small party went further afield and visited in succession the site of the new Federal capital at Camberra, the great Burrinjuck dam on the Murrumbidgee, and the Yanco irrigation area. This expedition was somewhat strenuous, but will always have pleasant memories for those privileged to take part in it.

The morning of Tuesday, August 25, was wholly devoted to a joint discussion with the geologists, zoologists, and botanists on "Past and Present Relations of Antarctica." The discussion was opened by Sir Douglas Mawson, and the subsequent speakers included Prof. Edgeworth David, Captain J. K. Davis, Mr. Griffith Taylor, Mr. H. T. Ferrar, Prof. A. Penck, Dr. G. C. Simpson, Dr. R. N. Rudmose Brown, Prof. A. C. Seward, and Mr. C. Hedley. The meeting was very largely attended, and the different contributions to the discussion were of the greatest interest. We understand that the discussion will be published in full in the official report. The concluding meeting of the section took place on Tuesday afternoon. Mr. T. F. Furber, the Director of the Trigonometrical Survey of New South Wales, gave an account of geodetic surveying in that

state, with special reference to the limits reached up to the present by the survey, the methods followed, and the order of precision attained. He said that the matters which were chiefly engaging attention at present were the general question of periodic errors of instrument graduation, the relation between the height of an observed ray above ground surface and the coefficient of refraction, and the preliminary comparison of the geodetic with the astronomical latitudes, longitudes, and azimuth, for the purpose of estimating the relative forms of the surface covered by the survey and that of the assumed spheroid of revolution.

The sand-drift problem on the eastern coast of Australia was dealt with by Mr. G. H. Halligan, Inspecting Engineer and Hydrographer, New South Wales. Mr. Halligan pointed out that, as a result of the Eastern Australian current, which first strikes the coast between Hervey bay and Moreton bay, the general direction of sand-movements below high water must be from north to south. With the aid of maps, he showed how the space intervening between the old rocky coast, as it existed at the time of the last subsidence, and the existing foreshore is partly or entirely filled with sands of marine origin, though covered in places with several feet of humus.

Mr. W. H. Tietkens, in discussing the possibilities of Central Australia, dealt mainly with that region which lies between 24° 20′ S. and 30° 35′ S., and between 123° E. and 133° E. This immense area is a sandy depression, in places, perhaps, not much above sea-level; but Mr. Tietkins believes that, if certain schemes of irrigation were carried out, part of it at least would be redeemed from desert waste.

On Wednesday, August 26, the Association left Sydney for Brisbane, where a few pleasant days were spent. No sectional meetings were held, but a number of interesting excursions took place. Some members went to the sugar-growing districts further north, others visited the Gympie goldfield, and many found sufficient to interest them in the more immediate neighbourhood of the town itself. At the conclusion of the Brisbane visit the Association broke up, and the overseas members made their way towards the ports from which they had arranged to sail.

The attendance at the Sectional Meetings was as a rule not large, and on the concluding day it was very sparce; but in view of the abnormal conditions under which the British Association met in Australia, the results must be pronounced to have been eminently satisfactory. Among the papers given to the geographical section the larger proportion were contributed, as was appropriate, by Australian geographers and scientists, and the meeting has substantially added to intelligent appreciation of the geographical features and the potentialities of Australia.

In a period of little over a month it is obviously impossible to see much of Australia, yet to all engaged in the study of geography even so short a visit must prove of permanent value. It was possible after all to learn something of the main physical regions and of the natural vegetation of the eastern part of the continent. The influence of climate upon the conditions of economic activity could everywhere be observed; and unfortunately the evil effects of drought were but too painfully evident. Great cities like Melbourne and Sydney, small towns on the irrigation areas which yesterday supported but a few sheep, all have their special interest for the student of geography. The President's address dealt with man as a geographical agent, and nowhere is his influence as such more apparent than in Australia, where a people of British stock are at the same time modifying and adapting themselves to their new environment. The official record of their activities is written in the admirable series of handbooks prepared for the benefit of members of the Association. Much, however, could only be learned on the spot from Australians themselves; and, notwithstanding the distractions of a Federal election and the anxieties involved in preparing for participation in a great war, they one and all did what lay in their power to enable us to understand the conditions under which they live and labour.

REVIEWS.

ASIA.

The Development of Siberia.

'Through Siberia. The Land of the Future.' By Fridtjof Nansen, G.C.V.O., D.C.L., etc. Translated by A. J. Chater. London: W. Heinemann. 1914. Pp. xvi., 464. *Maps and Illustrations. Price* 15*s. net.*

This latest volume by Dr. Nansen is the result of a journey he took in the summer and autumn of 1913, when he accompanied the *Correct* in an attempt to open a trade route from Norway to Siberia *vid* the Kara sea. The plan was, of course, not a new one, yet despite many successful attempts the route has never had any regular traders on it. The *Correct* left Tromsö on August 5, and five days later entered the Kara sea by the south of Novaya Zemlya. In the south of the Kara sea she encountered much ice, and was frequently delayed, but got through safely and reached the mouth of the Yenisei on August 23. She went up-river to Nósonovski island, where she discharged her cargo of cement for the Siberian railway into lighters, which, with a tug, had been sent to meet her from Krasnoyarsk. The *Correct* then loaded a cargo of samples of Siberian and Central Asian produce, including timber, flax, hemp, hides, wool, reindeer horns, graphite, and two camels and a wolf. On September 10 she left for Europe, encountered no ice in the Kara sea, and reached Norway without adventures.

Dr. Nansen left the *Correct* at Nósonovski island and went up the Yenisei by river to Yeniseisk, and thence to Krasnoyarsk, whence he made a rapid railway journey to Vladivostok. From there he went to Khabarovsk, and thence by the almost completed Amur railway back to the trans-Siberia line and home to Europe. When one realizes that Dr. Nansen had only about two months in Siberia, one is amazed at the scope of his book and the mass of interesting matter it contains. Few men could have seen so much in a hurried rush across the continent, still less have produced an authoritative work. Needless to say, there is not a dull page or superfluous paragraph in the volume, and Dr. Nansen has lost none of his descriptive power.

Especially valuable are the chapters on the colonization and development of Siberia, and on Russia in the east, and the yellow question. In fact, so much of importance has Dr. Nansen to say on Siberia and the Amur district that one tends to overlook the opening chapters and the appendix, which, in their treatment of the navigation of the Kara sea, deal with the principal object of the expedition, and the question, above others, on which Dr. Nansen's views are important. Dr. Nansen discusses all the available records from the sixteenth century onwards. These show great variations from one year to another, but indicate that with the use of steam it ought to be possible every year to reach the Siberian rivers by this route. The quantity of ice in the Kara sea varies so that in some years a more northern, in others a more southern, route must be taken. These variations, Dr. Nansen believes, are due to the quantities of ice that are formed and melt in the sea itself, which are determined by the refrigeration of the surface of the sea in the course of the winter, and also by the layer of snow covering the ice. The formation of ice, in its turn, largely depends on the conditions prevailing during the autumn.

The difficulties of this route to Siberia occur almost exclusively in the Kara sea. The season of navigation is short; late August and September are probably

best, but we require more knowledge, and it is worth obtaining in order to utilise to greater advantage the magnificent rivers of Siberia. The colonists in Siberia are most anxious that this route to Europe should be opened. Dr. Nansen suggests that investigations should be carried out by three or four sailing cutters with motor power which should stay in the Kara sea from early summer till late autumn. These by wireless communication could advise vessels of the best route. A wireless station should also be erected at Matochkin Shar, and aeroplanes or waterplanes might be usefully employed in surveying the distribution of ice.

Dr. Nansen gives an excellent account of the present state of Siberia. Despite minerals, including much unworked coal, Siberia's greatest wealth is in arable land. A great deal of this near the railway has been taken up, but railway freights for corn to centres of demand is very costly; hence the importance of water transit. Government gives considerable help to settlers, and is now trying to introduce better methods of agriculture and modern agricultural machinery, but much remains to be done. Better roads and more railways are required, and schools and postal communication must be improved. Distance from Russia and inaccessibility are great drawbacks, nor has Siberia yet recovered from the bad name the convicts gave it, but the number of immigrants is growing. There were three millions during the last eight years in contrast to less than one and a quarter millions in the previous ten years. Dr. Nansen seems to favour communal self-government for Siberia in view of its great distance from Petrograd.

In the Amur district recent years have seen a great increase of Russian immigrants, but distance puts them at a disadvantage compared with the yellow races, despite laws against Koreans and Chinese. The percentage of the yellow to the white races is steadily growing in the eastern provinces of Russia's Asiatic empire, and herein, as Dr. Nansen points out, lies Russia's gravest problem in the future—a more direct menace than the modernization and growth of China's great army.

The volume is well illustrated and extremely well printed; the maps, though adequate to follow the text, are the weakest part of the book.

R. N. R. B.

AFRICA.

Mr. Arnot's Missionary Travels.

'Missionary Travels in Central Africa.' By F. S. Arnot, F.R.G.S. London: Alfred Holness. 1914. Pp. xix., 156. *Maps and Illustrations.* 2s. *net.*

Mr. F. S. Arnot, whose death was reported in the *Journal* for August last (vol. 44, p. 238), has left behind him in this volume a connected account of his missionary travels in south central Africa during the past thirty-three years. When he was last in England he was asked to republish his first book, 'Garenganze,' in which, in 1889, he gave an account of his journeyings during his first term of service in Africa, 1881–1888. From the geographical point of view, the journeyings recorded in this book were perhaps the most important of his travels; in later years the country in which he laboured became better known. A reissue of 'Garenganze' would, however, in his own words, "have meant reprinting many mistakes and much that by this time is quite out of date." Accordingly he decided to rewrite the story of his pioneer journeys. The result is a new work. The story is told much more briefly than in the original. As told in 'Garenganze' it extended to two hundred and fifty pages; here it runs to only just over one hundred pages.

Another fifty pages summarize his journeys between 1889 and the present year. The preface is dated April 30, only a fortnight before his death. Mr. W. H. Bennet contributes an introduction in which he gives some biographical details, bringing out particularly Mr. Arnot's early association with Dr. Livingstone's family and its influence on his career. The maps are five simple sketch-maps of south and central Africa, identical save for the markings in red of the routes followed by Mr. Arnot on different journeys. Against medical advice he was engaged in a new visit to Central Africa, and had reached one of his former stations on the Kabompo river, when he was stricken with his fatal illness last January.

AMERICA.

The Roosevelt-Rondon Expedition.

'Through the Brazilian Wilderness.' By Theodore Roosevelt. London: John Murray. 1914. *Maps and Illustrations.* 18*s. net.*

The great charm of this book is that it is instinct with the personality of the author. Everywhere the reader has before him the man himself and his indomitable cheerfulness and courage; but the predominant note is his active interest in the myriad forms of plant or animal existence that are encountered, and there are few routes which could yield a greater wealth of material for the open-air student of life in all its varieties than that traversed by the "Expedição Scientifica Roosevelt-Rondon."

Immediately to the south of the Amazonian basin there stretches for more than a thousand miles the central Brazilian plateau or Plan Alto, composed in the main of sedimentary rocks, though on its margins the hard crystalline rocks are exposed in places. The eastern portion has long been known, but the narrow prolongation to the westward towards the point where the Guaporé, the Mamoré, the Beni, and the Manutata (Madre de Dios) coalesce to form the Madeira was until recently entirely unexplored. In 1890 a British syndicate was formed to survey this area, but litigation unfortunately necessitated the abandonment of the expedition before anything of great importance had been accomplished, and the opening up of the region was reserved for Colonel Rondon and his colleagues of the Brazilian Telegraphic Commission, to whom was confided the task of constructing a telegraphic connection between Eastern Brazil and the falls of the Madeira. Colonel Rondon, a man of exceptional abilities and character, is of nearly pure Indian race. He was born in Matto Grosso, near the scene of his future labours. Proceeding to Rio, he enlisted, served a year in the ranks, and was then admitted to the military school. After five years as a student and three as a professor of mathematics, he returned as a lieutenant of engineers to Matto Grosso, and, in the words of Colonel Roosevelt, began his life's work of exploring the wilderness, where his remarkable success must be attributed to his firmness and understanding in dealing with the Indian tribes.

When Colonel Roosevelt and his party landed at Rio, the courses of the Rio Xingu, and of the Arinos and Juruena, which unite to form the Tapajos, were well known, but westward of the latter to the Rio Gy-paraná, which had recently been shown by Colonel Rondon to enter the Madeira just below the falls, nothing was known of the northern slopes of the tableland, though the Commission were acquainted with the upper courses of a number of streams, including the Papagaio, the Ananas, and the Duvida (the "river of doubt") flowing northward into the great forest that was still untrodden by civilized

man. As Colonel Rondon was then intending to make an exploration of the Duvida, a cordial invitation was extended to Colonel Roosevelt to share in the responsibilities of leadership—an invitation that was at once gladly accepted. The two leaders met on the Paraguay at the Brazilian frontier, and the joint expedition made its way up that river and its tributary, the Sepotuba (or Sepituba, as it is usually called), to Tapirapoan (Tapirapuam), the headquarters of the Commission, where the navigation ends. After a short journey on muleback through the forest, they reached the edge of the western Plan Alto, a healthy, sparsely timbered, sandy tract about 2000 feet above the sea, presenting a great contrast to the lowlying forest to the south and north of it. Here they were transported northward in motor cars to the falls of Utiariti, where the Papagaio plunges downwards on its way towards the Amazon. The expedition was now in the land of the Parecis, an intelligent tribe of Indians, who are apparently easily able to assimilate themselves to the ways of Brazilian civilization. Leaving behind Anthony Fiala (a former arctic explorer) with a Brazilian officer to descend the Papagaio, which proved to be a tributary of the Juruena, the remainder proceeded north-westward to the hunting-grounds of the Nhambiquaras, a merry, high-spirited race whose principal failing was a conviction that it was their right and duty to maintain and extend their culture (excellent, no doubt, in its way) by means of armed raids for wives and other booty on the Parecis, whose chief preoccupation seems, on the other hand, to have been a very exciting form of football—or rather headball, for heads were employed instead of feet to drive the ball. It says a good deal for Colonel Rondon's capabilities that he was able to "control these bold war-like savages, and even to reduce the war between them and the Parecis."

On February 27, in the height of the rainy season, the start was made down the Rio Duvida in seven dug-out canoes. The party included the two leaders and Kermit Roosevelt; the zoologists George K. Cherrie and Leo E. Miller; Lieut. Lyra, who was in charge of the surveying operations; Eusebio Oliveira, a Brazilian geologist; and Dr. Cajazeira; as well as sixteen Indians and half-castes experienced in forest and river travel, who formed the rank and file of the expedition. After a few miles of comparatively easy travelling they reached the first rapids, where the river ran in a narrow channel cut in flats of friable sandstone and conglomerate so that it was necessary to transport the baggage and sometimes even the canoes overland. This was only the beginning of a succession of rapids that taxed all the resources of the expedition. Further on, transverse low ranges of crystalline rocks were encountered, through which the river made its way in narrow gorges. Here the packs were transported over the crests, while the canoes were with difficulty warped through by means of ropes. It was only after six weeks of toil, often in torrential rain, and when most of the canoes had been destroyed and replaced by others cut out on the spot from forest trees, that they reached the first huts of the rubber gatherers and learnt that they were on the river Castanho, the western branch of the Aripuanan,* which enters the Madeira about lat. 5° 20′ S. The difficulties of the members of the expedition were now over, but it was long before they completely recovered from the hardships they had undergone and the malaria and ulcers contracted on their journey.

The truth is that the expedition was insufficiently equipped for the task it essayed, which had, indeed, not been originally contemplated. In a descent of

* The Castanho and the Aripuanan below the confluence of its two branches have now been re-christened the Roosevelt.

nearly 2000 feet there was bound to be serious trouble from rapids, and it would be difficult to conceive anything floating more unsuited for the task of descending them than the clumsy heavy dug-outs. Even the rafts of the balsa tree employed on the Andean streams would have been far more useful, while birch bark or canvas canoes would have rendered the journey comparatively easy, for they take rapids easily without shipping a drop of water, where the waves break right over less buoyant craft, and are so light that they can be easily transported. Some of the baggage that was taken down the river might well have been spared, especially the "two big and heavy tents" which had ultimately to be abandoned. Tents, in the ordinary sense of the word, are not required in tropical South America. A fly to be spread overhead when required, a mosquito curtain of fine mesh, and a water-proof and insect-proof hold-all or valise to hold one's clothes and serve as a bed are all that are required, though when travelling in settled portions of Brazil a hammock should also be carried in accordance with the custom of the country.

The party suffered severely from malaria, which always seems to occur where there are rapids, and to be absent in the vicinity of streams with a uniform sluggish flow. Probably there are fish that prey on the *Anopheles* larva in the latter, and not in the small pools and backwaters among the rocks of a cataract. It seems doubtful whether the daily dose of quinine that was supposed to be taken was really persevered in. It seldom is. My own experience is that the Koch *régime* of two large doses on every eighth and ninth day is more effective and more easily maintained, especially if the same quinine days are kept by all.

Whatever precautions are taken, however, the explorer who strikes out into the unknown cannot ensure himself against hardship or disaster, for the unforeseen is sure to happen and upset the most careful calculations.

The appendix on outfit to which Colonel Roosevelt and his son and Mr. Fiala have contributed is excellent. I might suggest, however, that high boots reaching nearly to the knee, if sufficiently supple for easy walking and not too tight, are an excellent substitute for ordinary boots and leggings or putties, especially when the ground is wet or swampy.

It only remains, in conclusion, to congratulate Colonel Roosevelt and Colonel Rondon and their colleagues on the accomplishment of the most important piece of river exploration in tropical South America in recent years. At the same time the extensive collections of natural history specimens that have been obtained should prove of the greatest value to science, and all zoologists must look forward with interest to the publication of the results of their investigation.

JOHN W. EVANS.

AUSTRALASIA AND PACIFIC ISLANDS.

SHEEP AND WOOL IN AUSTRALASIA.

'The Sheep and Wool Industry of Australasia.' By Henry B. Smith. London, etc.: Whitcombe & Tombs. 1914. 8*s.* 6*d. net.*

Mr. Smith's book is a model of really practical information. Every side of the question is treated—briefly, but at sufficient length, very clearly, and effectively. For instance, there are separate chapters on such topics as moisture in wool, sorting, scouring, selling, pressing the clip, and even on slaughtering and fellmongering. The direct geographic interest is not great, but in a chapter on "Sheep and Localities" there are some interesting and pertinent illustrations of, *e.g.*, how the close crimp of a (typically shortish-stapled) fine merino wool suffers from a blazing sun and dust-storms; hence the

advisability of keeping only strong-wooled sheep in the "Back Country," where summer heat is fierce, and where the fine red dust makes a most potent "sand-blast." Similarly, the fine cross-breed is shown to be much more profitable than the merino in heavy and damp country, whether you are raising mutton and wool or only wool. The book is an eminently useful one, which can be strongly recommended to young farmers, and we hope that no one will be prejudiced against it by the author's somewhat unnecessary recommendation of it in his preface. There is no sign in the text of any assertiveness, or anything else except a wide and sound knowledge based on practical experience.

'The New World of the South.' By W. H. Fitchett, B.A., LL.D. (London: Smith, Elder & Co. 1913. Pp. viii., 428. 6*s*.) This is the second book written by Dr. Fitchett under the above general title. The former volume had for a subtitle 'Australia in the Making,' and told the story of the early exploration and settlement of the continent in its most romantic phases. The present work has for its subtitle 'The Romance of Australian History.' It is similar in character to the first, but deals for the most part with a later period. It is divided into four sections, the first dealing with the discovery of gold and adventurous stories of the goldfields; the second with bushranging exploits in the third quarter of the nineteenth century; the third with some of the best-known explorers of Australia—Sturt (the subject of the frontispiece portrait, which is the only illustration in the book), Leichhardt, Kennedy, Eyre, Burke, and Wills; while the fourth and last briefly sketches the political evolution of Australia from the days of the convict settlements to the establishment of the Commonwealth. The book is written in Dr. Fitchett's usual picturesque and graphic style.

GENERAL.

Economic Geography.

'Economic Geography.' By J. McFarlane, M.A., M.COM. Pp. viii. and 560. London: Sir I. Pitman & Sons. [1914.] 7*s*. 6*d*. *net*.

If there is any single quality particularly prominent in this book, it is conscientiousness—a conscientiousness which forbids the author even to describe as "*about* 80" a density of population which is statistically "about 79." But besides being intensely conscientious the book is simple, clear, sound, interesting, and sufficient for all ordinary university students. The method of treatment compromises between the natural region and the political unit, all political units being subdivided into natural regions; but the word *economic* is interpreted in a rather narrow sense, and there is rather a forced attempt to emphasize geological considerations. For instance, the normal student, for whom one would recommend the book, is not helped by being told that in the Weser basin "the sub-Hercynian hills are of Jurassic and Cretaceous formation" (p. 113). The best parts of the book are those referring to areas on which there is a vast quantity of official information—in more or less inaccessible reports and in a more or less repellent form, *e.g.* India and North America. This has been read, marked, learnt, and inwardly digested by Mr. McFarlane in such a way as to make it essentially individual and almost original; and he re-presents it with a skill as great as the labour of collecting it must have been. He is specially skilful in his treatment of the chief centres of industry; and almost equally so in his treatment of the still more difficult subject of communications.

The weakest part of the book will probably be found in the introductory chapters. The physical and climatic summaries are scrappy and not very effective, and the selection of products is as partial as their treatment. One or two are well done, *e.g.* cotton, and the question of soils is seldom neglected; but there is room for much improvement in many cases. For instance, we are told that for sugar-cane "a considerable amount of moisture is necessary at certain seasons" (p. 19), but neither the amount nor the season is indicated. So, on p. 20, we are told that jute requires "not too much rain"! And the saying (p. 19) about a plant needing to have "its feet in water and its head in fire" was always of the date-palm, not of rice. In other parts of the book we have noticed similarly a wrong note emphasized. For instance, the olive (p. 82) *does* make its way, and actually thrive, outside the limits of Mediterranean rainfall, its essential need being for shelter from northerly winds, not for winter rain or summer drought. So, on p. 470, the emphasis should be, not on the fact that Para rubber needs to be "flooded for a considerable part of the year," which every one knows, but on the fact that the real black Para (the context being "the best quality") owes its special resiliency to its being flooded for an *inconsiderable* part of the year (mid-November to end of March), and for that reason comes only from westward of the head of tide, the chief centre for the best quality being Iquitos. In the same connection we must protest against the implication—if it is not a direct assertion—that Trade winds "bring much rain" to interior lowlands (p. 451).

In the whole book there are only eighteen illustrations, and of these six are devoted to the mean rainfall of the continents, which can be found—and in a more effective form—in almost all the better atlases nowadays. The rest, however, are very clear and useful studies of natural regions, much to be recommended—with the caution that text and maps do not always agree, *e.g.* in reference to the west coast region of India (pp. 223 and 233), where also the key to the map is not quite correct. Still more serious is Mr. McFarlane's ultra-conscientious inability to say that, *e.g.*, a colliery is *near* some small town which might be found on an ordinary map. Efforts to correct a quite bewildering ignorance proved that within three pages he mentions six "places" which are *not* given on Stieler's 1 : 1,500,000 sheet of the area!

One further protest must be made. It is against the adoption of the alien contradiction-in-terms "prairie *steppe*" in connection with the different levels of the prairie (p. 383). *Steppe* is a Slav word, the essential idea in which is "waste land"; *prairie* is a Romance word, the essential idea in which is "meadowland." And to use *steppe* as equivalent to *step*, in association with a prairie, is more than a pardonable eccentricity like Mr. McFarlane's unconventional and unconvincing use of *though* or his spelling of Balkan place-names.

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the Secretary.—At the meeting of the Society on January 11 the President made the following statement: "Before we come to the business of the evening, I have a piece of news to tell you which I am sure you will be glad to hear. A very distinguished honour has been bestowed on our old friend and secretary, Dr. Keltie. The American

Geographical Society has conferred on him the Cullum Gold Medal, a medal which is given not annually but only on special occasions. I believe it has been given to only seven or eight people since it was founded, and amongst the holders have been Captain Scott, Dr. Nansen, Admiral Peary, and others of equal eminence. You will also be glad to hear that the Council has made an arrangement by which, when Mr. Hinks succeeds in March next to the posts of secretary and editor, Dr. Keltie will remain with us for another two years as Joint Editor of the *Journal*, and will thus be able to give his successor the help of his long experience when taking over these offices."

EUROPE.

The Upper Basin of the Warwick Avon.—A careful regional study of this area, illustrated by sketch-maps showing the main features of the physical geography and distribution of population, is made by Miss C. A. Simpson, holder of the Oxford Diploma in Geography, in the *Geographical Teacher*, vol. 7, part 6. Flowing south-west in the great valley eroded in lower lias clay, which traverses the Midlands at the foot of the Oolitic escarpment, the Avon as a whole is a longitudinal river; but above Warwick very few streams are actually "strike-streams," and even these are complicated by a number of scarp streams. The main streams flow obliquely across parallel outcrops of rock, which dip to the south-east; the valleys lying chiefly in the impervious lower lias and in the triassic clays and marls, while the more porous rocks of the permian sands, middle lias (or marlstone), and Northampton sands, stand out as hills. Glacial drift covers the surface of most of the formations, and its distribution affects the scenery and soil more than does the underlying rock. The porous gravels form convex hills, and the position of some springs seems to show the line below which the drift-gravel has been removed, though springs are most numerous on the face of the Oolitic escarpment at the junction of the marlstone with the lower lias clay. They have here controlled the positions of some of the larger villages. The basin is divided into two parallel valleys (those of the Avon itself and of the Leam) by the plateau on the east of which Rugby stands. Certain facts suggest that the Upper Avon originally continued its course into the Leam by way of the Rainsbrook (a tributary of the Leam from the north-east). Thus, on emerging from its upper valley (in which it flows on clay soil through poor grass country), it suddenly turns west through a narrow gorge, and, in spite of its larger size, continues its way through a valley both narrower and more deeply cut than those of the Rainsbrook and Leam. The profile of the Upper Avon is also directly continued by those of the last-named streams. There is not much variety in the vegetation of the district. Woods are scarce on the lower lias, most occurring on the "new red" marls and Permian sands. The best agricultural soil (and therefore the most densely populated part of the country district) seems to be where the drift-gravel thins out on the west side of the Rugby plateau, just a sufficiency of water being held up by the underlying clay. The pasturage has long steadily increased at the expense of the cultivated land, but since the great losses of sheep in 1879, these have not increased like the horses and cattle. The agricultural villages are generally small, and many are built on the gravel slopes of hills. The upper valley of the Avon, with its poor pastures, seems always to have been thinly peopled. Generally, the population is being drawn into the towns from the country, and much of the area is undergoing a change from the agricultural to an industrial type. The old highways of Watling Street and the Fosse Way have in places fallen into disuse owing to their steep gradients, though the latter is now being repaired to a large extent. The different

courses adopted by roads, railways, and canals in crossing the barrier of the Oolitic escarpment are an interesting study, the main roads generally keeping high to avoid marshy ground.

ASIA.

Dr. de Filippi's Expedition.—Dr. de Filippi returned to Italy in January after completing the work of his expedition. He will give an account of the results at a meeting of this Society in April or May next.

AMERICA.

Régime of the Upper Yukon.—During the past few years efforts have been made by officers of the U.S. Geological Survey and others to secure observations which might permit of an estimate of the discharge of the Yukon at Eagle, Alaska, near the spot where the river crosses from Canadian into American territory. The results are given by Messrs. E. A. Porter and R. W. Davenport (who, together with Mr. C. E. Ellsworth, supervised the observations) in *Water Supply Paper* 345 F. of the U.S. Geological Survey (1914). This contains also some useful remarks on the general conditions of the flow of the river in relation to the climatic conditions. Records of precipitation show that this, while remarkably uniform over the whole basin, is to be reckoned as meagre, the average being only some 11½ inches yearly, at least below 2000 feet. The snow layer which accumulates during the winter months begins to thaw rapidly in April and May, and its influence on the streams is great in early summer, the maximum monthly discharge being that of June. The importance of navigation on the Yukon to the whole life of the region lends a special interest to the dates of the freeze-up and break-up of the river. The latter (as in the case of the great Siberian rivers) is a most dramatic and impressive spectacle. During each of the years 1898 to 1912 it occurred between May 3 and May 16, while the freeze-up was recorded at varying dates from October 29 to November 22, with the sole exception of 1905, when the event occurred on the unusually early date of October 9. The discharge measurements were made by observations of level at a gauge on the banks, and of surface velocity by timing the passage of ice-cakes, driftwood, or bottle-floats. By measuring the velocities at different depths from an anchored boat, a coefficient of 0·92 was obtained for reducing the surface to the mean velocity, and, with one exception, discharges obtained on this basis plotted within 3 per cent. of the mean curve of relation between gauge height and discharge. The absolute maximum discharge observed occurred on May 22, 1911. It was then 253,000 feet per second, while the highest monthly average was 199,000 (for June, 1913). At the end of winter the discharge falls to a minimum of 11,000 feet, and the mean for the three years 1911–13 was only 73,200. From a consideration of the precipitation records it appears that the run-off is approximately 65 per cent. of the former. This is no doubt high, but may be explained by the special conditions prevailing—the perpetually frozen subsoil, the comparatively slight loss from evaporation, the steep slopes, and the absence of luxuriant vegetation. The drainage area contributary to the Yukon at Eagle is only about 122,000 square miles, out of a total (at the mouth) of some 330,000, so that the figures given above are far from representing the discharge of the lower Yukon. Proportionally to the area, the discharge at Eagle does not strikingly differ from that of the Mississippi or St. Lawrence, but falls far short of that of the Columbia, which, at the Dalles, Oregon, with a drainage area of 237,000 square miles, has a maximum discharge of 1,390,000 cubic feet per second, and a mean of 235,000 cubic feet.

Changes in Chesapeake Bay.—Chesapeake bay offers a particularly favourable field for the study of the results of erosion and sedimentation, being in reality a large tidal river with a drainage-basin of moderate size and retaining a large part

of the sediments brought in from that basin by its tributary rivers. Such study is, moreover, rendered unusually fruitful through the existence of two accurate surveys (by the United States Coast and Geodetic Survey) executed at dates more than half a century distant from each other. The first was carried out between 1845 and 1848, on the scale of 1 : 20,000, and showed both the shore-lines and depths of water; the second, between 1900 and 1903, on behalf of the Maryland Shell Fish Commission, on the same scale and showing the same detail. Advantage has been taken of those facilities by Mr. J. F. Hunter to make a preliminary comparison of the morphology of a limited part of the whole area at the two dates, further data being also obtained from a plane-table survey carried out by him with the aid of Mr. Yates. Mr. Hunter publishes the results of his investigations as *Professional Paper* 90-B of the United States Geological Survey. The area selected is on the east side of the bay (embracing the mouth of the Choptank river and the points and islands outside it), and in an intermediate position between the area to the north where the work of erosion has been most active, and that to the south where there has been much marsh building. The two principal features are the terrace of the Talbot formation, built up of clay-marl and sand and here nowhere rising more than 10 feet above the sea; and the swampy land, largely submerged at high tide, covered by sedge or grass which helps to retain the mud and to check the action of the waves. The most remarkable changes in the shore-line are to be seen on the outer side of the islands (James, Sharp's, and Tilghman), most exposed to wave action. James island has lost 420 acres, or 43 per cent. of its area, in fifty-three years. The cutting has proceeded most rapidly on the low cliffs of the Talbot formation, while the low-lying marl land is more resistant owing to the matted growth of vegetation. Sharp's island, the smallest of the three, has suffered still more, proportionally, and is bound to disappear before long. Within the line of the islands some considerable erosion at certain points has been brought about by the currents of the Choptank and Little Choptank rivers. A comparative study of depths shows many changes in the sea-bottom, due to erosion in some parts (especially near the shores) and deposition in others. Of the total area affected by one or the other process, about eighty per cent. (twenty-six per cent. of the total area under water) has been subject to scouring and only twenty to sedimentation; and as the vertical element in the two cases is approximately the same, it is evident that there has been a large net shifting of sediment further down the bay. Mr. Hunter thinks that a careful study of the whole bay on these lines would yield results of great value in the consideration of the phenomena of denudation generally.

AUSTRALASIA AND PACIFIC ISLANDS.

The Rainfall Régime of Australia.—The distributional features of Australian rainfall are set forth by Mr. B. C. Wallis in an article containing twelve monthly maps published in the *Scottish Geographical Magazine* for October, 1914. The maps are equi-pluvial—that is, the lines drawn across them run through places of equal rainfall intensity, as distinct from iso-hyetal, on which actual quantities of rainfall are shown. The method is particularly useful in the geographical study of general rainfall *régime*, and for a further account of a method originally due to Angot, we refer the reader to the July number of the same magazine (pp. 356–369), in which the rainfall of Africa is similarly treated. The Australian rainfall covers three periods in the year—(*a*) mid-December to mid-April: greatest intensity in the north, maximum effect in February; (*b*) mid-April to mid-August: winter rains especially in the south-west, maximum in June; (*c*) mid-August to mid-December: relative dryness throughout the continent, maximum dryness in November. The rainfall of the continent swings with the sun and is associated with the oscillation of the track

of the anticyclone centres between 28° and 35° S., whose passage from west to east, according to Dr. W. J. S. Lockyer, is the dominating factor controlling Australian weather, as also that of South Africa and South America in similar latitudes. In the summer, when the anticyclones move along their southern course, cyclonic disturbances from the sea affect the northern part of Australia, bringing the rains which follow, though lagging considerably behind, the vertical sun. When, on the other hand, the anticyclones move along their northern course, cyclonic disturbances affect the southern shores of the continent. In both cases the cyclones traverse the sea, which ensures abundant precipitation. The winter rains are especially pronounced in the south-west of Australia, Perth supplying a better example of the seasonal variation than either Adelaide, Melbourne, or Tasmania, just as Cape Town excels both East London and Port Elizabeth in this respect. The whole of the western part of the continent south of 20° S. is affected by the winter rains, but in the east this rainy season does not appear in similar latitudes. The dry season of the southern spring seems to be associated with certain temperature conditions, for besides being the time when the winter rains are dying away and the summer rains approaching, it is the period when temperatures over the land are markedly higher than those of the sea, the special dryness of November being accompanied by the maximum difference in air temperature between land and sea. We would point out to avoid confusion that Mr. Wallis's maps show the intensity of seasonal variations to which the rainfall of the Australian continent is subjected, and give no indication of the quantitative distribution—the fact that the eastern sea-board is wettest and the interior driest.

Coal Resources of Queensland.—A study of this subject, on somewhat similar lines to that on the "Coal Resources of New South Wales" noticed in vol. 41, p. 287, has been issued by the Queensland Geological Survey as Publication No. 239, by Mr. B. Dunstan. Most of the paper is taken up with a detailed account of individual coal areas, but some general facts are also given. Of a total area of 73,000 square miles, representing the geologically surveyed measures, the recognized coalfields cover 20,000 square miles. Most of the present supply comes from the Trias-Jura measures, mostly confined to the south-east of the state, which cover an area of 83,000 square miles, including 2000 square miles of coalfields (proved to contain coal-seams, whether workable or not). The Permo-Carboniferous formations, covering 30,000 square miles, include 16,000 square miles of coalfields. These lie further inland, and are still largely untouched, but with the development of communications will be an important source of supply. The Cretaceous measures (20,000 square miles, with 2000 of coalfields) are of less importance, the quality of the coal being inferior. The writer endeavours tentatively (though sounding a note of caution) to estimate for each coal area the actual, probable, and possible coal reserves in existence, limiting the calculation to seams not less than a foot thick and not more than 1000 feet below the surface. The general result is to show that the basin of the Dawson-Mackenzie rivers contains far more probable resources than all the other parts of the state put together. The Mammoth seam in the Mackenzie river area has a thickness of 20 feet, and the probable reserves* are put down as 450,000,000 tons. The Clermont area boasts a seam of 66 feet, but as the extent is less the probable reserves work out as 300,000,000 tons. Queensland's yield of coal in 1910 was about 870,000 tons, or 11·37 per cent. of the total for Australia. The output has been gradually increasing from 323,068 tons in 1895 to 891,568 tons in 1911, the total to the end of that year being estimated at 13,251,883 tons.

* These are estimated on the assumption that 1 square mile, round a spot where a seam is known, is the limit of probable occurrence.

POLAR REGIONS.

The Sea Route to Siberia in 1914.—As recorded at the time in the *Journal*, Mr. Jonas Lied sailed last summer on a new voyage to the Siberian rivers in continuation of his efforts of the previous year to open up commercial intercourse between Western Europe and Siberia. Some details of his experiences have lately been received in this country. Besides the two cargo steamers, Mr. Lied's flotilla included several river-steamers and barges which he took out on behalf of the Russian Government. The ships were at Cuxhaven only just before the outbreak of the war, but the flotilla succeeded in getting away to Tromsoe, whence the final start was made on August 16. The Kara straits were passed on August 24, and in spite of much ice and fog the mouth of the Ob was reached on August 30, and that of the Yenesei on September 1. Here Captain Sverdrup's vessel, the *Eclipse*, which had sailed in quest of the missing Russian explorers, Brussilof and Russanof (cf. *Journal*, vol. **40**, pp. 220, 646; **41**, p. 171; **42**, p. 575), was found stranded on a rock, but she was eventually got off and proceeded on her voyage towards Cape Cheyuskin. Mr. Lied ascended the Yenesei to Nosonovski island, where the cargoes were transferred to the river fleet, and the return voyage was begun on September 19. In spite of much ice to the north of White island, Tromsoe was safely reached in eleven days—as compared with nineteen spent on the outward voyage. We hope in due course to receive a fuller account from Mr. Lied, who is understood to be contemplating a third voyage during the present year.

The Shackleton Expedition.—In a message sent from South Georgia to the *Daily Chronicle* early in January, Sir E. Shackleton announced that the ice conditions in the Antarctic were too unfavourable to give hope of a start this season on the sledge journey across the Antarctic continent, which will, therefore, be of necessity postponed for a year. This is not altogether a surprise, as on sailing from Buenos Aires Sir Ernest was prepared for the possibility of delay from the cause mentioned. Much will now depend on his ability to push southward through the ice to suitable winter quarters to the south of the Weddell sea.

HISTORICAL GEOGRAPHY.

Early Dutch Maps preserved in Spain.—That a wide field of research is still open to students of the history of cartography, even in such a comparatively well-worked period as the sixteenth century, is shown by the results of a two months' journey round the libraries of Spain carried out early last year by Dr. C. F. Wieder, of the University Library, Amsterdam. This has revealed a number of interesting documents, some of them hitherto entirely unknown, which shed much new light on the activities of the Dutch (as distinguished from the Flemish) map-makers of the latter part of the sixteenth, and the early and mid seventeenth century. The investigation was made in continuance of researches in London, Paris, and elsewhere, as well as in the Dutch libraries and archives, with special reference to a work on the early history of Manhattan undertaken by Dr. Wieder; but the results attained are of much wider application, and bring out in strong relief the importance of the work of the Dutch cartographical school at the period in question. At Madrid, the Deposito de la Guerra contains a large plan of that city dating from 1656, which, though drawn by a Spaniard, was engraved by Solomon Savry of Amsterdam, and printed at Antwerp by J. J. van Veerle. Here, as well as in other libraries, Dr. Wieder found Spanish editions of the well-known atlases of Ortelius, Blaeu, and others, including (at the Deposito de la Guerra) the rare marine atlas of Van Alphen (1660). In the private library of the King a lengthened search brought to light a volume of "varios," which yielded no fewer than ten hitherto unrecorded early Dutch maps.

Within the past few years various similar maps have come to light in Holland, *e.g.* maps by Blaeu of the Netherlands (1604) and of Holland (1608); one of the Netherlands by J. van Deutecom (1588); of Holland by Van Langren (1595). But the maps at Madrid—by Blaeu, Kaerius, Hondius, D. de Mein, and others—are of other European countries as well, and prove the independence of the cartographers of the *northern* Netherlands from their southern contemporaries (Ortelius, etc.) at Antwerp.* A second find of the same character was made in the Deposito de la Guerra, in the form of early plans of Dutch towns, that of Haarlem by J. van Deutecom being especially interesting. But one of the most important monuments of Dutch cartography is to be found at Valencia, in the large engraved World-map of 1592 (7½ feet long) which, according to previous statements, was published by Johannes Baptista Vrient at Antwerp. Now Dr. Wieder had proved by careful comparison that a smaller map issued by Vrient and found in some copies of Linschoten was the work of Peter Plancius, and as it was known that the "privilege" for the issue of a World-map was granted to the same distinguished cosmographer in 1592, the presumption seemed to be that the Valencia map was also by Plancius. The chief difficulty—that the privilege mentioned Cornelis Claes of Amsterdam as the publisher—was removed on inspection of the map, when Dr. Wieder found that Vrient's name appeared merely on a slip of paper pasted on the Valencia copy. Further evidence of Plancius's authorship was afforded by the statement on the map that it was based on a number of charts received from Portugal, and the fact that a document exists proving the purchase by Claes, at Plancius's instance, of a series of twenty-five Portuguese charts. The light thus thrown on the work of Plancius as a cartographer is of great interest, and a further interesting fact is the apparent dependence on the Valencia map, both of Blaeu's map of 1606 and of Hondius's of 1611.* Dr. Wieder also obtained valuable results from an examination of the atlases of Christianus Sgrooten and Jacobus van Deventer, embodying results of surveys of the Netherlands carried out on behalf of the Spanish authorities.

GENERAL.

Memorials to Capt. Scott and Lieut. Bowers.—A lofty monument, erected at Finse, among the mountains of Southern Norway, in memory of Capt. Scott and his companions, was unveiled on December 28 by Dr. Skattum, vice-president of the Norwegian Geographical Society, who made feeling reference to the noble characters and heroic deaths of the explorers. "Could anything," he asked, "be conceived more elevating from its grand ideality, than the conduct of Scott and his followers during their final death-march? It represented the very highest display of moral strength, the greatest possible exhibition of physical and mental fortitude and endurance." We understand that a second monument, subscribed for by Norwegian friends and admirers, and by British residents in Norway, will be erected at Fefor in Gudbrandsdalen, the place chosen by Scott for the trial of his motor sledges and other polar outfit. A memorial to Lieut. Bowers, placed in Bombay Cathedral by his fellow-officers of the Royal Indian Marine, has also been lately unveiled, the ceremony being performed by Lord Willingdon, Governor of Bombay. It is in the form of a simple tablet of marble, with an inscription quoting Captain Scott's tribute to Bowers as "cheerful, hopeful, and indomitable to the end."

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* Hondius's map was reproduced in facsimile by Prof. E. L. Stevenson in 1907, and one of Blaeu's—assigned to 1605, or a year earlier than the above date—has just appeared under the same auspices. We hope to refer to this again later.

OBITUARY.

Archibald Ross Colquhoun.

By the death of Mr. Archibald R. Colquhoun the Society loses a Gold Medallist who was a world-wide traveller and an ardent Imperialist. As an explorer his fame rested on the journey which he made in the early eighties from Canton to the Irawadi. Mr. Colquhoun was then between thirty and forty years of age, an engineer by profession, with an appointment in Burma under the Indian Public Works Department. Born at sea off the Cape of Good Hope in 1848, the son of the late Dr. Archibald Colquhoun, he had entered the Indian Government service in 1871, and had had his interest in exploration stimulated by his experience as secretary to the Government mission to Siam and the Siamese Shan States in 1879. It was the interest of the journey through the Shan country of Zimmè, combined with the influence of a study of Marco Polo's narrative, which inspired Mr. Colquhoun to attempt on his own account an exploring expedition through Indo-China. At first he had nothing much more definite in his mind than the ambition to distinguish himself and win, perchance, one of the Society's medals, but as his plans began to take shape he became keenly interested in the question of opening up railway communication between Burma and China, and devoted himself with much enthusiasm to the furtherance of that object. After the Siam mission he wrote to the late Colonel Henry Yule, mentioning his desire to engage in exploration and asking for advice. Ever ready to encourage such aspirations in suitable persons, Colonel Yule returned a sympathetic reply, and subsequently, when Mr. Colquhoun came home from Burma, gave him valuable help in formulating his programme. Mr. Colborne Baber, Captain Gill, and Mr. McCarthy were also interested in the expedition and gave valuable advice. The sympathy of various Chambers of Commerce was enlisted for the idea of improving communications with China through British territory, and the Glasgow Chamber of Commerce accorded financial support to the expedition. Thus encouraged and assisted, Mr. Colquhoun set out from Canton early in February, 1882, with Mr. Charles Wahab as his sole white companion, intending to ascend the Canton river to its sources, thence strike westwards to Ssu-mao, and from there proceed through the Shan States to Moulmein in Lower Burma. In face of many natural difficulties and much local opposition in different districts, he succeeded in carrying out this programme as far as Ssu-mao; but there, within a few miles of Zimmè, the expedition's further progress in that direction was finally barred by the Chinese authorities, and Mr. Colquhoun had to turn north to Tali-fu. From there, not without further difficulties, the expedition made its way to Bhamo.

The troubles which attended the journey were not without reward. Colonel Yule, who said that Mr. Colquhoun seemed to him "one of those men who were born with a genius for travel," described the expedition as "the best that has yet been made from sea to sea across farther India in or near the latitude of Canton." Some 1300 miles of new country between Wu-chau and Tali-fu were surveyed, and valuable information about the political and economic conditions of the country was secured. The Shan States, between Burma and China, were found to have become independent, and the districts bordering on Burma were discovered to be much richer than had been supposed. Mr. Colquhoun arrived home in the autumn of 1882, and in November opened the Society's lecture-session with an account of his journey. Shortly afterwards a detailed narrative was published in two volumes under the title 'Across Chrysê'; it is still known as one of the best books of travel in China. In 1883 Mr. Colquhoun was awarded the Founder's Medal of the Society. His

journey had confirmed him in his advocacy of the construction of a railway from Lower Burma to Ssu-mao, and before he received his medal he was off again to make a further study of the country on behalf of this project. Great hopes were entertained of his future career as an explorer, but his energies were diverted into other channels. He became special correspondent to the *Times* in the Franco-Chinese war, and though subsequently Deputy-Commissioner for Upper Burma for some years, his connection with the Indian Government service was finally severed in 1884. Going out to South Africa, he accompanied the pioneer force of the British South Africa Company into the territories now known as Rhodesia, and was appointed first Administrator of Mashonaland, but retired from that service also in 1897. Subsequently he travelled much in North and Central America and the Far East, and wrote several books, among the best known being his 'Key of the Pacific' (an advocacy of the Nicaragua canal scheme), 'China in Transformation,' 'The Mastery of the Pacific,' and 'The Africander Land.' At the end of 1909 he became editor of the journal of the Royal Colonial Institute, which he at once developed from a simple "report of proceedings" into an important magazine for the discussion of imperial problems, under its present title *United Empire*.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Fifth Meeting, January 11, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*Mrs. Mary Allum; J. T. O. Barnard, C.I.E.; Herbert Sydney Costin; Park Goff, M.A.; Rev. William Hay; Lieut. Kenneth John Manners, R.N.R.; Lady Nannie Theresa Wolseley; Mrs. Reginald Frederick Yorke.*

The paper read was:—

"The Adai Group of the Caucasus." By Harold Raeburn.

Afternoon Meeting, January 21, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Mr. T. Sheppard exhibited some historical maps of the Humber region.

Sixth Meeting, January 25, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*Lieut. Lawrence A. W. Brooks, R.F.A.; Leonard Brooks, M.A.; Walter John Buchanan; Oliver Robert Hawke Bury; Harold G. Daniels; Miss L. Elwyn Elliott; H. D. Girdwood, B.A.; Samuel Lyon; Miss Alice L. Meinertzhagen.*

The paper read was:—

"The Historical and Physical Geography of the Theatres of War." By Dr. Vaughan Cornish.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science (s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Belgium. Powell.

Fighting in Flanders. By E Alexander Powell. London : William Heinemann, 1914. Size 8 × 5, pp. xii. and 232. *Map and Illustrations. Price* 3*s.* 6*d. net. Presented.*

Europe—Geography and War. Herdman.

Some geographical factors in the great war. By T. Herdman. London : A. Brown & Sons, [1914]. Size 7½ × 5, pp. 72. *Sketch-maps. Price* 9*d. net. Presented.*

France—Alps—Anthropology. Arbos.

B. Section G. (Comité Travaux historiques, etc.) **28** (1913) : 296–306.

Evolution économique et démographique des Alpes françaises du Sud. Par Ph. Arbos.

France—Alps—Glaciers. Letonnelier.

B. Section G. (Comité Travaux historiques, etc.) **28** (1913) : 288–295.

Documents relatifs aux variations des glaciers dans les Alpes françaises. Par G. Letonnelier.

France—Dauphiné. Blanchard.

Recueil Travaux I.G. Alpine (Grenoble) **2** (1914) : 427–449.

Le lac de l'Oisans. Par Raoul Blanchard.

France—Isère. Blanchard.

Recueil Travaux I.G. Alpine (Grenoble) **2** (1914) : 411–426.

Contribution à l'étude de la formation du départment de l'Isère. Par Marcel Blanchard.

France—Nice—Longitude. *C.R.A. Sc.* **159** (1914) : 577–580. Jekhowsky.

Détermination de la difference de longitude entre Paris et Nice par T. S. F. By B. Jekhowsky.

France—West coast. Pawlowski.

B. Section G. (Comité Travaux historiques, etc.) **28** (1913) : 47–83.

Les transformations du litoral française.—L'île de Noirmoutier à travers les âges, d'après la géologie, la cartographie et l'histoire. Par August Pawlowski. *Map.*

Germany—Strassburg. *Petermanns M.* 60 (1914): 7–8. **Braun.**

Entwicklungsgeschichtlich-physiognomische Planskizze von Strassburg i. E. Von Gustav Braun. *Map.*

Italy—Cloudiness. **Eredia.**

La Nebulosità in Italia. By Filippo Eredia. (Estratto dagli Annali del R. Ufficio Centrale di Meteorologia e Geodinamica, vol. 35, parte i., 1913.) *Maps and Figures.*

Portugal—Iron industry. *B.S.G. Lisboa*, 1914 (1914), 32 Série: 203–290. **[Vieira.]**

A implantação da industria do ferro em Portugal. By Pedro A. Vieira. *Diagrams.*

Russia. **Alexinsky.**

The Modern World Series. Modern Russia. By Gregor Alexinsky. Translated by Bernard Miall. London: T. Fisher Unwin, 1914. Size 8 × 5½, pp. 362. *Price 5s. net. Presented.*

A cheaper edition of the work noticed in vol. 43, p. 427.

South-East Europe—Adriatic coast. **Schubert.**

Handbuch der Regionalen Geologie, herausg. von Prof. G. Steinmann und Prof. Dr. O. Wilckens. V. Band, 1 Abt. Balkanhalbinsel. A. Die Küstenländer Oesterreich-Ungarns. Von Dr. Richard Schubert. Heidelberg, 1914. Size 10½ × 7, pp. 51. *Sketch-map and Illustrations. Price* 2.70 *Mk.*

Spain—Early description. *B.R.S.G.* (*Madrid*) 46–56 (1904–1914): *passim.* **Columbus.**

Descripción y cosmografía de España. Por Fernando Colón. (MS. de la Biblioteca Colombina.)

Sweden—Gothland. **Munthe.**

Sveriges Geol. Undersökning, Ser. Ca, No. 11: pp. iii. and 67.

Drag ur Gottlands Odlingshistoria i relation till öns Geologiska Byggnad. Av Henr. Munthe. *Maps and Illustrations.*

Sweden—Hydrography. **Wallén.**

Das Wassersystem Schwedens. Von Axel Wallén. (Hydrografiska Byrån an die Baltische Ausstellung in Malmö 1914.) Stockholm: Nordstedt & Söner, 1914. Size 9½ × 6½, pp. 15. *Map, Illustrations, and Diagram.*

Sweden—Iron ores. **Tegengren.**

Sveriges Geol. Undersökning, Ser. Ca, No. 8, pp. 16 and (103).

Järnmalmstillgångarna i Mellersta och Södra Sverige utredning verkställd Åren 1907–1909 af Sveriges Goologiska Undersökning genom F. R. Tegengren. *Map and Charts.*

Sweden—Marine biology. ——

Ur Svenska Hydrografisk-Biologiska Kommissionens Skifter IV. Göteborg, 1912. Size 17½ × 12½, pp. (73). *Portrait, Maps, and Diagrams.*

A collection of papers by different authors, mostly concerned with fish and fisheries.

United Kingdom—Avon. *G. Teacher* 7 (1914): 369–382. **Simpson.**

The upper basin of the Warwick Avon. By Charlotte A. Simpson. *Sketch-map and Diagram.*

United Kingdom—Derbyshire coalfield. **Gibson and others.**

The Geology of the Northern Part of the Derbyshire Coalfield and Bordering Tracts. By W. Gibson and C. B. Wedd, with contributions by G. W. Lamplugh, J. B. Hill, and R. L. Sherlock, and an Appendix by L. Moysey. (Mem. Geol. Survey. England and Wales. Explanation of Sheet 112 and the Southern Part of Sheet 100.) London, 1913. Size 9½ × 6, pp. 186. *Sketch-map, Illustrations, and Diagrams. Price* 3*s.*

United Kingdom—England—Agriculture. *G. Teacher* 7 (1914): 382–394. **Ward.**

The agricultural geography of England on a regional basis. II. Yorkshire. By E. Marjorie Ward. *Sketch-maps.*

United Kingdom—Ireland—Clare island. **Lyons and Hallissy.**

P.R. Irish A. 31 (1914): *Clare Island Survey* 6, pp. 227; 7, pp. 22.

Climatology. By W. J. Lyons. Geology. By T. Hallissy. *Maps and Illustrations* (in Part 7).

See note in the December number, 1914.

United Kingdom—Pennines. *Quart. J.R. Met. S.* **40** (1914): 311–326. **Wallis.**
The rainfall of the Southern Pennines. By B. C. Wallis. *Sketch-maps and Diagram.*

United Kingdom—Relief and history. *J.G.* **13** (1914): 39–45. **Stevens.**
Influence of the mountains of the British Isles upon their history. By Benj. A. Stevens.

United Kingdom—Scotland—Lochs. **Gregory.**
P.R. Philos. S. Glasgow **45** (1914): 183-196.
The Scottish Lochs and their Origin. By Prof. J. W. Gregory. *Sketch-map and Diagrams.*
Cf. note in vol. **44**, p. 228.

ASIA.

Ceylon—Pearl fisheries. **Solomon.**
A memorandum on the Pearl fisheries of Ceylon. By John I. Solomon. N.P., [1914]. Size 13 × 8½, pp. 10. *Presented by Author.*
Written in 1909, but first printed last year.

French Indo-China—Irrigation. **Rouen.**
B. Economique de l'Indochine, N.S. **17** (1914): 517–540.
L'irrigation des plaines de Kep, Voi, Bao-Loc, Les Pins et Phu-Lang-Thuong (Tonkin). Par — Rouen. *Map.*

Himalayas. *Riv. G. Italiana* **21** (1914): 189–203, 355–372. **Dainelli.**
Intorno alla Morfologia Himalayana. By Giotto Dainelli.
The writer took part in Dr. de Filippi's recent scientific expedition.

India. **Mookerji.**
The fundamental unity of India. (From Hindu sources.) By Radhakumud Mookerji. With an introduction by Ramsay Macdonald. London: Longmans, Green & Co., 1914. Size 7½ × 5, pp. xx. and 140. *Map. Price 3s. 6d. net. Presented.*

India—Historical. **Bernier and others.**
Travels in the Mogul Empire. A.D. 1656–1668. By Dr. François Bernier. Translated, on the basis of Irvine Brock's version, and annotated by Archibald Constable (1891). Second edition, revised by Vincent A. Smith. Oxford: Humphrey Milford, 1914. Size 7½ × 5, pp. xliv. and 498. *Maps and Illustrations. Price 6s. net. Presented.*

India—Historical. **Shakespear.**
History of Upper Assam, Upper Burmah and North-Eastern Frontier. By L. W. Shakespear. London: Macmillan & Co., 1914. Size 9 × 5½, pp. xviii. and 272. *Maps and Illustrations. Price 10s. net. Presented.*

India—Survey. **Survey of India.**
General Report on the Operations of the Survey of India during the survey year 1912–13. Prepared under the direction of Colonel S. G. Burrard. Calcutta, 1914. Size 14 × 8½, pp. 43. *Maps. Price 3s.*

India—Survey. **Survey of India.**
Records of the Survey of India. Vol. 4. Explorations on the North-East Frontier during 1911–12–13. Vol. 5. Reports of the Survey Parties for 1912–13. Prepared under the direction of Colonel S. G. Burrard. Calcutta, 1914. Size 13 × 8½, pp. 92, 171. *Maps and Illustrations.*

Japan—Lesser Islands. **Salwey.**
The island dependencies of Japan. An account of the islands that have passed under Japanese control since the restoration, 1867–1912. By Charlotte M. Salwey. London: E. L. Morice, 1913. Size 9½ × 6, pp. 148. *Maps and Illustrations. Price 5s. net. Presented.*

Korea. *B. American G.S.* **46** (1914): 756–769, 817–830. **Keir.**
Modern Korea. By R. Malcolm Keir. *Sketch-map and Diagram.*

Malay Archipelago—Celebes. **Van Heerdt.**
Ts. K. Nederl. Aardr. Gen., II. Ser. **31** (1914): 618–644.
De berglandschappen behoorende tot de onderafdeeling Paloe van Midden-Celebes. Door R. Boonstra van Heerdt.

Malay Archipelago—Ceram. *Petermanns M.* **60** (1914): 16–18. **Deninger.**
Morphologische Uebersicht der Insel Seran. Von Karl Deninger. *Map.*

Malay Archipelago—Mentawei. **Hansen.**
Bijdragen Taal-, Land- en Volkenkunde Nederl.-Indië 70 (1914): 113–220.
De groep Noord- en Zuid-Pageh van de Mentawei-eilanden. Ethnographische beschrijving. Door J. F. K. Hansen. *Map and Illustrations.*

Malay Archipelago—Roti. **Brouwer.**
Ts. K. Nederl. Aardr. Gen., II. Ser. 31 (1914): 611–617.
Voorloopig overzicht der geologie van het eiland Roti. Door H. A. Brouwer. *Sketch-map.*

Philippines—Bulacan. *Philippine J. Sc.* 9 (1914): 201–259. **Dalburg and Pratt.**
The Iron Ores of Bulacan Province, P.I. By F. A. Dalburg and Wallace E. Pratt. *Map and Illustrations.*

Russian Central Asia—Oxus. **Herrmann.**
Alte Geographie des unteren Oxusgebiets. Von Albert Herrmann. (*Abhandl. K. Ges. Wissens. Göttingen, Phil.-Hist. Klasse.* N.F., Band XV. Nr. 4.) Berlin, 1914. Size 11 × 9, pp. 57.

Siam—Survey. **Survey Department.**
Siam. Report on the operations of the Royal Survey Department for the year 1912–1913. Bangkok, 1914. Size 13 × 8½, pp. 48. *Maps. Presented.*

Tian Shan. **Krenkel.**
Abh. K. Bayerischen A.W., Math.-phys. Klasse 26 (1913): No. 8, pp. 44.
Wissenschaftliche Ergebnisse der Reise von Prof. Dr. G. Merzbacher im zentralen und östlichen Tian-Schan 1907/8. Faunen aus dem Unterkarbon des südlichen und östlichen Tian-Schan von Erich Krenkel. *Illustrations.*

Tian Shan. **Leuchs.**
Abh. K. Bayerischen A.W. Math.-phys. Klasse 25 (1912): 8 Abh., pp. 95.
Geologische Untersuchungen im Chalyktau, Temurlyktau, Dsungarischen Alatau (Tian-Schan). Von Kurt Leuchs. *Map and Illustrations.*

Turkey. **Lukach.**
The city of dancing Dervishes and other sketches and studies from the Near East. By Harry Charles Lukach. London: Macmillan & Co., 1914. Size 8 × 5½, pp. 258. *Illustrations. Price* 7*s.* 6*d. net. Presented.*

Turkey—European spheres. *B.G.S. Philadelphia* 12 (1914): 165–177. **Dominian.**
Geographical influences in the determination of spheres of foreign interests in Asiatic Turkey. By Leon Dominian. *Illustrations.*

Turkey—Hittites. *P.S. Biblical Archæol.* 36 (1914): 233–239. **Sayce.**
Geographical notes on the Hittite hieroglyphic inscriptions. By Prof. A. H. Sayce.

Turkey—Palestine—Cana. **Masterman.**
Palestine Explor. Fund Quart. Statement (1914): 179–183.
Cana of Galilee. By Dr. E. W. G. Masterman.
Advocates identification with Khurbet Kana, not with Kefr Kenna.

Turkey—Palestine—Safed. **Masterman.**
Palestine Explor. Fund Quart. Statement (1914): 169–179.
Safed. By Dr. E. W. G. Masterman.
One of the most highly situated towns in Palestine, 2750 feet above sea-level.

Western Asia—Historical. **Hogarth.**
The Ancient East. By D. G. Hogarth. London: Williams & Norgate, [1914]. Size 6½ × 4, pp. 256. *Sketch-maps. Price* 1*s. net. Presented.*

AFRICA.

French Chad territory. *B.S.G., etc., Marseille* 37 (1914): 301–323. **Baudon.**
Les Voies d'accès vers le Tchad: reconnaissance d'une nouvelle route. Par A. Baudon. *Sketch-map.*

French Chad territory. **Mercier.**
Renseignements Coloniaux (*L'Afrique Française*) 7 (1914): 261–282.
La Mission de Ravitaillement du Tchad par Kano. Par Commandant C. Mercier.

Morocco—Sus. *B.R.S.G.* (*Madrid*) 11 (1914): 252–265. **De la Escalera.**
Expedición en el Sus. Itinerario y descripción de los países recorridos por D. Fernando M. de la Escalera en la campaña entomológica de 1912.

Niger—Hydrology. **de Gironcourt.**

B. Section G. (Comité Travaux historiques, etc.) **28** (1913): 1–10.

Hydrologie du Niger à Jebba, Nigeria du Nord (issue des territoires français). Par G. de Gironcourt. *Plan and Diagram.*

The above title now replaces that of *Bull. de Geog. hist. et descriptive*, by which the periodical was previously known.

Nigeria. **Raphael.**

Through Unknown Nigeria. By John B. Raphael. London: T. Werner Laurie. 1914. Size 9 × 6, pp. xx. and 362. *Illustrations. Price* 15*s. net. Presented.*

Portuguese East Africa—Co-ordinates. **Teixeira.**

South African J. Sc. **10** (1914): 391–400.

Determination of the Latitude and Longitude of the Pillar of the Transit Instrument at the Campos Rodrigues Observatory. By Augusto de Almeida Teixeira. [In Portuguese and English.]

The observatory is in Portuguese territory near the Swaziland frontier, and has been geodetically connected with the Transvaal triangulation, as well as fixed astronomically.

Portuguese East Africa—Mozambique. *Geol. Mag.* VI. **1** (1914): 529–536. **Holmes.**

The Lateritic Deposits of Mozambique. By Arthur Holmes. *Illustrations.*

NORTH AMERICA.

Alaska. **Eakin.**

The Iditarod-Ruby Region, Alaska. By Henry M. Eakin. (U.S. Geol. Survey. Bulletin 578.) Washington, 1914. Size 9 × 5½, pp. 45. *Maps and Illustrations.*

Alaska—Katmai. *Science* **40** (1914): 509–512. **Rigg.**

The Effects of the Katmai Eruption on Marine Vegetation. By George B. Rigg.

Alaska—Yukon. **Porter and Davenport.**

The Discharge of Yukon River at Eagle, Alaska. By E. A. Porter and R. W. Davenport. (Department of the Interior. United States Geological Survey. Water-Supply Paper 345–F.) Washington, 1914. Size 9½ × 6, pp. 77. *Sketch-map, Diagrams, and Illustrations.*

See note in the Monthly Record, February.

Canada—British Columbia—Botany. **Botanical Office.**

First annual report of the Botanical Office of the Province of British Columbia, 1913. By J. Davidson, Victoria, B.C., 1914. Size 10½ × 7½, pp. 30. *Sketch-map and Illustrations.*

Canada—British Columbia—Coast Survey. **Parry.**

Hydrographic Ann. No. 2, 1913 (1914): 6–11.

An historical sketch of the exploration and survey of the waters of British Columbia. By Captain J. F. Parry. *Maps and Illustrations.*

A brief *résumé* of the survey-work on this difficult coast-line in the late eighteenth century, due attention being, of course, paid to Vancouver's remarkable work. A continuation is promised later.

Canada—North-West. **Douglas.**

Lands Forlorn. A story of an expedition to Hearne's Coppermine river. By George M. Douglas, with an introduction by Dr. James Douglas. London: G. P. Putnam's Sons, 1914. Size 9½ × 6½, pp. xvi. and 286. *Maps and Illustrations. Price* 12*s. net. Presented.*

United States—Cape Cod canal. *B. American G.S.* **46** (1914): 832–834. ——

The Opening of the Cape Cod Canal. *Sketch-map.*

See note in the January number, p. 79.

United States—Montana. *B.G.S. Philadelphia* **12** (1914): 129–165. **Freeman**

Montana, a study of the geographic factors influencing the state. By O. W. Freeman. *Sketch-maps and Illustrations.*

United States—New York—Geology. *J. Geology* **22** (1914): 582–593. **Crosby.**

Physiographic relations of Serpentine, with special reference to the Serpentine stock of Staten island, New York. By W. O. Crosby. *Section.*

United States—Ohio. *Science* **40** (1914): 607–609. **Coffey.**
Changes of drainage in Ohio. By George N. Coffey.

CENTRAL AND SOUTH AMERICA.

Argentine—Córdoba—Altitudes. **Doering.**
B.A. Nacional Ciencias Cordoba **19** (1913): 441–466.
Resultados hipsométricos de mis excursiones en el año 1902. Por Oscar Doering. *Diagrams.*

Argentine—Handbook. **Mills.**
South American Handbook. Argentina. By George J. Mills, with introduction by W. H. Koebel. London: Sir Isaac Pitman & Sons, [1915]. Size 8½ × 5½, pp. xxxii. and 210. *Maps and Illustrations. Price 6s. net. Presented.*

Argentine—Patagonia. **Willis.**
Ministry of Public Works. Bureau of Railways. Argentine Republic. Northern Patagonia. Character and resources. Vol. 1. Text and maps by the Comisión de Estudios Hidrológicos, Bailey Willis, Director. (New York: Scribner Press, 1914.) Size 10 × 7, pp. xx. and 464. *Maps and Illustrations, also separate case of Maps. Price* $8.00 *net. Presented by the Author.*

Bolivia and Chile—Boundary. *B.S.G. Potosí* **2** (1914): 63–81. ———
Limites con Chile.

Brazil—Amazon. **Müller.**
Abh. K. Bayerischen A.W., Math.-Phys. Klasse **26** (1912): No. 1, pp. 42.
Zoologische Ergebnisse einer Reise in das Mündungsgebiet des Amazonas . . . I. Allgemeine Bemerkungen über Fauna und Flora des Bereisten Gebietes von Lorenz Müller. *Illustrations.*

Chile. **Mills.**
South American Handbooks. Chile. By George J. Mills, with introduction by W. H. Koebel. London: Sir Isaac Pitman & Sons, 1914. Size 8½ × 5½, pp. xxii. and 194. *Maps and Illustrations. Price 6s. net. Presented.*

Chile—Juan Fernandez. *B. Pan-American Union* **39** (1914): 201–216. **Albes.**
The island of Juan Fernandez. By Edward Albes. *Illustrations.*

Cuba—Rainfall. *Quart. J.R. Met. S.* **40** (1914): 295–309. **Brown.**
A Cuban rain record and its application. By A. Hampton Brown. *Sketch-map and Diagram.*

Iguasú Falls. *B. Pan-American Union* **39** (1914): 364–377. **Adams.**
Iguazú, Niagara's Mate. By Harriet Chalmers Adams. *Sketch-maps and Illustrations.*

Panama Canal. *B. Pan-American Union* **39** (1914): 345–363. **Barrett.**
The Opening of the Panama canal. By John Barrett. *Illustrations.*

Peru. *B.S.G. Lima* **29** (1914): 47–64. **Muro.**
Viaje de Lima á Iquitos en 10 días. Por A. Mesones Muro. *Map.*

Peru—Archæology. **Bingham.**
The ruins of Espiritu Pampa, Peru. By Hiram Bingham. (From the American *Anthropologist* (N.S.), vol. 16, No. 2, 1914.) Lancaster, Pa., 1914. Size 10 × 6½, pp. 185–200. *Sketch-map and Illustrations.*

Peru—Cuzco. *B.S.G. Lima* **29** (1914): 142–167. **Giesecke.**
Censo del Cuzco. Por A. A. Giesecke.
On the census of the province held in September, 1912.

Peru—Survey. *B.S.G. Lima* **29** (1914): 15–39. ———
Debate sobre el levantamiento del Mapa del Perú.

Peru and Ecuador. *B.S.G. Lima* **29** (1914): 70–82. **Herrera.**
Río Morona. (Monografía Histórico Geográfico.) Por Jenaro E. Herrera.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia—Text-book. **Taylor.**
The Oxford Geographies. Edited by A. J. Herbertson. A geography of Australasia. By Griffith Taylor. Oxford: Clarendon Press, 1914. Size 7½ × 5, pp. 176. *Sketch-maps. Price 1s. 6d. Presented.*

Australia—Artesian basin. **Pittman.**

The Great Australian Artesian basin and the Source of its Water. By E. F. Pittman. (Prepared for the Sydney Meeting of the British Association for the Advancement of Science, August, 1914.) (Geol. Surv. of N.S.W.) Sydney, 1914. Size 9½ × 7½, pp. 57. *Maps.*

Mainly a reply to Prof. Gregory's criticisms of a former publication.

Australia—Nomenclature. **Fleurieu.**

La Nomenclature française en Australie et en Tasmanie. Par A. de Fleurieu. (Extr. Congrès national Sociétés françaises Géogr., XXX^e^ Sess., Paris, 1913.)

The writer has for some years urged the replacement on the map of various French names (including that of his ancestor Fleurieu) given by early French navigators.

New Zealand—Geology. *T. and P. New Zealand I.* **46** (1914): 255–262. **Bartrum.**

The Geological History of the Westport-Charleston High-Level Terraces. By J. A. Bartrum. *Sketch-map and Diagrams.*

New Zealand—Geomorphology. **Cotton.**

T. and P. New Zealand I., **46** (1914): 286–294.

Preliminary Note on the uplifted East Coast of Marlborough. By C. A. Cotton. *Sketch-maps and Illustrations.*

New Zealand—Historical. **McNab.**

From Tasman to Marsden. A history of Northern New Zealand from 1642 to 1818. By Dr. Robert McNab. Dunedin: J. Wilkie & Co., 1914. Size 9 × 5½, pp. xiv. and 286. *Price 6s. net. Presented.*

New Zealand—Survey. **Department of Lands.**

Report of the Department of Lands and Survey, New Zealand, for the year 1913–14. By James Mackenzie. Wellington, 1914. Size 13 × 8½, pp. xiv. and 74. *Maps. Presented.*

Pacific—Historical. **Colwell.**

A century in the Pacific. Edited by James Colwell. Introduction by Dr. W. H. Fitchett. One volume—five parts. London: Charles H. Kelly, 1914. Size 9½ × 6, pp. xii. and 782. *Price 21s. net. Presented.*

Pacific—Voyage of the "Pandora." **Edwards and Hamilton.**

Voyages of H.M.S. *Pandora*, despatched to arrest the mutineers of the *Bounty* in the South Seas, 1790–91. Being the narratives of Captain Edward Edwards and George Hamilton, with introduction and notes by Basil Thomson. London: Francis Edwards, 1915. Size 9 × 6, pp. 178. *Maps. Price 6s. net. Presented.*

POLAR REGIONS.

Antarctic—British Expedition. *J. United Service I.* **43** (1914): 469–490. **Simpson.**

Lecture by Dr. G. C. Simpson on the British Antarctic Expedition. July 10, 1914. *Map and Illustrations.*

Antarctic—Wilkes and Palmer. *B. American G.S.* **46** (1914): 830–831. ———

Tablets in Memory of Wilkes and Palmer. *Illustrations.*

See note in the January number, p. 81.

South Orkneys—Glaciation. *T.R.S. Edinburgh* **49** (1913–14): 831–864. **Pirie.**

Glaciology of the South Orkneys: Scottish Antarctic Expedition. By Dr. J. H. Harvey Pirie. *Sketch-maps, Diagrams, and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Hydrography. **Hydrographic Department.**

Hydrographic Annual for the year 1912, No. I. The same for 1913, No. 2. Published by the Hydrographic Department, Admiralty. London, 1913–14. Size 13 × 8, pp. (No. 1) 20; (No. 2) 36. *Maps, Diagrams, and Illustrations.*

A valuable new publication intended to further the interchange of ideas and experiences among the personnel of the Hydrographic Service.

Marine survey. *Hydrographic Ann.* No. 1, 1912 (1913): 2–4. **Purey-Cust.**

A method of sweeping for the discovery of rocks, making use of the ship. *Sketch-map, Diagrams, and Illustrations.*

One of several papers on associated subjects.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Denudation—Water transport. **Gilbert.**

The Transportation of Débris by running Water. By Grove Karl Gilbert. (U.S. Geol. Survey, Profess. Paper 86.) Washington, 1914. Size 11½ × 9, pp. 263. *Illustrations and Diagrams.*

Will be referred to in the Monthly Record.

Earth's crust. *Petermanns M.* **60** (1914): 8–15. **Toula.**

Schrumpfungsversuche. Von Franz Toula. *Illustrations.*

Practical experiments to elucidate the wrinkling, etc., of a shrinking sphere.

Geomorphology—Coasts. **Belloc.**

B. Section G. (Comité Travaux historiques, etc.) **28** (1913): 84–159.

Les Rías de la côte occidentale d'Ibérie et les formations analogues, fjords, firths, friths, lochs, loughs, aberiou, etc. Origine.—Description.—Toponymie. Par Emile Belloc. *Maps and Sketch-maps.*

Geophysics. *Science* **40** (1914): 333–340. **Barrell.**

The Status of Hypothesis of Polar Wanderings. By Joseph Barrell.

An examination of the "Pendulation" and allied Theories which have met with considerable support in Germany, but which the writer considers untenable.

Glaciology. **Günther.**

Sitzb. math.-phys. Klasse K. Bayerischen A. W. München, 1913 (1913): 469–484.

Die Glasialhypothese und der Mond. Von Siegmund Günther.

Hydrography and Meteorology. ———

Manual for the taking of hydrographical and meteorological observations at the coast stations and in the lighthouses of the marine administration. (Chief Hydrographic Dept., Hydro-Meteorol. Section.) [In Russian.] St. Petersburg, 1913. Size 11 × 7½, pp. 187.

Hydrology—Underground water. **Versluys.**

Contribution à la Théorie de l'Ecoulement de l'Eau Souterraine. Par J. Versluys. Amsterdam, 1914. Size 10 × 6½, pp. 15.

Concerned with mathematical formulæ.

Ice. *T.R.S. Canada* **8** (1914): Ser. III., 19–22, 29–50. **Barnes and others.**

The crushing strength of ice. By H. T. Barnes.

The expansive force of ice. By H. T. Barnes, J. W. Hayward and Norman M. McLeod. *Diagrams.*

Meteorology. **Hellmann.**

Beiträge zur Geschichte der Meteorologie. Von G. Hellmann. Nr. 1–5. Veröffentl. K. Preuss. Meteorolog. Inst., Nr. 273.) Berlin: Behrend & Co., 1914. Size 11½ × 8½, pp. 148. *Illustrations. Price M.5.*

Meteorology—Circulation. *Monthly Weather Rev.* **42** (1914): 330–339. **Ekholm.**

On the Influence of the Deviating Force of the Earth's Rotation on the Movement of the Air. By Dr. Nils Ekholm. *Diagram.*

Revision of a memoir originally published in 1897.

Meteorology—Observing. **[Hellmann.]**

Anleitung zur Anstellung und Berechnung meteorologischer Beobachtungen. Zweiter Teil. Besondere Beobachtungen und Instrumente. Dritte erweiterte Auflage. (Veröffentl. K. Preuss. Meteorolog. Inst., Nr. 268.) Berlin: Behrend & Co., 1913. Size 11 × 8, pp. 64. *Illustrations. Price M. 3.*

Oceanography. **Carpenter and Wilson-Barker.**

Nature notes for ocean voyagers. Being personal observations upon life in "the Vasty Deep," and fishes, birds, and beasts seen from a ship's deck; with popular chapters on weather, waves, and legendary lore. By Captain Alfred Carpenter and Captain D. Wilson-Barker. London: C. Griffin & Co., 1915. Size 9 × 6½, pp. x. and 182. *Sketch-maps and Illustrations. Price 5s. net. Presented.*

Oceanography—Corals. *T.R.S. Edinburgh* **49** (1912–13) 687–690. **Gardiner.**

The Corals of the Scottish National Antarctic Expedition. By Prof. J. Stanley Gardiner.

Oceanography—Deposits. *Sc. P.R. Dublin S.* **14** (1914): 256–267. **Joly.**

On the investigation of the deep-sea deposits. By Dr. J. Joly. *Illustrations.*

Oceanography—Deposits. *T.R.S. Edinburgh* 49 (1912–13): 645–686. **Pirie.**
Scottish National Antarctic Expedition, 1902–04: Deep-sea deposits. By Dr. J. H. Harvey Pirie. *Map.*

Physical Geography—Landscapes. **Friederichsen**
Moderne Methoden der Erforschung, Beschreibung und Erklärung geographischer Landschaften. Von Dr. Max Friederichsen. (G. Bausteine, Schriften des Verbandes deutscher Schulgeographen, Heft. 6.) Gotha, 1914. Size 8½ × 5½, pp. 26. *Illustrations.*

River discharge. **Hall and others.**
U.S. Geol. Surv. Water-supply paper 345, E. (1914): 53–66.
A method of determining the daily discharge of rivers of variable slope. By M. R. Hall, Warren E. Hall and C. H. Pierce. *Diagrams.*

River-erosion. **Philippson.**
Die erosion des fliessenden Wassers und ihr Einfluss auf die Landschaftstypen. Von Dr. Alfred Philippson. (G. Bausteine, Schriften des Verbandes deutscher Schulgeographen, Heft 7.) Gotha, 1914. Size 8½ × 5½, pp. 36. *Illustrations.*

Seismology. **Klotz.**
Earthquakes, phases of the Moon, Sub-Lunar and Sub-Solar points. By Dr. Otto Klotz. (From *The J. R. Astronomical Soc. Canada*, July—August, 1914.) Ottawa, 1914. Size 9½ × 6, pp. 273–281. *Diagrams.*

Seismology—Historical. *Riv. G. Italiana* 21 (1914): 463–470. **Almagià.**
Intorno ai primi saggi dei carte sismiche. By Roberto Almagià. *Facsimiles.*

Vulcanology. *Abh. K. Preuss. A.W.*, 1914: Nr. 2, pp. 67. **Branca.**
Bericht über die mir zugegangenen Urteile der Fachgenossen, betreffend die in "Ziele Vulkanologischer Forschung" von mir gemachten Vorschläge. Von Wilhelm Branca.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Nordenskjöld.**
Otto Nordenskjöld. Kolonisationen och Naturfolken. Stockholm: Albert Bonniers, 1914. Size 7½ × 5, pp. viii. and 176. *Presented.*

Anthropogeography—Mountain influence. **Rittwagen.**
B.R.S.G. (Madrid) 11 (1914): 266–283.
Consideraciones sobre psicología orográfica y en especial sobre la de Marruecos.—Possibilidad de la Geografía esotérica. Por Guillermo Rittwagen.

Anthropology. *P.R. Philos. S. Glasgow* 45 (1914): 17–27. **Elliot.**
Prehistoric Man. By Prof. G. F. Scott Elliot.

Commercial—Oil. **Talbot.**
The oil conquest of the World. By Frederick A. Talbot. London: Wm. Heinemann, [1914]. Size 9 × 5½, pp. x. and 310. *Illustrations. Price 6s. net. Presented.*

Historical—Cabral. **McClymont.**
Pedralvarez Cabral (Pedro Alluarez de Gouvea). His progenitors, his life, and his voyage to America and India. By James Roxburgh McClymont. London: Bernard Quaritch, 1914. Size 9 × 7½, pp. 72. *Price 7s. 6d. net. Presented.*

History of Cartography. *Scot. G. Mag.* 30 (1914): 617–624. **Schütte.**
Ptolemy's Atlas. By G. Schütte. *Illustrations.*
A continuation of the writer's previous studies of this subject in the *Scottish Geographical Magazine.*

History of Navigation. **Chatterton.**
The Old East Indiamen. By E. Keble Chatterton. London: T. Werner Laurie, 1915. Size 9 × 5½, pp. vi and 244. *Illustrations. Price 12s. 6d. net. Presented.*

GENERAL.

Bibliography—Map-catalogue. ——
Inventaris der Verzameling Kaarten berustende in het Algemeen Rijksarchief. Uitgegeven op last van den Minister van Binnenlandsche Zaken. Eerste Supplement. The Hague: Martinus Nijhoff, 1914. Size 9 × 6, pp. xvi. and 149.
Includes the accessions between 1867 and 1886, with some others. The arrangement is topographical.

Educational—Meteorology. **Odell.**

Weather chart exercises. (British Isles and West of Europe.) By L. M. Odell. London, [1914]. Size 10 × 7½, pp. 32. *Charts and Diagrams.*

Travel.

Naval Recollections, 1852–1914. By A retired Flag officer. London, 1914. Size 7½ × 5, pp. 240. *Presented.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles—England. **Bartholomew.**

The Survey Series of Touring Maps from the Ordnance Survey. By J. G. Bartholomew. Salisbury Plain District. Scale 1 : 126,720 or 1 inch to 2 stat. miles. Size 26 by 31 inches. Edinburgh: John Bartholomew & Co., [1914]. *Price, mounted on cloth, 2s. net. Presented by the Publishers.*

British Isles—London. **Roque.**

Rocque's Map of London, 1746. Sheets A 3 (*a*), A 3 (*b*), B 1 (*a*), B 1 (*b*). Each 14 by 20 inches. London: London Topographical Society, 1914.

This is an addition to the interesting facsimiles of old maps of London in course of reproduction by the London Topographical Society. Sheets A 3 (*a*) and A 3 (*b*) include the neighbourhood of Chelsea and Pimlico, and B 1 (*a*) and B 1 (*b*) that to the north of Oxford Street between Cavendish Square and Tottenham Court Road. They are excellent reproductions, and will doubtless prove interesting and instructive for comparison to many who have not easy access to a copy of the original.

Europe. **Johnston.**

The European War, 1914. The Eastern Campaign. Scale 1 : 2,280,000 or 1 inch to 35·9 stat. miles. Size 37 by 27 inches. Edinburgh & London: W. & A. K. Johnston, Ltd., 1914. *Price 1s. 6d. net. Presented by the Publishers.*

A general map of the Eastern theatre of war, with relief shown by tints of green and brown, at the following intervals in feet: 0–600, 600–1500, 1500–3000, 3000–6000. International boundaries are shown by bold red lines.

Europe. **Philip.**

Philips' Photo-Relief Model War Map of Central Europe. Scale 1 : 2,090,880 or 1 inch to 33 stat. miles. Size 19 by 33 inches. London: George Philip & Son, Ltd., 1914. *Price 1s. net. Presented by the Publishers.*

Extends from Warsaw to Southampton and from Copenhagen to Budapest. It is a photograph of a model, and is too dark to be very satisfactory. International boundaries are shown by red lines, and water is coloured blue.

Netherlands. **Beekman and Welcker.**

Geschiedkundige Atlas van Nederland. Uitgegeven door de Commissie voor den Geschiedkundigen Atlas van Nederland en geteekend door het lid der Commissie Dr. A. A. Beekman. De Rijnverdeeling in de 17e en 18e Eeuw. Door J. W. Welcker. The Hague: Martinus Nijhoff, 1914.

The present part of this historical atlas of the Netherlands contains five sheets of maps showing the Rhine during the seventeenth and eighteenth centuries. By symbols in colours the banks, canals, dykes, wharves, etc., at different times are clearly indicated.

Switzerland. **Bureau Fédéral de Statistique, Berne.**

Atlas Graphique et Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur, 1914. Size 11 by 16 inches. Berne: Kümmerly & Frey. *Presented by the Bureau Fédéral de Statistique, Berne.*

This is an important and interesting atlas consisting of fifty-one plates, conveying, by means of graphic diagrams and maps, much useful statistical information. It has been prepared by the Bureau Fédéral de Statistique from the latest official data in connection with the Swiss National Exhibition of last year, and gives at a glance, far more clearly than could be done by lengthy tables of figures only, a vast amount of information that could only be otherwise obtained by many hours of lengthy research. The atlas is divided into ten sections, as follows: I. Surface conditions; II. Population; III. Movement of the population; IV. Military; V. Instruction; VI. Agriculture; VII.

Industry and commerce; VIII. Means of communication and transports; IX. Finances; and X. Political statistics.

It was originally intended to supplement the charts and diagrams by tables giving the data from which these have been prepared, but for want of space this was not found possible. However, the manuscripts of these are deposited in the Bureau Fédéral de Statistique, and can be consulted there by any one specially interested.

Europe. **Smulders.**

Oostelijk Operatietooneel. Scale 1 : 2,250,000 or 1 inch to 35·5 stat. miles. Size 34 by 26 inches. The Hague : J. Smulders & Co., [1914].

A somewhat roughly executed map of the Eastern theatre of war from the Baltic sea to the Black sea.

ASIA.

Russia—Caucasus. **Oswald.**

A geological map of the Caucasus. Compiled from the latest sources by Felix Oswald, D.SC., B.A., F.G.S., F.R.G.S. Scale 1 : 1,000,000 or 1 inch to 15·78 stat. miles. 2 sheets, each 15 by 25 inches. London : Dulau & Co., 1914. *Presented by Dr. Felix Oswald.*

About seven years ago Dr. Oswald issued a geological map of Armenia which at considerable labour and cost to himself he had compiled from his own personal observation and knowledge, combined with all other available information. He has now followed this by a geological map of the Caucasus, which includes the whole of the range from the Black sea to the Caspian sea, and which is far more complete in detail than anything of the kind before attempted. What with Russian official surveys and the expeditions of private individuals, much has been done in recent years to add to our knowledge of this region in many branches of science, and the material for compiling a geological map, though still lacking in many respects, has proved sufficient to enable Dr. Oswald to present a good general idea of the geological structure of the whole range, and in some parts to give a fair amount of detailed information. The outline of the map is a photo-lithograph in black and white of the original drawing, and upon this geological colouring has been added.

Explanatory notes, by the author, describing the geology of the region, accompany the map as a separate pamphlet.

AFRICA.

Africa. **Survey Office, Khartoum.**

Africa. Scale 1 : 1,000,000 or 1 inch to 15·78 stat. miles. Sheet North B–36 (and part of North A–36), Mongalla. Compiled at the Survey Office, Khartoum, 1914. Size 23 by 27 inches. London agents : E. Stanford, Ltd.; Sifton, Praed, & Co.; T. Fisher Unwin. *Price 2s. net. Presented by the Director of Surveys, Khartoum.*

Egyptian Sudan. **Survey Office, Khartoum.**

Africa. Scale 1 : 250,000 or 1 inch to 3·95 stat. miles. Anglo-Egyptian Sudan. Sheets : 55–L, Doka; 78–C, Akobo; 86–C, Madial. Each 18 by 27 inches. Compiled at the Survey Office, Khartoum, 1914. *Price 10 P.T. each sheet. Presented by the Director of Surveys, Khartoum.*

Eritrea. **Checchi, Giardi, and Mori.**

Ministero delle Colonie, Direzione Generale degli Affari Politici. Ufficio Cartografico. M. Checchi, G. Giardi, e Attilio Mori. Colonia Eritrea. Circoscrizioni Amministrative. Florence : G. Giardi, 1914. *Presented by the Ministro delle Colonie, Rome.*

An atlas containing the following maps : Eritrea, 1912, 1 : 500,000; Commissariato dell' Hamasen, 1 : 500,000; Commissariato dell' Acchelè-Guzai, 1 : 600,000; Commissariato del Seraè, 1 : 600,000; Commissariato di Massaua, 1 : 800,000. The general map of Eritrea shows relief by colour tinting at intervals of 500 metres from sea-level to 2000 metres, and at 1000 metre intervals from 2000 to over 4000 metres. The remaining maps give heights in figures, and relief by hachures.

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 250,000 or 1 inch to 3·95 stat. miles. Sheet 8 N.W., Cartier, Ontario. Size 27 by 19 inches. Ottawa : Department of the Interior, 1914. *Presented by the Department of the Interior, Ottawa.*

The area included in this sheet extends in latitude from 46° 30′ to 48° N., and in longitude from 81° 30′ to 83° W. In addition to the topographical features, it indicates district boundaries, township boundaries, railways, numbers of lots and concessions, roads, Indian reserves, portages, and other information.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 113, Spillimacheen, B.C., 4th edit., July 1, 1914; 213, Athabaska, Alberta, 2nd edit., September 1, 1914; 414, Saulteux, Alberta, 2nd edit., July 1, 1914; 415, Tawatinaw, Alberta, 3rd edit., June 1, 1914. Size 17 by 30 inches. Ottawa: Department of the Interior, 1914. *Presented by the Department of the Interior, Ottawa.*

Canada—Alberta. **Dept. of the Interior, Ottawa.**

Northern Alberta. Scale 1 : 792,000 or 1 inch to 12·5 stat. miles. Map showing disposition of lands. Prepared under the direction of F. C. C. Lynch, Superintendent of Railway Lands. Corrected to September, 1914. Size 42 by 34 inches. Ottawa: Department of the Interior, Railway Lands Branch, 1914. *Presented by the Department of the Interior, Railway Lands Branch, Ottawa.*

The special information given on this map includes lands finally disposed of (including school lands); lands entered for, sold, or reserved previous to 1913 (unpatented); lands entered for, sold, or reserved during 1913 (unpatented); Indian reserves; Indian reserves surrendered and sold; timber berths; forest reserves; boundaries of Dominion Lands' Agencies; Dominion of Lands' offices; mounted police stations, known outcrops of tar sands, and coal-seams. In addition, numerous useful notes appear on the map respecting the character of the country, navigability of rivers, and borings for petroleum.

Canada—British Columbia. **Dept. of Mines, Ottawa.**

Diagram showing the geology of Texada Island, British Columbia. Scale 1 : 126,720 or 1 inch to 2 stat. miles. Size 10 by 13 inches. Ottawa: Department of Mines, Geological Survey, 1912. *Presented by the Department of Mines, Ottawa.*

Canada—Nova Scotia. **Dept. of Mines, Ottawa.**

Geological Survey of Canada. Map 121 A, Franey Mine and vicinity, Victoria county, N.S. Scale 1 : 14,000 or 4·5 inches to 1 stat. mile. Size 8 by 9 inches. Ottawa: Department of Mines, Geological Survey, 1914. *Presented by the Department of Mines, Ottawa.*

United States. **U.S. Geological Survey.**

United States. Scale 1 : 2,500,000 or 1 inch to 39·4 stat. miles. 9 sheets, each 16 by 25 inches. Washington: Department of the Interior, United States Geological Survey, 1914. *Presented by the United States Geological Survey.*

A new edition of a useful general map which was first published in 1890. The special feature of the map is that it gives contour-lines in brown (at varying intervals, according to the character of the region) for the whole of the country, which have already proved useful for many purposes. There is no colour tinting, and it is not overcrowded with names. Railways are in black.

WORLD.

World. **Bacon.**

Bacon's Sixpenny Contour Atlas. South-East England Edition. Size 10 by 7½ inches. London: G. W. Bacon & Co., Ltd., [1914]. *Presented by the Publishers.*

A cheap little atlas, containing thirty-six sheets of maps of all parts of the world with relief indicated on the tinted layer system, and an index giving the latitude and longitude of principal towns. Larger scale maps are given of South-East England, and there are several maps of the world showing physical phenomena.

World. **Robertson**

The Bible Atlas. New edition. Revised and rearranged by Edward Robertson, B.D., D.LITT. Edinburgh and London: W. & A. K. Johnston, Ltd., [1914]. *Price* 1*s. net. Presented by the Publishers.*

A revised and rearranged edition of a cheap little atlas, intended specially for the use of scholars of Sunday-schools and Bible-classes. There are altogether 16 sheets of maps, plans, and diagrams.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, from September 6 to October 17, 1914. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 2007, Scotland, west coast: River Clyde—Dumbarton to Glasgow, 3*s.* 126, North sea: Heligoland, 3*s.* 1, Atlantic ocean: Portsmouth to

Canary islands, 4s. 1609, Mediterranean, Greece: Santa Maura road and Port Drepano, Santa Maura canal, 3s 1096, New Zealand, South island: Admiralty bay and Current basin, French pass, Catherine's cove, 3s. Corrected Charts—Nos. 3778, 3779, 3780, Telegraph chart of the World, showing submarine cables, principal land lines, and wireless telegraph stations open for commercial purposes, sheets 1, 2, and 3, 4s. 1094, England, east coast: Outer Gabbard to Outer Dowsing, 4s. 1543, England, east coast: Yarmouth and Lowestoft roads (Plans: Yarmouth haven, Lowestoft harbour), 4s. 3477, England, west coast: River Mersey—Rock light to Runcorn, 3s. 2879, Milford haven. Plan added: Pembroke reach, 5s. 1426, Scotland, west coast: Loch Linnhe, northern part, and Lochs Leven, Aber, and Eil (Plan: the Narrows), 5s. 2550, Scotland, north-east coast, Port and vicinity of Wick, 2s. 2252, Baltic sea: Gulf of Bothnia, 3s. 3465, Baltic sea: Traelle næs to Aarö sund. Plans added: Fredericia, Kolding, Middelfart, Assens, 3s. 120, North sea: River Schelde, from the sea to Antwerp (Plan: Vlissingen or Flushing), 5s. 3753, Norway: Plans on the west coast of Norway; Tiel sund—northern portion, Gi sund. Plan added: Navik, 3s. 1872, North sea: Calais to the river Schelde entrance, 4s. 2158a, Mediterranean sea, western sheet, 4s. 2158b, Mediterranean sea, eastern sheet, 4s. 234, Mediterranean, Egypt: Port Said, 3s. 1805, Mediterranean, France: Cette to Marseille. Plan added: Port of Cette, 3s. 202, Adriatic sea: Port Pola and the Brioni islands (Plan: Port Veruda), 2s. 1520, Greece: The Peiræus and Phalerum bay, 3s. 20, Persian gulf: Bahrein harbour, 2s. 655, India, west coast: Port of Bombay, 3s. 43, India, west coast: Gulf of Kutch, 3s. 740, India, west coast: Achra river to Cape Ramas, 3s. 750, India, west coast: Malabar coast from 9° 53′ to 8° 40′ N. lat. (Plans: Quilon road, Alleppi road), 3s. 711, Indian ocean: Mauritius, or the Isle of France, 3s. 1288, China: Plans in the Yangtse-kiang—Se-yun-kau creek to Silver island, Chin-kiang-fu and Silver island, 3s. 2265, Japan, inland sea: Kobe and Hyogo bays, 2s. 1011, Russian Tartary: Eastern Bosporus strait with Vladivostok harbour, 3s. 316, Russian Tartary: Castries bay, 2s. 1868, Borneo: Taganak to Tawi Tawi, 3s. 1593, Borneo: Silam harbour, 3s. 2111, Borneo: Nosong point to Ambong bay (Plan: Dinawan anchorage), 5s. 1456, Africa, west coast: River Cameroon, with the Ambas islands (Plan: Ambas (Amboise) islands), 3s. 1379, Australia: Plans in New South Wales: Port Macquarie, Richmond river entrance, Cape Byron bay. New plan of Clarence river entrance on this sheet, 3s. 3254, Australia, north coast: Norman river entrance, 2s. 1896, New Zealand, North island: Entrances to Auckland harbour, 2s. 1485, Pacific, Caroline islands: Yap or Uap island (Plan: Tomil haven), 2s. 1570, Pacific, New Hebrides islands: or Uap island to Efate island, 3s. 1579, Pacific, New Hebrides islands: Malekula (Mallicolo) island, southern part (Plan: Pangkumu bay), 3s. 2225, Pacific, New Hebrides islands: Ambrym island, 3s. 3172, Antarctic:—Antarctic ocean—Sheet 3: between lats. 60° S. and 75° S. and longs. 105° E. and 155° E., 3s. 3174, Antarctic:—Antarctic ocean—Sheet 5: between lats. 60° S. and 75° S. and longs. 155° W. and 103° W., 3s. 3176, Antarctic:—Antarctic ocean—Sheet 7: between lats. 60° S. and 75° S. and longs. 52° W. and 2° E., 3s. 3206, Antarctic:—Antarctic ocean, Sheet 8, 3s. 2656, North America, Bay of Fundy: Brier island to Gulliver hole, including St. Mary bay, 3s. 339, North America, Nova Scotia: Baccaro point to Pubnico harbour, 3s. 1651, North America, east coast: Nova Scotia, Prince Edward island, and part of New Brunswick (Plan: Sable island), 4s. 312, River St. Lawrence: Father point to Green island. Plan added: Escoumains, 3s. 267, United States, east coast: Albemarle sound to Cape Fear (Plans: Hatteras inlet, Ocracoke inlet). Plan added: Beaufort harbour, 3s. 856, Pacific ocean: Anchorages in the New Hebrides: Rannon anchorage, Susan bay, Craig cove, Rodd's anchorage, 2s.

(*J. D. Potter, Agent.*)

British Isles and France. **Royal Cruising Club.**

Royal Cruising Club Charts. No. 1, Blackwater to Orfordness; 3, Thames Estuary; 5, Covehithe Channel to Caister Road; 6, Covehithe to Orfordness; 12, Sea Reach to River Medway; 127, Portland to the Needles; 199, English Channel Tracks and Lights; 311, Harvois and Ushant; 313, Pontusval to Brest; 315, Approaches to l'Abervrac'h; 317, Chenal du Four; 319, Rade de Brest. London: Royal Cruising Club, 1914. *Presented by the Royal Cruising Club.*

The Royal Cruising Club has for some years past issued charts of the British Isles and coasts of Holland, Belgium, and France, with plans of important harbours, for the use of its members. A set has lately been presented to the Society, and those

mentioned above have appeared during last year. For the greater number of the charts the basis is the British and foreign Admiralty charts, with such information added, chiefly obtained from the surveys of members of the club, as may be considered specially useful to yachtsmen, such as sailing directions, tidal notes, courses, and bearings. To render them clearer most soundings below three fathoms, and other matters not considered necessary for the purpose in view, have been omitted.

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, December, 1914. Washington: U.S. Hydrographic Office, 1914. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, January, 1915. London: Meteorological Office, 1914. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **Meteorological Office.**

Monthly Meteorological chart of the Indian Ocean, January, 1915. London: Meteorological Office, 1914. *Price 6d. each. Presented by the Meteorological Office.*

PHOTOGRAPHS.

Cameroons and Togoland. **Hunt.**

Eleven photographs of the Cameroons and Togoland taken by Miss Alice M. Hunt. *Presented by Miss Alice M. Hunt.*

Eight of these photographs are postcard size, and three are quarter-plate.

(1) A rubber factory at Kribi, Duala; (2) Natives with barrel of rubber, Kribi; (3) Natives on shore at Kribi; (4) Natives with stores at Kribi; (5) A native hut in the bush near Duala; (6 and 7) Loading mahogany at Duala; (8) Loading ebony at Duala; (9) Lome; (10) Embarking passengers at Lome; (11) Surf boat fetching passengers at Lome.

South America.

Five photographs of the Iguazu Falls, South America. *Presented by the Right Hon. Earl Curzon of Kedleston, G.C.S.I., G.C.I.E.*

The Iguazu falls are on the river of the same name, a tributary of the Parana, which forms the boundary between Brazil and the Argentina territory of Misiones. These are excellent photographs, measuring 7 by 9½ inches. Enlargements of them will be shown in the photograph room of the Society's house.

South America.

Six photographs of the Iguazu Falls, South America. *Presented by the Argentine North-Eastern Railway Co.*

Another set of photographs of the falls mentioned above. They are not very clear specimens, but, like the others, represent strikingly beautiful scenery. They measure 7 by 9½ inches.

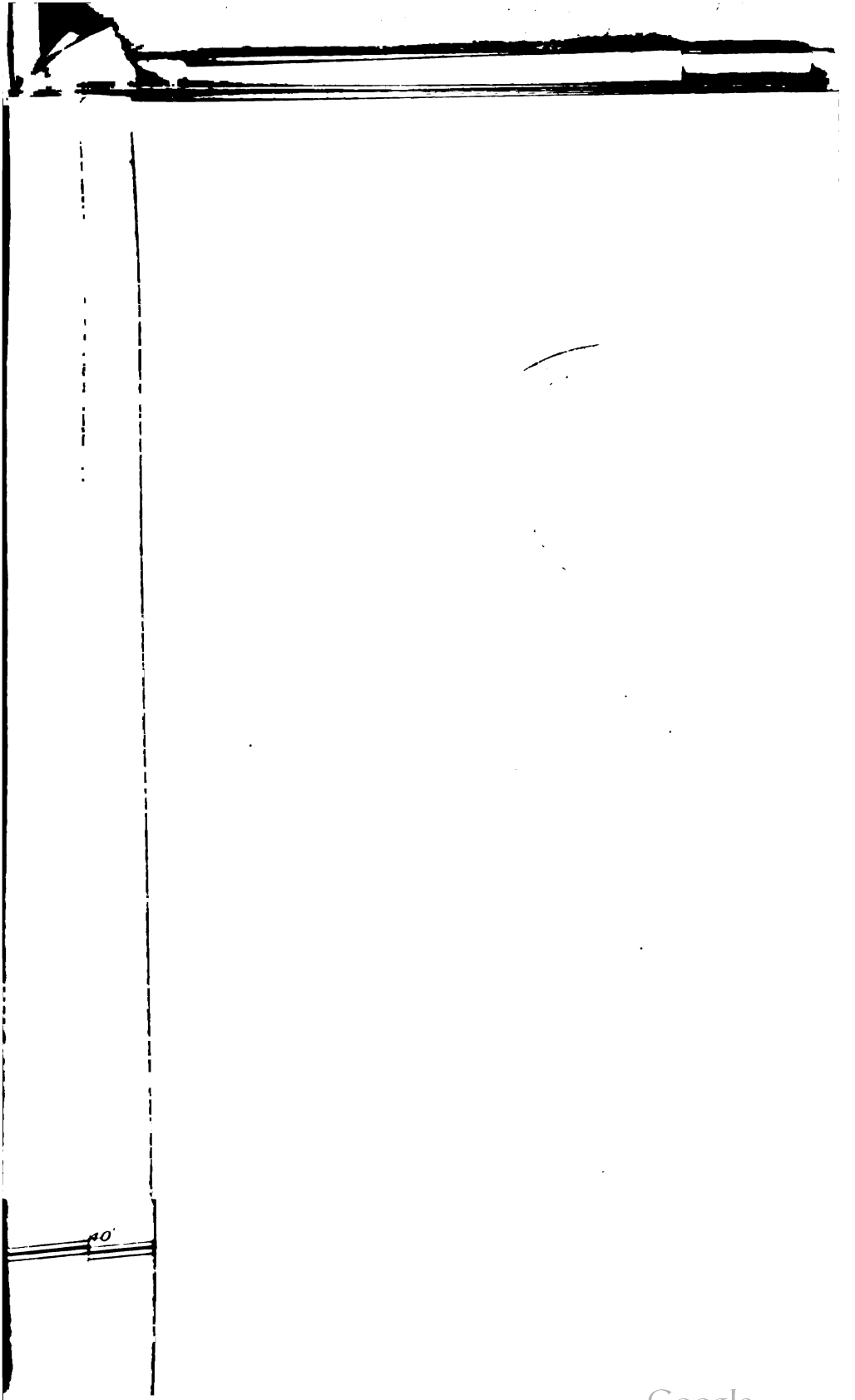
(1 and 2) The Brazilian falls; (3) The Argentine falls; (4 and 5) Part of the Argentine falls; (6) Part of the Iguazu falls.

United States and Alaska. **Hunt.**

Fifteen postcard-size photographs of the Yellowstone Park and Alaska taken by Miss Alice M. Hunt. *Presented by Miss Alice M. Hunt.*

(1 and 2) Grand Cañon, Yellowstone Park; (3) Hot spring in Yellowstone Park; (4) Fish Pot Crater in Yellowstone lake; (5) Pulpit terraces, Mammoth Hot Springs, Yellowstone Park; (6 and 7) Terraces at Mammoth Hot Springs, Yellowstone Park; (8) Wild bears in Yellowstone Park; (9) Lake Bennett on the White pass, Yukon railway; (10) The coast facing the Pacific ocean at Sitka; (11 and 12) Totem poles at Sitka; (13 and 14) Taku glacier, Taku inlet; (15) Parliament buildings at Victoria, British Columbia.

N.B.—It would greatly add to the value of the collection of Photographs which have 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

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THE ADAI-KHOKH GROUP, CENTRAL CAUCASUS.*

By HAROLD RAEBURN.

It is now some forty-five years since the adventurous journey of Mr. Freshfield and his companions, Messrs. C. C. Tucker and A. W. Moore, first brought home to Western geographers a true idea of the extent and importance of the glacier regions of the Caucasus. During the course of that journey the great volcanic peaks of Elbruz (Mingi Tau), 18,470 feet, and Kazbek, 16,546 feet, both considerably higher than Mont Blanc, and both European mountains, if we consider the watershed as the continental boundary, were ascended for the first time. The party also effected the first crossing—from Europe to Asia—of the splendid glacier and *névé* of Karagom, which forms perhaps the most remarkable feature of the group dealt with in this paper. In 1868, and for many years thereafter, mountain explorers had to use as the basis of their work the 5-verst (1 : 210,000) map of the Russian Survey. This map, constructed for military and administrative purposes, naturally enough, paid little or no attention to the unexplored glaciers or to the peaks not prominently visible from easily accessible positions.

Its omissions and errors fostered the delusion long prevalent in Western geographical circles that the Central Caucasus range—which may be taken as extending from Elbruz to Kazbek—consisted of a single narrow ridge. It was left to the early climbing explorers to discover that a whole mass of great peaks (including Dykhtau, over 17,000 feet), situated entirely in Europe, had been merged in, and confounded with, the almost equally great mass which culminates in Shkara lying immediately to the south on the Asio-European watershed.

* Royal Geographical Society, January 11, 1915. Map, p. 272.

Again, the peak of Ushba, nearly as high as Mont Blanc, had, although one of the most striking and remarkable mountains in the world, been completely ignored. It is a purely Asiatic summit dominating the, at that time, almost inaccessible mountain land of Suanetia. It appears to be obvious that only those summits visible from the north side of the chain were at that time triangulated. Somewhat similar errors led to the fusing of the remarkably complicated ridges and peaks and extensive *névés* and glaciers of Adai Khokh into one watershed ridge with simple flank glaciers.

The second explorer to visit the range of Adai was a Hungarian, M. de Déchy, in 1884. He had with him the famous Swiss guide, Alexander Burgener of Saas, and a young guide, J. Ruppen. M. de Déchy is the author of a superbly illustrated work on the Caucasus. M. de Déchy ascended *one* peak which he believed to be the highest peak of the group—that triangulated by the Russian Staff as 15,244 feet, and named by them Adai Khokh. This ascent was made from the Tsaya valley on the east. M. de Déchy, led by one of the boldest and most determined guides Switzerland ever produced, certainly ascended *a* peak in the Tsaya basin; but the peak he climbed is, I think, quite clearly shown by comparing his marked route of ascent on the map given with his paper in *Petermanns Mitteilungen* for 1889, with the true orography of the group in the map (taken from the Russian 1-verst survey) accompanying this description. The peak he really ascended is the great mass with *two* tops which divides the north from the south Tsaya glacier. This peak is without name or height on any *map*, and is fully 1000 feet lower than Adai Khokh, say between 14,100 and 14,200 feet. Clear disproof of the ascent of either Tshantshakhi or Adai—apart from his map—is contained in M. de Déchy's description of the ascent in his papers in the *Alpine Journal* for 1885, in the paper in *Petermanns Mitteilungen* for 1889, and in his great work published in 1905.

Messrs. Freshfield, Moore, and Tucker, with François Devouassoud, had obtained in 1868 the name Adai for a splendid rock-peak which dominates the Tshantshakhi or eastern Rion valley on the south side of the group. Owing to his ascent having been made in mist and to the curious errors of the 5-verst map, M. de Déchy was led at first to identify his peak with this summit. Later, when the Rion peak was shown to be considerably lower than the triangulated summit, M. de Déchy came to the conclusion that he must have made an error in identification, and that in reality he had ascended the highest peak of the group.

M. de Déchy, in illustration of his paper in *Petermanns Mitteilungen* for 1889, "Das Massiv des Adai Choch," published a map of the group, which, founded on the erroneous 5-verst map, bears very little resemblance to the real facts and orographical relations of the various mountains, watersheds, and glaciers. M. Déchy has traced upon this

map a line showing the route followed to the summit of his supposed Adai.

In 1890 a third exploring party, Messrs. Holder and Woolley, with the Swiss guide Ulrich Almer, visited the district. Attacking from the Rion basin, they ascended the beautiful mountain to the south-west of the Karagom *névé* called Burjula. They also traversed the Karagom upper *névé* in its length and climbed a high peak. This was the Russian triangulated highest peak.

In 1889 the English party organized by Messrs. Freshfield and Dent to search for the English and Swiss climbers lost the previous year in the Caucasus mountains, crossed with four Swiss guides a pass in the Adai group. This leads from the east Mamison glacier to the south Tsaya glacier, and is of considerable difficulty on the north or Tsaya side.

During the late 80's and 90's the new Russian survey was carried out in the district, and in 1891 one of the surveyors, M. Kovtoradzé, is reported to have succeeded in gaining Adai from the Karagom glacier.

The name-peak of the whole group, Adai Khokh, is a striking illustration of a case where the breaking of the rule of not naming unless the real position of the native named peak is definitely known, has led to a great deal of confusion and misunderstanding. The real name of the highest peak is Uilpata. No native knows it under the title of Adai. Adai is applied indiscriminately to most of the peaks, to the massif in fact, visible from the upper Mamison and stretching from Kaltber to Tshantshakhi. The Russian surveyors have transferred the name Adai from the peaks easily visible from points outside the group to the highest—invisible—point near the centre. The 1-verst map has, however, inserted Uilpata as a secondary name. It has even gone further in the case of Burdjula, which is honoured by having printed on it no less than three separate names.

In 1907 and 1909 an Italian climber, Dr. Vittorio Ronchetti, of Milan, visited and explored in the group. In 1913 Dr. Ronchetti, with a companion and an Italian guide, ascended Adai, or, as he calls it, Uilpata, "to within a few metres" of the top. There the party were caught in storm, and were forced to spend the night at a height of 15,000 feet. Here he was severely frostbitten, and had the misfortune to suffer the loss of half of one foot in consequence. *This ascent was the first from the Tsaya side* of the peak. In 1913 and 1914 British expeditions visited every side of the group. Thanks to generally favourable weather, thanks also to considerable experience of guideless mountaineering and to loyal and harmonious co-operation among all the members, very considerable success was obtained. In all, nine new peaks, ranging from 13,500 to nearly 15,000 feet, were ascended. Eight cols were attained, not crossed, from about 13,000 feet, and several glaciers explored.

The map accompanying this paper, which is based upon the 1-verst

survey, embodies also all the information obtained by the various foreign and British expeditions in the group since the publication of Mr. Freshfield's map in 1893.

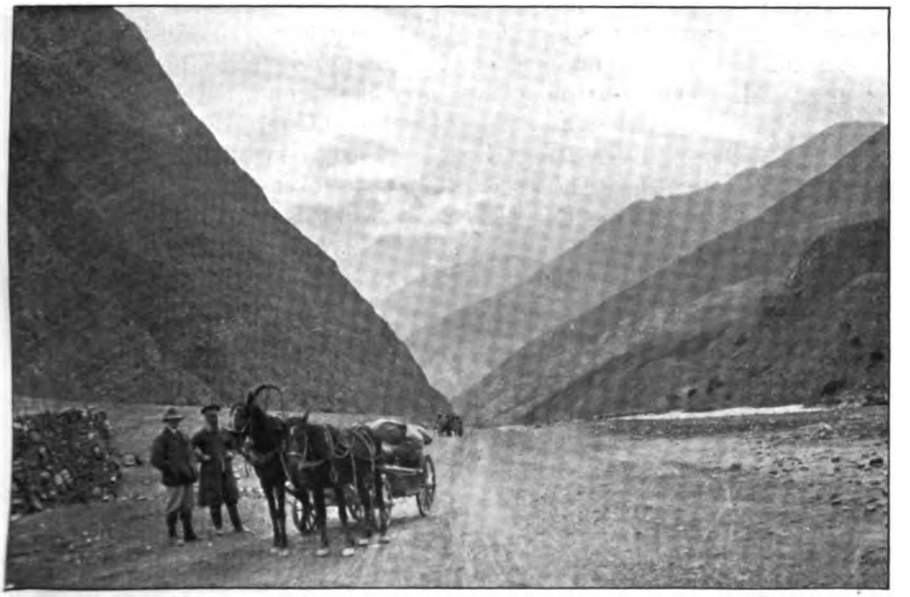
The Adai Khokh group consists of the mountain mass lying immediately west and north of the Mamison road. This road passes up the gorges and valley of the river Ardon, which, rising on the south of the geological axis of the chain, breaks through it at the wild and picturesque gorge of Kassara. It then flows out to the steppe region past Alagir, through the limestone gorges of the foothills, thence to join the river Terek flowing into the Caspian. On the south the group is bounded by the Mamison or upper Ardon and the Tshantshakhi or eastern Rion. On the north the Sadon valley and headwaters of the Urukh river. On the west I have taken as a perhaps artificial but convenient boundary the line of the old native glacier pass of the Gurdsivzek leading from the Karagom and Urukh valleys to that of the Rion.

The area of the mountains measuring from St. Nikolai Kazarma (the future Visp of the district) on the Mamison road to the Gurdsivzek, and from Dsinago, the highest village on the Karagom, to Gurshevi, the highest village south of the Mamison pass, is about 300 square miles. Of this close on 90 square miles is within the limits of permanent snow and ice, or rather more than all the glaciers of Elbruz (83 square miles).

In the early summer of 1914, I was fortunately able to obtain the adherence of three friends to a projected climbing—exploring expedition in the Caucasus mountains. The party thus consisted of four. Mr. W. N. Ling, of Carlisle, my friend and sole comrade of many years' guideless climbing in the Alps and Norway; Mr. W. G. Johns, of London; Mr. J. R. Young, of Glasgow, to whose photographic skill and patience I am indebted for the majority of the slides exhibited; and myself, of Edinburgh. We thus formed a thoroughly representative British climbing party. The route adopted was *viâ* Berlin, Warsaw, Moskow, thence to Rostov-on-the-Don, and from thence to Vladikavkaz, the chief city of Cis. Caucasia. The name of the city betokens its importance. It means the Lord of the Caucasus, as Vladivostock means Lord of the East, and the name Vladimir, Lord of the World. In order to make the necessary arrangements for transport, provisions, equipment, interpreter, and cook, I travelled three days ahead of the party, arriving in Vladikavkaz on July 3, 1913.

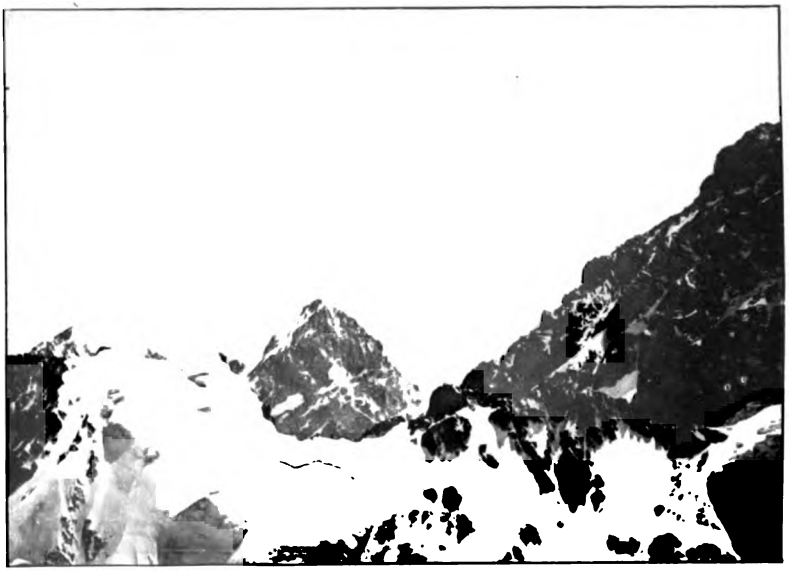
I had three days' hard work in Vladikavkaz, and only on the evening of the third found leisure to take a short walk up the turbulent glacier river Tcherek, which flows through the town. Many naked men were watering their barebacked horses in the stream; crowds of children were playing in the shallows. On the south-east the pale limestone precipices of the "Table mountain" rose among dark green pine forests. To the south the partly enclouded snows of Kazbek rose 14,500 feet above the town's level (2000 feet).

MARKET DAY, ONI, RION VALLEY, IMERITIA.



MAMISON ROAD (OSSETINSKÉ DAROGA), CENTRAL CAUCASUS.

MAMISON KHOKH, OR THE CURTAIN (14,200 FEET),
FROM THE SOUTH-EAST RIDGE.



TSHANTSHAKHI, NORTH-EAST FACE, FROM SONGUTA RIDGE.

The rest of the party arrived on the 6th, and after a day's packing we started for the mountains on the 8th. I had been fortunate in engaging as interpreter and climbing companion a young Russian engineer-cadet. A boy in years, he was a man in everything else. His experience had been confined to a visit to the lower ends of some of the Balkarian glaciers and the ascent of Kazbek, which does not involve any *climbing* ability. He proved an apt pupil in both rockcraft and icemanship, and was invaluable in our dealings with the frequently troublesome and erratic porters and horse-owners. His name was Rembert Martinson. He spoke Russian, French, and German, and is of Danish descent.

As cook-interpreter and tent watcher I engaged a native tribesman, an Imerition from the Asiatic town of Oni on the river Rion. This man Militan Burjeladsé was the one failure of the personnel. His love for cigarettes and vodka was as strong as his loathing of walking and work, and his incapacity as a cook only equalled by his ability at shirking. The sole disagreeable incident of the expedition, a robbery of some things from a tent in our absence, must, I feel sure, be laid to his sin of omission or commission.

We left Vladikavkaz at 8 a.m. on July 8, and drove in three lineikas across the steppe to Alagir, at the foot of the Mamison road. The lineika is a light low vehicle something like an Irish jaunting car on four wheels. It is usually in the last stage of debility and senile decay, and the harness has probably seen many generations of the small, but active, docile, and enduring horses. Near Vladikavkaz the plain is well cultivated, with vineyards, orchards, green vegetables, and maize-fields. Farther west it changes to the bare brown earthy steppe, thinly clothed with brilliant weeds and flowers, and scantily tufted with grass. The birds are—many vultures and eagles, living aeroplanes, soaring round in the blue sky; kites and buzzards at lower elevations; small windhover hawks, like our kestrel, or perhaps the lesser kestrel; grey crows; magpies near trees; hoopoes with their butterfly-like flight; crested larks; wagtails of two species, swifts, swallows, and martins; crowds of brilliant bee-eaters on the telegraph wires; finches, chats, and warblers of many species.

At Alagir we put up for the night in a semi-deserted "gostinitza," which, however, though it had nothing to eat but "yeitso" or eggs, possessed a good piano. On the 9th we drove through the gorge in the limestone foothills, finely wooded with beech and hornbeam, and reached the Cossack post St. Nikolai. Here six horses were engaged, and the baggage packed on their backs. The horse track up the Tsaya valley, which leads from St. Nikolai into the heart of the Adai group, is quite a good one. The new path does not cross to the left bank and climb up to the dirty village of Tsaya, but remains near the torrent on the right bank till not far below Rekom. Here it crosses by a bridge for which a toll is demanded. Rekom is an old wooden building in the Tsaya pine

forest, an ancient shrine, a great place of Ossetian pilgrimage in days of yore, and is so still. Many skulls and horns of "Tur" and deer, etc., adorn its walls. Grotesque birds are carved on the wooden eaves. At one time coins and other valuables used to be thrown into the interior and lay on the floor, but nowadays a locked wooden offertory box stands on a pole inside the enclosure fence.

The pine woods below the snout of the Tsaya glacier have been a summer resort and pilgrimage for hundreds of years. Just as in England of old,

> "Whan that Aprilé with his showrés swooté
> The draught of March hath percud to the rooté,
> * * * * *
> Than longen folk to gon on Pilgrimages,"

so in the Caucasus when the burning June sun smote upon the dusty plains of the steppes, the Ossetians came up to this beautiful spot to drink goats' milk, breathe the glacier air, and inhale the spiced breeze of the pines. In late years a wooden "sanatorium" has been erected in a green turfed enclosure above Rekom, and is generally fully occupied in the summer months. A small "dukhan," or shop, has also been opened, and many kinds of supplies, including "kachetinskoe" (red Caucasian wine), can be bought at reasonable prices. Good Russian bread is also obtainable—a great boon to those who cannot manage the sodden dough which is the usual "staff of life" in the mountains of the Caucasus.

We pitched our large tent for a period of twelve days about half a mile above the "Lednik," in a small opening among the pines. Close beside us raced by the turbulent torrent of the newly glacier-born Tsaya river. Above towered enormous cliffs, likened by M. Déchy to those above Rosenlaui. A small prattling brook of clear water coming down from a ravine of the Tsaya Aiguilles joined the Tsaya just below the camp, and furnished good bathing and drinking supplies. A few minutes' walk up the forest track to the glacier gave a wonderful view—a tree-framed picture of the name peak of the group and dominating peak of the Tsaya valley, Adai Khokh, with its hanging north-east glacier. The main glaciers of Tsaya and their crowd of great encircling peaks are quite out of sight; only the *débris*-covered snout of the Tsaya glacier filling the valley-trough appears from round the corner to the left. The height of this base camp was 6300 feet.

According to the plan of campaign, and in order to gain some insight into the intricate topography of the group, it was resolved to first make an attempt to ascend to the ridge of the Tsaya Aiguilles. This spur, the "splintered fence of granite teeth" of Mr. Freshfield's phrase, runs north-east from Adai Khokh and Songuta. None of its summits had been yet ascended. Three, at least, attain heights of over 14,000 feet.

On July 11, 1913, the whole party of five left camp at 5.15 a.m., and

proceeded up the left side of the valley. In half an hour the woods are quitted, and the "great kosh," the last of the summer "boarding establishments," is reached. This consists of a number of stone shelters covered with boughs and cloths, underneath the overhang of a huge smoke-blackened cliff. Koshes inhabited by goatherds, all keen "Tur" hunters, exist higher up. One of these we christened the "Doggeries," as it was guarded by a pack of particularly vociferous and bellicose big, mastiff-like dogs.

About an hour above the camp a wide scree-floored corrie opens out on the right. This was ascended, snow being reached at seven a.m., which led into a gradually steepening couloir, and so to the summit ridge at about 13,000 feet. The nearest rock peak on the west was climbed from thence. It was, by aneroid, 13,500 feet, and has since been named Tur Khokh from the abundant traces of these animals, *Capra Caucasica*, seen *en route* by the first party to ascend it. The descent on the north side of the Tur col appears easy. It leads to Dunti and Kamunta in the Urukh watershed. Two days later another of the Tsaya Aiguilles was climbed. This is the point to which the figures 4294 M. are attached in Merzbacher's map. It was named Ullargh Khokh from the abundance of the bird for which that is the native name. This is the great Rock partridge, *Tetraogallus Caucasicus*. It is like a huge ptarmigan, but possesses, instead of the frog-like croak of that bird, a loud, clear, musical-scale whistle which rang round the rocks above the high camp (9000 feet) just at dawn. The camp was on grass below the moraine of the small nameless—since called Ullargh—glacier coming down from the south face of Ullargh, and the unnamed peak between it and Songuta to the west. Some good views and photographs were got from Ullargh of the northern mountains of Karagom, all hitherto unascended, and several well over 14,000 feet high.

One of the chief objects of the expedition to the Adai group was the ascent of Tshantshakhi, and to settle conclusively whether this could have been the peak ascended by M. de Déchy in 1884. M. Déchy had most positively stated "the ascent was made by the north-east arête." We had, therefore, to find this side of the mountain. The maps led to the belief that we should find it in the southern Tsaya glacier basin. Accordingly the next expedition was arranged for the investigation of this. On July 16 we left Tsaya camp with light tents and provisions for two days. We had engaged two herdsmen, father and son, as porters. The Ossetian mountaineers, like almost all Caucasians, though wiry and enduring, are not of powerful physique, and are unaccustomed and unwilling to carry burdens such as Swiss porters often do. I think some exploring climbers, both English and foreign, have sometimes failed to realize this difference, and have had trouble in consequence. As we were taking these men at any rate up the first icefall, we provided them with properly nailed boots. These they put on their naked feet with great

pride. All Caucasians wear soft hide shoes. We followed the excellent track up the left moraine to the foot of the great cataract of the first icefall. We crossed high up a rubble and ice gully—owing to absence of snow, somewhat dangerous from falling stones—and gained a snow-slope on the left above the steeped part of the fall. As the snow was hard and steep, I cut steps for the porters. It was interesting to observe how they negotiated this passage. The Caucasians with gloved feet are accustomed to place the whole foot flat upon a slope in order to obtain the best hold. They are quite good climbers upon *rocks* of moderate difficulty. They are, of course, helpless upon an ice or hard snowslope. The elder man still tried the old method in his novel footgear. The boy watched us and imitated quite successfully our way of driving our toothed boot-edges into the slippery surface.

A short distance above this and just below where the north Tsaya glacier plunges in riven cataracts of seracs between towering walls of rocks, is the last grass patch. Here tents were pitched at a height of 9300 feet. Some of the party saw the porters safely down the snow-slope. I made an investigation of the north Tsaya icefall. I was forced to the conclusion that it was too dangerous at present. The steep ice-slopes up which it would be necessary to cut a way were continually being swept by boulders, stones, and blocks of ice. This confirmed us in the intention to ascend the southern glacier's icefalls, which had not been found difficult either by Mr. Freshfield or Dr. Ronchetti's parties. We left this high camp at 1.45 a.m. on July 7. After having been forced almost to the right bank by the enormous crevasses caused by the inflow of the north Tsaya icefall, we recrossed to the foot of the high rock—the foot of the great spur which separates the north and south Tsaya glaciers. This is marked by Merzbacher as 3092 M., and as it is the pivotal point in Mr. Woolley's panoramas taken from the lower Tsaya glacier, I have ventured to name it Woolley's rock.

The second icefall here is high and intricate, but not seriously difficult. Above this a third icefall is encountered of less importance. This surmounted, an almost circular snow basin is entered upon, walled round with peaks of steep rocks and ice. On the right a long high-ridged mountain mass *with two tops* sweeps up to well over 14,000 feet. This is marked in Mr. Woolley's photographs as "Mr. Freshfield's Double Peak (or Bubis?)." On the left the well-marked peaks of Dr. Ronchetti's "Triple Peak" (showing, however, from here as two peaks only) rise between the Mamison pass and Tsaya. Below the lowest gap on their eastern side the "Freshfield Perival" (pass) of 1889, approached by somewhat repulsive-looking steep avalanche-grooved snow-slopes and not too easy rocks, leads up to the east Mamison glacier on the north side of the Mamison pass. No signs of either Adai or Tshantshaki were visible. We therefore resolved to attempt the ascent of this "Double Peak." We attacked it by a rocky arête falling from

the main ridge in a south-easterly direction. The arête developed difficult rock climbing with much loose stones high up, and with a party of five progress to be safe was necessarily slow. About 2 p.m. we reached a minor top, 13,800 feet by aneroid. As even the east peak was a long way off and about 500 feet higher, and the weather had now turned threatening with snow and cold wind, the ascent was given up. We had, however, got a splendid view of Adai's south-east face just across the *névé* basin of north Tsaya, and a route could be planned upon it which would make its conquest a certainty. This route is almost identical with that by which Dr. Ronchetti's party made the first ascent of Adai from Tsaya. We also saw, though only partially and through mist, a threatening vision of an enormous black cliff at the head of the north Tsaya basin, which could be none other than Tshantshakhi's north-east face. The mountain, therefore, does not possess a "north-east ridge." The hopeless-looking appearance of this face, while it increased our desire to conquer the mountain, warned us of the almost certain failure of an attempt from the Tsaya basin. We therefore resolved to shift camp to the headwaters of the upper Mamison.

We returned by the route of the ascent, shortening the passage of the main icefall by jumping down from the sneering upper lips of some big crevasses. We reached the upper camp at 6.30, packed up, and heavily laden, gained the lower camp at 9.30 p.m., after a twenty-two-hour day. On July 22 we struck camp, after the usual misunderstandings and delay in getting horses. The horses promised for six o'clock of course did not come, and it took two hours to get others. The men knew nothing about loading them, and in consequence the packs were continually falling off. It therefore took four and a half hours to get down to St. Nikolai Kazarma, a walk of about two and a half hours. Mr. Young and I were the rearguards, somewhat temper-rasped and semi-starving, who reached St. Nikolai at 12.15. We only managed to obtain one lineika and an arba, the latter a small rough cart drawn usually by a pair of little oxen. We drove and walked through the fine gorge of the Ardon at Kassara, and stopped at a "gostinitza" of sorts below the ruins of King George of Georgia's castle, at Saramag, for a meal. Here we procured two horses, which Messrs. Ling and Johns rode up to Kalaki Kazarma, the highest permanently inhabited spot on the pass.

The men of the lineika and arba and our own Imeritian cook had been imbibing vodka during our halt, and our drive up the pass was considerably enlivened thereby. The cook had managed to beg, borrow, or steal a white horse, and kept shouting and singing in great style. He continually charged up in the rear and incited our men to race. The road is not adapted for this. It is carried at a great height along a precipitous slope above the river. There are no parapets or fence of any kind, and the surface is about as bad as anything pretending to be a road at all could have. My friend was seated facing the inside cliff, and

risked being swept off by projecting boulders. I frequently found myself looking between my knees at the foaming glacier torrent 500 feet below as the erratic driver now pulled his steeds first to one side of the road and then the other. At last, when I had almost made up my mind to use my iceaxe, with which I was frequently obliged to threaten the cook, to stun the driver, in order to load him on the lineika and drive myself, an incident occurred which sobered him somewhat. He had got down to lead the horses for a bit, and was walking, or rather lurching, along the very edge when all at once he slipped and disappeared. He had, however, twisted the reins loosely round his arm, and with wonderful quickness, assisted by the frightened horses jerking themselves back, he climbed up again and walked on as if nothing had happened. We did not reach Tib before dark. Here we were surrounded by gesticulating, shouting crowds climbing up on the vehicle, so that I was obliged to push them off. It looked like attempted highway robbery at least. At last in a lull I managed to find out that they only wished to furnish guides for the kazarma, as the "daroga" or road was quite impossible. I ordered the procession to move on at once. We found that, in fact, the road, though not good, was much better than lower down, and we got to the kazarma all right about 10 o'clock. This kazarma is much frequented by people and traffic between Cis and Trans-Caucasia. Many arbas and pack-horses were put up in the yard, and the three rooms available, full of a crowd of many different tribes, so that we preferred to put up our light tents outside. The traffic is chiefly timber from the south and salt and provisions from the north side.

Next day we took a couple of pack-horses up to the highest earth patch—10,100 feet—below the huge and disproportionate moraine of the Mamison west glacier. This upper Mamison valley exhibits the peculiarity of containing two parallel glaciers only separated by their two lateral left and right moraines; both glaciers are in strong retreat. The lowest of these and the one which leads to the lowest gap for many miles in the Tsaya Mamison watershed, the Freshfield Pass, has been named the West Saramag glacier by my friend, Dr. Ronchetti. I think, however, that though it certainly does flow off the south-west flank of Saramag peak, it is nevertheless a Mamison valley glacier. Saramag has already a large and fine glacier flowing off its eastern side, and the transference of the name Saramag to this side is likely to lead to confusion. As Dr. Ronchetti's peak, "the Triple Peak" or Ronchetti Khokh, forms its western source, a more suitable name for it would be the Ronchetti glacier. Meanwhile I have described it under the name of Eastern Mamison glacier, which defines its position as one of the sources of the Mamison river. From this camp on consecutive days the two highest summits to the west and east were ascended. The west summit is that triangulated on the Russian 1-verst map as 1897 Sazhens = 13,279 feet and unclimbed, but I think the triangulation is on a lower point, and the

ridge is higher. Merzbacher has called it Mamison Khokh, 4048 M., 13,279 feet. The route was up the moraine and the Mamison west glacier, then up the ridge separating Mamison valley from Tshantshakhi valley. The summit is a long, sharp ridge of rock with a great precipice impending over the south Tsaya glacier side. Dr. Ronchetti considers that this summit is not sufficiently important to bear the name of Mamison, and would transfer or apply that name to the next peak on the north-west. This is the great "double peak" already described from the Tsaya valley. Though almost entirely a Tsaya massif, this great ridge originating in the sharp spur of Woolley's rock runs south-west for more than 2 miles. Its highest point is at its south-western extremity. Here it presents a steep rock bastion towards the head of the Tshantshakhi glacier, and is thus a near neighbour of Tshantshakhi, though considerably lower.

The point ascended by us on July 24, 1913, might perhaps be called Mamison Shoulder. The night of July 24 was bad with heavy rain, wind, and thunder. The morning got somewhat better, but we did not get away from high camp till 5.45. The east Mamison glacier was then ascended to the col of Saramag. From there the watershed rock-ridge was climbed to the top dominating the east Mamison and also the Saramag glacier. It is triangulated on the 1-verst map as 1970 S. = 13,790 feet, but has no name. Merzbacher has applied the name Saramag to an insignificant hump about 2 versts south of this. Our summit, to our surprise, proved to be crowned by a large and well-built cairn. A tent platform had also been constructed somewhat below the top. The peak is evidently easily accessible from the Saramag glacier, and must have been reached from thence by a Russian survey party. It may be considered as entitled to the name Saramag.

We had now to think of one of our main objects, the conquest of Tshantshakhi. Our views of its north-east face did not show any route which seemed free from very considerable danger and difficulty. As the north face consists of black rock precipices, the north-east is heavily defended by hanging glaciers. We therefore resolved to press an attack from the Tvilisa glacier on the south-west. We now engaged an arba and crossed the Mamison pass, 9280 feet, to Tshantshakhi kazarma, on the Rion (Asiatic) side. At the top of the pass is open in summer a small "dukhan" where tea, bread, wine, and vodka can be got. Also a room (there are two) to sleep in if the weather is bad. The road had only recently been opened through a heavy snowdrift on the east side of the ridge. By driving a tunnel through the soft and narrow shale ridge here, the pass could be kept in use for probably two months longer than at present. So gradual is the rise on the east side, and so well engineered is the road, that only one zigzag has been found necessary. It is much steeper on the Asiatic descent. The Tshantshakhi kazarma lies about 1200 feet down on the west side. It is a large, strong

stone building with several good rooms for travellers. It is often full to overflowing when bad weather prevents the crossing of the pass. A small belfry contains a bell, which is rung in snowstorms for the guidance of wanderers.

The day after our arrival, Sunday, July 27, was very bad, thick mist and driving rain, and very cold. We mostly lay in bed, wrote, or mended clothes, etc. Tshantshakhi's lower rocks, when they showed up occasionally, were white with new snow.

Tshantshakhi sends down to the south a huge rock ridge cut up with gigantic obelisks and pinnacles of black rock, separated by steep snow and ice couloirs. Where this ridge sinks into shale and grass at the source of the small stream falling into the Tshantshakhi torrent at the kazarma, a shepherd's track leads over to the Tvilisa valley. On July 28, leaving the kazarma at 10 a.m., we crossed over here to the Tvilisa glacier, and followed up the left moraine to a rocky slope, level with its first icefall. Here we bivouacked—not comfortably—on loose blocks of rock at 10,500 feet. I found an almost perfect egg-shell of the great Rock partridge, *Tetraogallus Caucasicus*, below this. We started, after a rather cold night with snow and sleet, at 4 a.m. on July 29, found a way, guided partly by mouse and marten tracks, through the three icefalls of the Tvilisa glacier—very complicated—and attacked Tshantshakhi by its south-west face. Here a steep ice couloir runs up between the first rocks on this face, and a very steep ice-slope leading to the col on the south ridge below the final peak of the mountain. We all wore crampons, but heavy cutting was necessary before the Bergschrund was crossed at 9 a.m. First an ice-slope and then a steep rock chimney with overhung exit led to a small rock platform. The rocks above were unclimbable, so return was made to the ice couloir. After ninety minutes' hard cutting the angle became hopelessly steep. Escape was effected through a crack in the overhanging ice of the couloir's left edge on to the open ice-slope beyond. On this becoming too steep for crampons to hold, the party cut back to north to a rock rib running far up the south-west face of the peak. The rocks here, though almost vertical, were "good." Owing to the new snow and ice on them the crampons were not removed. By this and several other rock ribs good progress was made. Higher the rocks died out, and steep ice thinly covered with new snow made the climbing both difficult and slow. At length, however, the south ridge was reached not very far below the top, and the climbing became relatively safe and easy, except for a fierce and very cold wind. At 3.45 we reached the highest point, a narrow rock ridge capped by 2 feet of new snow. In spite of the driving and clearing mists and whirling snow-dust, it was clearly made out no higher point existed, and the aneroid, which had agreed almost exactly with the Russian triangulated top of Saramag, made the height 14,500 feet. Owing to difficulties encountered the hour was rather late, 3.45 p.m., so that only fifteen minutes could be allowed for cairn, records, and food. At 4 p.m.

the descent was begun by same route. Owing to bad conditions, the utmost care was necessary, and the pace was slow. In the gathering darkness the ice-crack giving access to the couloir of ascent was missed. However, all the party were safely established in another crack, and, fastened on to 140 feet of rope, the leader was lowered over into the couloir. It is astonishing how time flies under such circumstances, but it must have been fully two hours later before a sufficient staircase was constructed to the steps of the morning in the couloir. The leader then came up to take the post of sheet-anchor in the depths of the crevasse, and the descent was resumed. The rock platform was at last gained at 10 p.m.

At five we managed to get under way again, descending the overhanging chimney below the platform to the ice-slope above the Bergschrund. Crampons proved of great service on this descent, and the bivouac was safely reached at 8.30. Here a good meal and rest put the party in good trim for the heavily loaded trudge over the ridge to the kazarma. On the way we met our photographic member, Mr. J. R. Young, who, somewhat anxious at our prolonged absence, had engaged a porter-shepherd and come to seek us.

In 1914 another British expedition paid a visit to Tsaya and Karagom valleys. The party this time consisted of Mr. R. C. Richards, of London, Mr. H. Scott-Tucker, of London, under the same leader. We had again the excellent companionship, and able service in dealing with the natives, of young Martinson. This time a much better cook was obtained than the rascally and lazy Asiatic (Imeritian) of 1913. He was a Russian soldier named Miranoff. He was small and somewhat timid, and easily humbugged by the natives, but clean, willing, and quite a decent cook, though wholly devoid of all initiative. He was quite a dandy in his way, and I was forced to make him leave at St. Nikolai, on the Mamison road, more than half of the large supply of bedding, spare clothes, and luxuries he had brought with him. His shaving mirror, however, proved useful on several occasions, as we had brought none of our own.

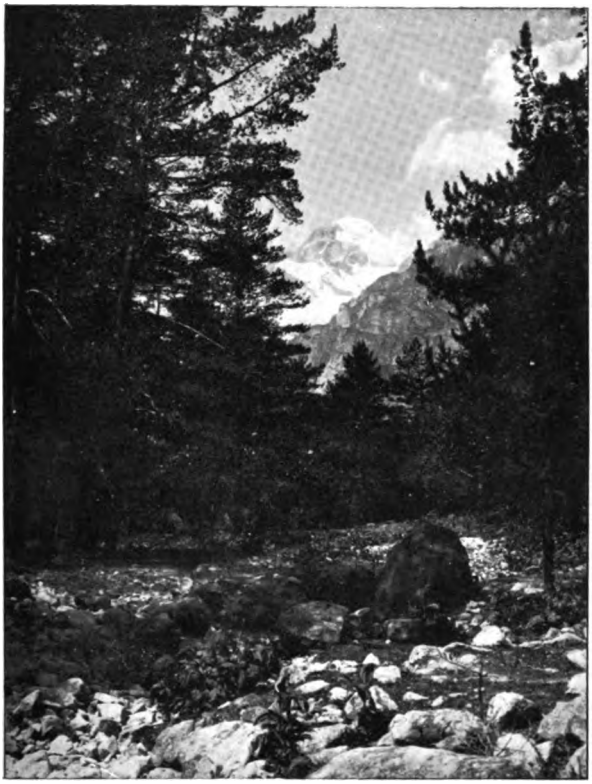
We arrived and set up our tents on the old site of 1913, in the Tsaya pine forest below the glacier snout, on July 12. Fortunately we had reached the Caucasus just after, not before, a terrific burst of rain-storms which had swept Europe from France to the Caucasus. The railways were washed away in places, and the Mamison road, never much of a road at any time, had in parts completely disappeared. Of course we were told at Vladikavkaz that it was absolutely impossible to get to the mountains for several weeks. My reply to that was to order the lineikas for the next morning, and we got through—with difficulty naturally—in two days.

In order to investigate the problems of a Tsaya-Karagom pass, first suggested by Mr. Freshfield and still unsolved, it was resolved to attempt the Adai-Songuta col, and from there, if found practicable, make the first ascent of Songuta. Two hunters were engaged as porters, and high camp

pitched (9000 feet) on last glass below the terminal ice-cliffs of the hanging glacier of Uilpata on July 14. Of course porters were never taken beyond the camps. Leaving camp at 3.5 a.m. on the 15th, the right moraine under the south-east spur of Adai was followed to the glacier. This glacier is formed in a very peculiar manner. I know of no parallel case in the Alps, Norway, or Caucasus. Imperfect observation of it from a distance has led to very erroneous delineation upon the 1-verst map. On the north-east face of Adai can be seen from far off a great hanging mass of ice. Below this an almost three-parts circular *névé* basin sweeps round below Adai, the Adai-Songuta col and the south ridges of Songuta. While the major part of the ice pours over a great cliff to another almost flat circular basin below the south-east spur of Adai and Songuta's south ridges, a portion escapes through a deep gap cloven between Adai main peak and its south-east spur to join the north Tsaya glacier.

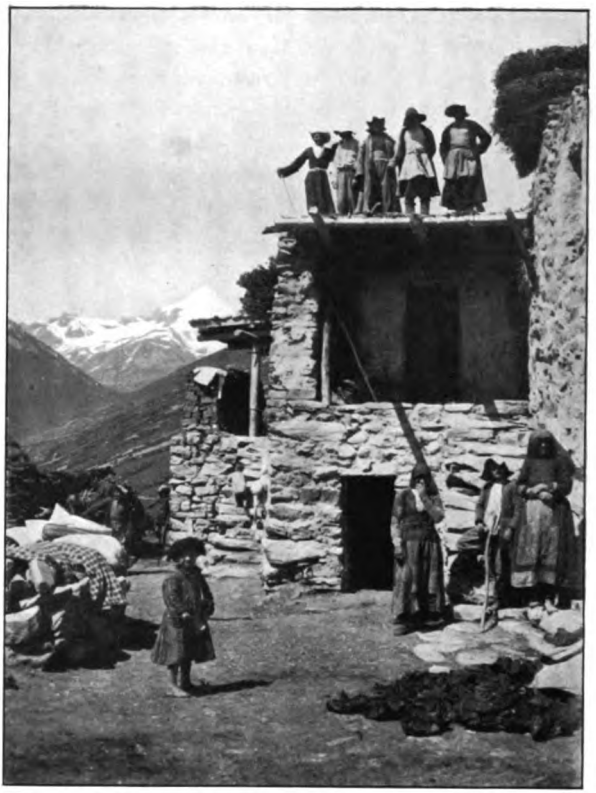
The ice-crowned cliff between the upper and lower basins of the Uilpata glacier can be passed, though not without difficulty, on either side. After passing through an easy icefall we gained the lower basin. From there we ascended the rocks of Songuta's south spur, and traversing left when those became overhanging, gained an ice couloir between these rocks and the central ice-cliffs. At the top of this we then entered the upper snow reservoir. The direct col appears impossible, as it is guarded by an enormous cornice. We gained the watershed ridge by attacking a steep rock rib of Songuta. Owing to the bad condition of the steep rocks of Songuta's final peak the ascent of that mountain was not completed. The descent to the Karagom *névé* on the north side of the pass I ascertained by descending a couple of hundred feet, to be quite easy. The difficulties on the south side will, I believe, always be considerable.

It was then resolved to make an attempt on the second highest summit of the group. This is the strikingly shaped mountain which Mr. Freshfield has styled tentatively as the "Double Peak" in his work. It is credited with a height of 14,874 feet in preliminary sheets of the 1-verst map. It consists apparently of two—there are in reality three—sharp rock peaks separated by a huge vertical-looking snow couloir. It lies between the "Shoulder" of Adai and the broad snow peak "like the Grand Combin" of Tvilisis Mta at the west extremity of the North Tsaya glacier. High camp was pitched on July 19 on last grass at 9300 feet just above the first icefall of the Tsaya glacier. It was interesting to note that our two hunter-porters employed "crampons" of knotted rope fitted to their gloved feet for use on the steep snow slope by which the first icefall is passed. The rocks above here are an evident haunt of Tur, and the men brought with them their rifles and disappeared in search of the big goats whenever relieved of their loads. I employed several hours of the afternoon in hunting for a passage through the rocky walls barring access to the North Tsaya glacier on this east side. The climbing was



ADAI, OR UILPATA (15,244 FEET), FROM CAMP IN TSAYA FOREST AT 6300 FEET.

THE NORTHERN MOUNTAINS OF KARAGOM.



NATIVES OF KALAKI (OSSETES).

SUMMIT OF THE MAMISON PASS (9280 FEET).

very steep and by no means always easy, and I invariably found myself cut off from access to the North Tsaya glacier by vertical walls some hundreds of feet high. We therefore resolved to seek a way round the North Tsaya icefall and follow the route indicated by Dr. Ronchetti in photographs sent me. On Monday, July 20, high camp was quitted at 1.5 a.m. Passing up the main Tsaya glacier, we climbed a steep snow- and scree-filled gully, which cuts off "Woolley's peak" from the ridge behind. This gives an easy access to the North Tsaya glacier above its formidable icefall. We then traversed this glacier in its whole length to the foot of the "Double Peak," or, as it stands at the head of the Bubis valley and glacier on the south-west side, it is, I think, preferable to call Bubis. The ascent was made to the dividing col of the chief peaks, mainly by the great couloir. This couloir is upwards of 3000 feet high, and is pitched at a very steep angle. Fortunately, owing to the late bad weather and heavy snowfall, the ice was covered for the most part with good adhesive snow. Late in the season, and in good weather, the route may easily be impossible. An attempt to utilize the ridge of the south peak had to be abandoned owing to the excessive steepness and also rottenness of the rocks.

In leaving these rocks for the couloir again an incident occurred which showed the necessity of the precautions adopted. The snow up here was thin and becoming treacherous. While crossing a space near the rocks the leader and last man on the 100-feet rope being both on rock the snow slipped off beneath the two central climbers. Fortunately the end men were watching, and the others were stopped with comparative ease. From the col, reached about twelve noon, a short climb up a corniced ridge led to the summit of the south peak. This consists of a sharp rock point now covered with about 2 feet of fresh snow. It was impossible to detect any difference in height between this peak and its twin summit to the north. Its superiority in height over all the peaks of the group (except Adai) was very evident. Its only possible rival is the beautiful mountain, Karagom, on the other side of the Karagom *névé*.

The descent to the Karagom *névé* looked fairly easy, but this col could never be employed as a convenient passage for the Tsaya-Karagom watershed. The best pass may possibly be found between Bubis and Tvilisis-Mta, but this would be a double pass, across the top of the Bubis glacier, before reaching Karagom *névé*. Probably the actual easiest, though a very high pass—over 14,000 feet—will be by Dr. Ronchetti's route of ascent to the south ridge of Adai. The return route was to a great extent by the route of ascent. High camp was not regained until after dark. The condition of the snow on the glacier remained very troublesome, crusted, and bad all day and night, and rendered the ascent extremely laborious and fatiguing. The magnificent scenery of the North Tsaya and Karagom glaciers, and the successful assault of the fine peak

of Bubis amply compensated for all this. Most impressive views were obtained of the tremendous black cliffs of Tshantshakhi's north-east face which dominates the south corner of the North Tsaya glacier.

An expedition which was planned to combine the ascent of Tsaya Khokh with the passage of the Tsaya Col to Kamunta was frustrated by a tremendous cloud-burst which struck the range on July 22. The rain was the heaviest I have ever seen and did a lot of damage in Tsaya forest, many pine trees being torn out by the roots and being carried into the Tsaya river by the water. The new bridge was also carried away. This involved the resumption of the old path which climbs up past the villages of Tsaya high above the gorge on the left bank.

On the 23rd we descended to St. Nikolai by this route. These villages are poor, the scanty clothing of the children—some wore none—is ragged. The men were engaged in a kind of shooting match. We met numbers of the children lower down who had been across to the Tsaya woods to gather bowls of very fine strawberries. They were very persistent merchants of these. Five versts below St. Nikolai the Sadon valley comes in on the left. We turned up this. Blasting for the new electric waterpower track was going on, and many men were at work rebuilding the washed-out road. Numbers of these men were Turks, with red fezzes, from beyond Armenia.

Sadon village looked as though recently bombarded. Many houses destroyed, others with fronts or sides cut away, giving a view into the interior where domestic work was calmly being proceeded with in public. There is a good store or "dukhan" here, where excellent Russian bread was bought. Many other things are to be had also. We got across the stream here by a long plank, but a good deal of difficulty was experienced in getting the horses over the swift current, one being almost washed away off its feet. Owing to the destruction of the bridges, the "trek" up the Sadon valley to below Sgid was troublesome. We camped here for the night in a disagreeable drizzle of rain. It was wonderful to notice, however, how quickly our horsemen produced a good fire with most unpromising sodden green bushes.

The next day's walk was over the Sadon pass, 8000 feet, to Kamunta. Sgid is a fair-sized village with a good new schoolhouse. A man here had a fox cub as a pet. The country above is bare green hills covered with very rich grass. On the north rise the battlemented limestone mountains of Kion Khokh and its neighbours. The Tsaya ridge to the south was mostly enveloped in clouds. The track is good, and easy going for the horses, though muddy in places with the recent heavy rains. A long ridge of soft dark shale leads down to the stronghold village of Kamunta in the Urukh basin. All wood and water must be carried up to this village from far below. The houses are built of enormous blocks of stone, cyclopean walls without mortar. In the cemetery above the village the corpses of the former inhabitants can be seen, lying in rows,

through large holes in the stone mausoleums. We stayed here along with two Russian travellers in a single small room belonging to the dukhan keeper. I was here surprised to find, along with several other books, a Russian treatise on aviation!

On July 25 we walked from Kamunta to Dsinago, descending the valley of the Agamugi by quite a good road, on which it would be possible to drive in a *lineika* to its junction with the Urukh river; then up this river to Dsinago. This is a semi-Mohammedan village, and we passed several inhabitants engaged in evening prayer along the roadside. There is a veterinary post here in charge of a Dr. Sergius Alexandrovitch Iokelson, to whom we introduced ourselves, and were invited by him to camp in the enclosure, and did so later. Now, however, we were bound higher, and only stayed long enough for a meal, and to hire four donkeys to convey baggage to a camp as far up the right bank of the Karagom glacier as possible. These donkeys are sturdy little beasts and very strong. Unfortunately, they seem to fancy themselves as singers and as cocks, and evening and dawn in this valley is rendered an aural inferno with their rasping brays.

The country at Dsinago is a fairly wide valley-flat, with a good deal of cultivation. A few versts above, the track enters a fine forest of pines, and climbs up steeply, soon mounting high above the moraine-covered ice-tongue of the Karagom glacier. We pitched tents in a small flat behind the right moraine, where many signs of other camps already existed.

On the following morning I walked up the glacier for a couple of miles till the icefall became too complicated and difficult for further progress. The remains of a hooded crow seen here. The Karagom icefall is a magnificent sight, pouring out of huge rock portals on either side in a tumbled mass of seracs. The upper fall is not less, I think, than 2000 feet high. The whole nearly 4000 feet. Sharp high rock peaks streaming with snow and hanging glaciers rise on all sides. There are quite distinct traces of the path, which here descends the moraine for the crossing to the Fastag glen and the Gurdzivzek to Gebi.

On the 27th we left at 8 a.m. for a high camp to explore the northern peaks of Karagom.

In about two hours, partly by moraine, partly on the glacier itself, we reached an exquisite little tarn which is well called "The Blue Lake." It occupies a space dammed up by the moraine with steep rocks on its east side. Beyond this the side hills fall back, and a wide grassy space of alternate ridges and flats of ancient moraines covered with rhododendron or turf comes into view. We climbed the grass slopes in the direction of the north Karagom glacier to a height of 9000 feet, and here pitched the high camp. The spot was a small flat just below a chaos of gigantic boulders. I prospected in the afternoon 1000 feet higher to the moraine of the glacier, but could not see over the ridge Saudor running up to join the great wall of Karagom. We left high camp at 1.15 a.m. on

July 28, and ascended to the right moraine of the north Karagom glacier; then steep screes, ice-slopes, and rocks to the narrow and corniced ridge of Saudor. From here (about 12,000 feet) Skatikom (14,600 feet) is not visible on account of a sharp little three-peaked mountain rising on the Karagom ridge.

Turning due south along the ridge we crossed a col, found a way through a small hanging glacier, and gained the watershed ridge at a snowy hump (about 13,000 feet). Turning at right angles to the east, we climbed along the watershed ridge over a number of steep and sharp rock towers. Three separate tops were ascended. From the last only did the grand peak of Skatikom become visible on the other side of a wide, deep depression connecting Karagom *névé* with Skatikom *névé*. The height here was about 13,600–13,700 feet. Fine views of all the Karagom peaks. Adai-Khokh looks very well here, and easily shows its dominance. This peak I have ventured to name Vologata, though its connection with that glacier is not very direct. It is really in the Skatikom basin. As the day was yet young, 11.20 a.m., we now resolved to attempt the ascent of the highest point on this massif. This is the east summit of Karagom, and accordingly we retraced our steps to the snow hump at the junction of the Saudor ridge. Thence a descent of about 300 to 400 feet placed us on the col below that peak, height about 12,700 feet. The 2100 feet thence to the top of Karagom gave some interesting climbing, mostly on a corniced ice arête where considerable care, judgment, and labour was necessary in dealing with the frequently unstable snow surface. The first rocky top reached proved not to be the highest point. That was not gained till 4.45 p.m. The west summit was fully a verst distant and is distinctly lower.

Most splendid views of all Adai peaks, and of the giants Dykhtau, Koshtantau, and the other central peaks. The return journey, begun at 5.15 p.m., was hastened by a most threatening appearance of the western heavens. It was delayed by the very bad and soft state of the snow. Only the outskirts of the storm really reached our length, but the sunset seen from the Saudor ridge at 12,000 feet surpassed anything any one of us had ever seen in his life, of sublimity and awful grandeur. The vast black clouds hanging over the huge cones of Dychtau and Koshtautau, rent in every direction by the zigzags of the lightning, seemed to take fire as the sun dipped, and the whole spectacle was that of a world in flames. Owing to bad snow and difficulties on the moraine in the dark, we did not get back to camp till nearly midnight. It was a hard day of twenty-four hours, but a very repaying one.

The following morning we shifted the light camp down to Karagom camp, bathed and rested. Next day went down to Dsinago, where we camped in Dr. Iokelson's enclosure. Dsinago is a good place for provisions. We got eggs at 1 ruble for 100, and the bread was well baked, of wheat with a proportion of rye. This village is an excellent centre for

mountain excursions and ascents; it is also at the foot of one of the easiest glacier passes across the main chain. Transport is abundant and prices reasonable. It is certain to develop largely in the future.

We now resolved to pay a visit to the Laboda group, the highest summit of which, Laboda, had not yet been ascended. Messrs. Dent and Woolley had ascended Ziteli, a lower point of the group, in 1895, and Mr. Dent's map accompanying his paper, with his admirable description, shows the route very clearly. Our ascent of Laboda was made from a high camp on the left moraine of the Tana glacier on August 1. It was by the east ridge, of rock mainly. The actual summit is a high cornice of snow, about 80 feet above the last rocks. The height of this peak is 14,170 feet.

Unfortunately, it was misty on the summit and only very partial views were obtained. It should form an admirable view-point for the Central Caucasian peaks, rising as it does immediately south of the Shtuluvzek, and neighbouring not remotely the great masses of Shkara and Dykhtau. The climb was interesting and very steep, though the difficulties were not serious. On our return to Stir Digor from Laboda, on August 2, we got the first muttering, though we then failed to realize this, of the great war so soon to sweep over Europe. One of our porters, who could speak a few words of English (picked up on the Vancouver railway), said, as we paid him off, "My brother, he soldier, he go way. I do' know." Again, the horses ordered for next morning at four were, late at night, said not to be available, owing to all horses requiring to be inspected by the military authorities. On my insisting on contracts already made being carried out we eventually got them.

It was not until reaching the railway at Elchatova station, however, that we learned of war's actual outbreak. The railway was in the hands of the military authorities, all trains said to be stopped except troop trains, pouring men *south*. "Austria had attacked Servia, and Russia was going to fight *Germany* in her defence."

What affected the Caucasus more was that the scoundrelly adventurers in German pay, who ruled at Constantinople, were expected to throw Turkey at once at Russia's Asiatic frontier.

The expedition eventually got back to London in three weeks, after a slow and roundabout but very interesting journey through the Sea of Azof and the Black sea (from Rostov), the Crimea, Odessa, Varna, Constantinople, Greece, Italy, Switzerland, and France. Though thus only half the Caucasian programme was accomplished, the information gained of the Adai group was tolerably complete.

The PRESIDENT (before the paper): I must, in the first place, point out that the Caucasus to which our attention is turned to-night is not the region which is now a seat of war. It is somewhat unfortunate that the expression "the Caucasus" is commonly used in this country in two different senses—a political and a geo-

graphical one. In the political sense it covers the portion of the Caucasian isthmus that forms part of the provincial administration seated at Tiflis, and includes Georgia and a large portion of Armenia. It is in the Armenian highlands that fighting is now going on. In a geographical sense the Caucasus is a mountain range. The distinction is well marked in the *Encyclopædia Britannica* by the use of Caucasia for the political province, and Caucasus for the chain. Now, the mountain chain of the Caucasus may be simply figured by a letter Y, the stem being to the west towards the Black sea. Its whole length is about 650 miles, and that of the stem about 300. The inside of the fork of the Y is occupied by a highland district, known as Daghestan, the Mountain Land, formerly the home of Schamyl. The Chetchens, who are now fighting for Russia in Poland, were among his followers. To-night we are dealing only with the stem of the Y, and only with a little knot on that.

Before, however, Mr. Raeburn reads his paper, I may make some brief remarks on a region I know well. It is forty-six years to-night since I gave the Society what I may venture to describe as the first authentic account of the "Frosty Caucasus." This evening I limit myself to one point—the relation between the geology of the region and its river-courses and passes. This relation is curious and has often been imperfectly appreciated. The Central Caucasus is not, as is sometimes stated, a single ridge. It is nearly as broad as the Alps, say, at the St. Gothard. Roughly speaking, it consists of three parallel ridges, a central crest of granite with fringes broader on the north than on the south, of crystalline schists. These are bordered on the north by a limestone range and on the south by a range of Palæozoic slates. You may notice that from north of Sukhum Kale the granites form the watershed as far east as the river Ardon. From this point, first the Ardon and then the Terek break through the granite. Farther west each northern river has made a fine gorge through the limestone, but these two have still deeper ones through the granite, one of which is the famous Dariel. This was the Caucasian pass known to the Romans, and in the centre of the gorge stood the castle of Queen Tamara, which succeeded a Roman fort.

Now let us look at the consequences on human traffic. The central granite crest for 100 miles nowhere falls below 10,000 feet and is uniformly rugged and glacier-clad. Consequently, the two military passes practical for wheels, break through it by the gorges of the Ardon and the Terek and then find a much easier watershed. The famous Cross pass to Georgia and Tiflis creeps under Kasbek and goes over the southern slates; the Mamison pass leading to Imeritia and the Black sea slips over the bank of soft schists that links up the watershed where it is transferred from the granite to the slates. One other detail I may mention. Between the military horse-track of the Klukhor, leading to Sukhum Kale, and the Mamison there is no pass not over glacier, but there are places where the glaciers can be traversed by cattle and horses, as the Zermatt St. Theodul was in early times. One of these horse-passes was marked on old Russian maps as the Pass Mta, and since it is exactly over the source of the ancient Phasis it is at least pleasant to think we have here a link with the Golden Fleece. You can now recognize the important position of the Adai Khokh group. It stands at the point where the granite range is first broken on its eastern flank by the Kassara gorge. It is one of the principal groups, or massifs, of the Central Caucasus, the others being the Elbruz spur, the Ushba group, the Dykhtau group, and the Kasbek group. Its highest peak is about the same height as Monte Rosa. It contains one of the finest glaciers in the whole chain, the Karagom. I described the first and as yet only passage of its icefall, nearly 4000 feet high, forty-six years ago. The peaks above it I left to my successors, and Mr. Raeburn will describe them to you to-night.

The PRESIDENT (after the paper): I am sorry to say we have had several disappointments. We hoped to have had here Dr. Felix Oswald, who has studied the geology of the Caucasus and constructed a very detailed map illustrating it. If there is no one here who is anxious, or able, to take part in the discussion of Mr. Raeburn's paper, I will add a few words from my own knowledge of this region. In the first place I desire that we should not go away to-night without paying the thanks that are due to the Russian Government for the consistent courtesy which during the last fifty years they have shown to English travellers in the Caucasus, and that at times when the political relations between the two countries were very different from what they are now. English travellers in the Caucasus have been received by the local officials with a kindness altogether surprising; not only have Cossacks been put at their disposal to help in the villages, or to bring up letters from the post two or three days' journey off; not only have these facilities been granted us, but we mountaineers have also had put at our disposal privately-published maps and even manuscript provisional sheets of the surveys in progress. Thus we have been enabled to bring to the notice of Western Europe authentic maps of the Caucasus earlier than would otherwise have been possible. I would also include in this expression of thanks the native princes, as they are termed—they are really somewhat in the position of Highland chiefs—who have always been extremely good to English travellers. I was much touched two years ago ago (1889 was the last year I was in the Caucasus) by receiving a message from the Prince of Suanetia that he hoped I would soon come again, if I was not too old, and at any rate that I would send some of my countrymen.

The paper we have heard to-night has been in the main, of course, a mountaineering paper—and mountaineering, if it helps to topographical exploration, may seem not to have much direct scientific result. In the case of the Caucasus it has had this practical result; it has added a new playground to Europe, and, as the Alps get more and more overcrowded, it is a great thing that there should be no further off from us in time than the Tyrol was when I was a boy, mountains where we can enjoy real primitive travel—change of life and of company as well as change of scene. There are many attractive aspects of this country which it would be impossible to go into to-night, but which are interesting to scientists of different kinds. The Caucasus, of course, is a great field for the botanist; it is also an extraordinary field for the ethnologist. The Ossetes who live about Adai Khokh have many curious customs and legal institutions, which were dealt with by Mr. Delmar Morgan, who was for a long time a member of our Council, in a translation of a paper by Prof. Kovalevsky, published in the *Proceedings* of the Asiatic Society. One point which has struck me in the paper read was the illustration it afforded of the origin and growth of human feeling towards mountains. We are often told there were no relations between men and mountains in the old days except those of dread and dislike; I do not believe that this is true. In a paper which I read to the British Association ten years ago, I argued that the feeling for mountains is a very old and primitive instinct. To-night we have wandered in a primitive country, and seen the way the snowy mountains are regarded by the dwellers round them. We find first, the simpler uses—the shepherd and the hunter camped by the side of the glacier; then we come to the shrine of Rekom, which has been a great place of pilgrimage from old days, where worship has been carried on to the spirit of nature; and lastly, we meet with this very curious practice of visitors from the plains coming up for glacier air, and living in the hollows of the rocks and enjoying a regular health-cure. Here then you catch primitive relations between men and mountains in an earlier stage than you get them in the Alps, where, even in the Middle Ages, there were monasteries for recluses, and bath-houses for invalids.

A great deal has been added to our knowledge to-night as to the details of this glacier group of Adai Khokh. It is a noble group; it has scenery and mountains which are quite on a parallel with any of the Alpine groups we are familiar with, and it offers a very fine field for climbers and travellers. I think we shall all agree in being anxious to pass a hearty vote of thanks to Mr. Raeburn for the trouble he has taken in preparing this paper, and the very excellent and practically final map which will accompany it when published.

SUBMARINE SLOPES.*

By Professor J. STANLEY GARDINER, F.R.S.

Off all lands there is a comparatively gentle slope which runs down to about 100 fathoms, with a steeper inclination to some depth between 200 and 400 fathoms. Beyond this the inclination becomes still smaller, passing gradually down to 2500 fathoms, or whatever is the depth of the ocean in the vicinity.

Off continents—and particularly off those continents which fringe the Atlantic ocean—this first shelf to 100 fathoms, or thereabouts, is broad, and it is usually termed the *continental shelf*. Landward of this we have the coast, and it may be a precipitous coast, or it may show an almost continuous platform from 0 to about 100 feet above the high-tide level. The latter condition is common off the North Atlantic and the North Polar sea, and the platform has been supposed to be a typical structure of general distribution; it is known as the *continental*, or *coast*, *platform* or *plain;* it need not concern us further, except that we may point out that it is neither an universal nor even a general feature around other oceans than the Atlantic, nor even on the west side of the Atlantic.

The inclination of the continental shelf varies with its breadth. If it were a mile or 1000 fathoms broad its inclination would be less than 6° ; while actually off no continent is the shelf less than several miles broad, and even an inclination of 1° is rare.

Perhaps a chart of the Bay of Biscay illustrates the continental shelf as well as any. North of the Bay of Biscay it is nearly 100 miles broad, while south of the bay it is about as narrow as off any continent, being in one place only about 5 miles across; off Portugal it is also narrow. To the north it broadens round the British Isles, merging into the Wyville-Thomson ridge, which connects Scotland to the Faroes, Iceland, and Greenland. North of this line lies an enclosed sea rather than an ocean. The shelf is narrow off Norway, accompanied by deep cutting fjords;

* Royal Geographical Society, November 19, 1914.

off Greenland it is fairly broad, while off the north of America and Euro-Asia it is very broad. Through the whole of this North Atlantic region, where the continental shelf attains its maximum development, the depth of its edge is about 80 fathoms, not 100 fathoms which elsewhere is perhaps the most commonly found depth; whatever depth it may be, it almost coincides with the so-called "mud-line."

To seaward from the edge of the continental shelf is a first slope to some depth between 200 and 400 fathoms. Its angle of dip shows great

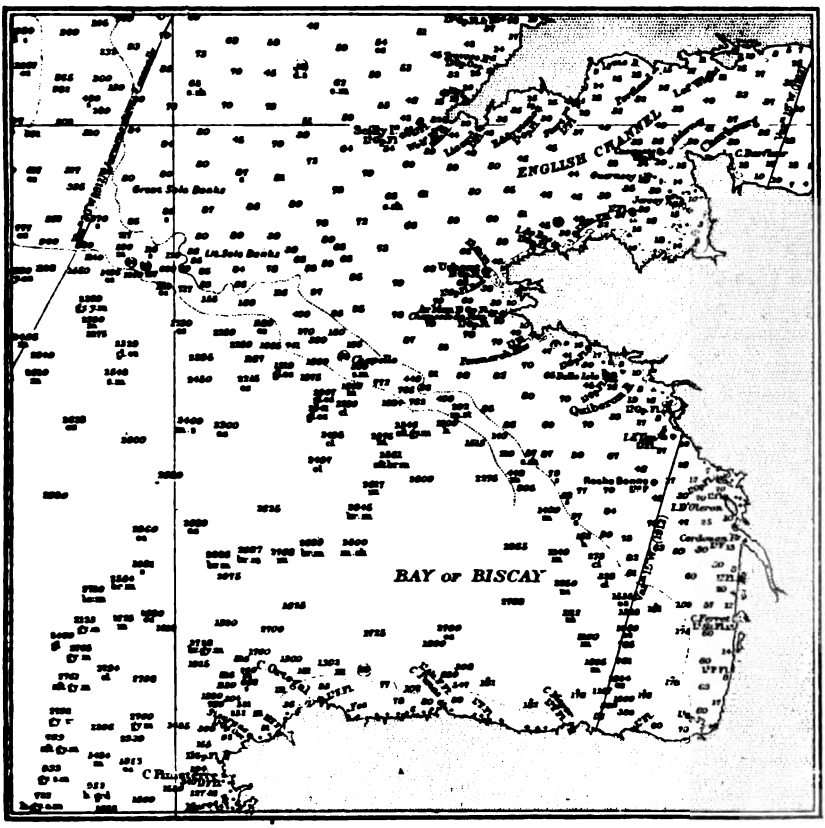


CHART OF THE BAY OF BISCAY AND ENGLISH CHANNEL.

variation, but its slope is markedly steeper everywhere than that of the continental shelf connecting it to the land. Surveyors, when at work for navigational purposes, put down a multiplicity of soundings in depths below 100 fathoms, but off coasts, when they reach this depth, at once turn towards the land. Any line of soundings outside is run as the ship is on passage to her base port and without reference to the lines of soundings inside. As the surveyor gets farther from land, accuracy is more difficult to attain, as three fixed points on the land for bearings are

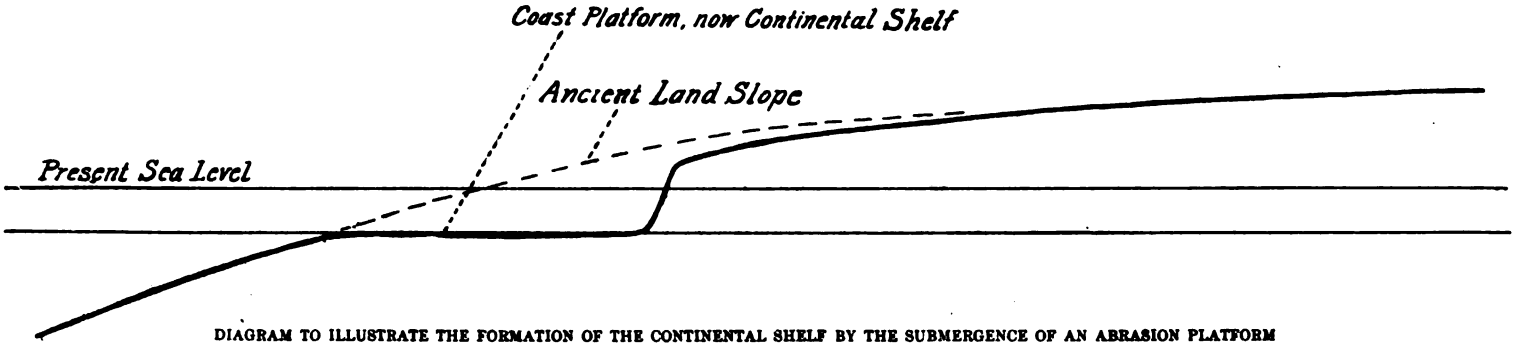


DIAGRAM TO ILLUSTRATE THE FORMATION OF THE CONTINENTAL SHELF BY THE SUBMERGENCE OF AN ABRASION PLATFORM

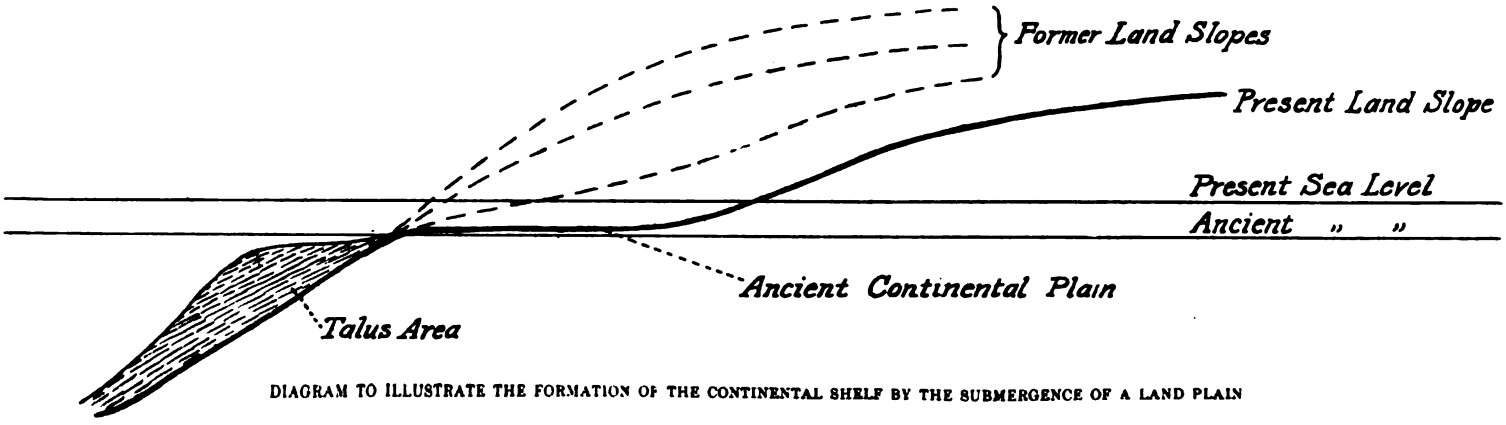


DIAGRAM TO ILLUSTRATE THE FORMATION OF THE CONTINENTAL SHELF BY THE SUBMERGENCE OF A LAND PLAIN

seldom visible. It is accordingly difficult to determine this slope off the edge of the continental shelf with accuracy, but it is clear that 5°, or 100 fathoms in 1250 fathoms, is exceptionally steep in the North Atlantic. Such a slope of 5° is seldom exceeded even in other parts of the world off continents, except where the coasts are fringed or barred by such organic growths as are termed "coral reefs."

The further slope to the bottom varies. It is not unusual to find a platform succeeded by a marked steep for 100–300 fathoms at the bottom of this first steep, but generally continents tail off with an increasingly gradual slope to the abysmal depth, 2000 or 3000 fathoms, or whatever it may be. About 7½ per cent. of the ocean floor lies within the 100-fathoms line, while the percentage between the 100-fathoms line and the 1000-fathoms line is about the same.

To summarize we have (*a*) the continental shelf extending to 80, 100, or 120 fathoms or even deeper, succeeded by (*b*) a steep to about 300 fathoms, which may tail off to the abysmal depth, or be succeeded by one or more shelves with steeps between.

The above are well-known facts restated here by way of introduction. Continents may be assumed to be more or less permanent in a geographical sense (not geological), while, as you will see, I am mainly concerned with slopes off recent oceanic islands, the study of which may, I hope, throw light on their formation, as well as on the actions of the sea at present in progress.

I must also give, somewhat crudely for the sake of clearness, the chief theories as to how continental shelves may have been formed :—

A. An *abrasion platform* might be cut by marine denudation, possibly accompanied by slow submergence, in any case subsequently submerged. In fact, a coast platform is submerged to form the continental shelf. As an objection to this view may be mentioned the great breadth of the supposed abrasion platform as indicated by that of the continental shelf, on which waves should completely lose their forces before reaching the land. Indeed, the waves might be expected to pile up the products of abrasion against the land, thus protecting it. The formation of a continental shelf in such a manner is more easily understandable on an already dissected coast. It is conceivable, too, that a similar shelf could be formed without submergence.

B. *Submergence of a land plain.*—A land at a fixed level for a long period of time is gradually eroded towards a base level. This stage of maturity is first reached near the coast, so that a gently rising plain is formed, while there may be mountains inland. Such a plain becomes the continental shelf by submergence. To seaward there would be a distinct area of talus, and in consequence there should be a steeper slope. On this view of the formation of the continental shelf there should be no abrupt incision, but the slopes above and below the sea-level should pass gradually into one another.

These two views both imply either submergence or other change of level of the continent in respect to the sea. That there has been submergence of the land on either side of the North Atlantic is, I consider, clear, as there are numerous deep-cutting canals, submarine cañons, opposite many rivers, and deep-cut bights or straits. Some of the cañons, as those of the Congo and Adour and as many off North America, are particularly remarkable. While the central deeper parts of the English channel and of the Irish sea might conceivably be explained by scouring,

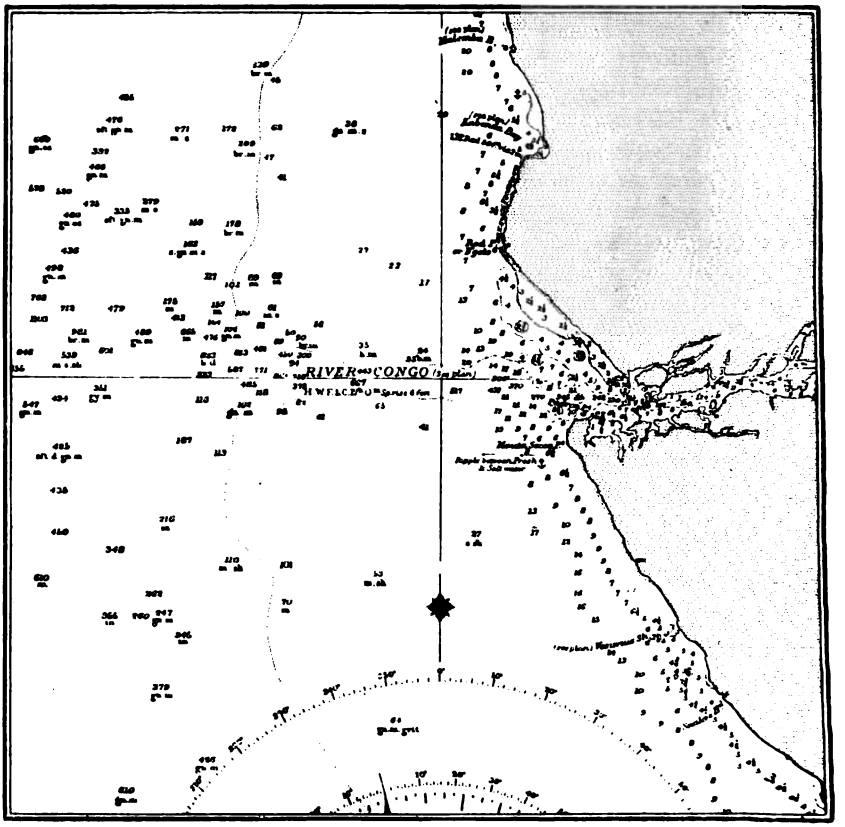


CHART OF THE CONGO CAÑON.

they can only, in the present state of our knowledge, be regarded as indicating submergence.

The submergence of 3000 to 5000 feet required in some places, such as off the Congo,* where 750 fathoms is found well within the line con-

* It is quite inconceivable that a river of fresh water flowing into heavier salt water could cut for itself a deep channel below the surface of the sea. At most it might keep open a channel which might become more marked in a partly enclosed

necting the 100-fathoms lines north and south, presents peculiar difficulties in relation to the continental shelf, for it can only be explained by a real subsidence of the whole coast-line, not by faulting. In the North Atlantic there have been, however, so many oscillations of level that it is not improbable that the continental shelf largely owes its origin to the above causes.

C. *Glacial drift.*—Material being deposited on the bottom where the ice melts along coasts of ice-covered lands, or where drifted land ice melts. The best example of this method of the formation of a continental shelf is seen in the banks of Newfoundland, where the icebergs of Davis straits get stranded and deposit their loads of rocks. To some degree such shelves are found off all lands once glaciated, being submarine terraces off their coasts.

D. *Continential shelves by sea deposits*, the terrigenous waste being deposited as near any coast as the depth and movements of the sea allow. In course of time such depositions must result in the formation of continental shelves. This method may and probably must coexist with any of the former and help to mould its submarine slope. The depth of the edge of the shelf depends on the depth to which the seas off coasts are sufficiently moved by waves, tides, and currents to transport the land waste. On the coast of an enclosed sea the edge will be at a much shallower depth than where in the open ocean waves, tides and currents may scour to great depths. By the land rocks, if split off, would be broken into pebbles, themselves to be powdered to sand. Coarse grains would gradually be ground into mud. This would be carried further and further seaward until finally the motion of the water is insufficient to move its particles. The edge of the continental shelf would correspond with the "mud line," and the slope to seaward would be expected to represent the angle at which such mud would lie. To seaward the mud should gradually merge into ooze, but actually a considerable area of hard bottom frequently intervenes.

In discussing this view, let us start by considering the vertical distribution of wind-wave movements. Trawlers are agreed that in moderate winds (3–4 on the Beaufort Scale) the bottom at 20 fathoms is churned up in the North sea, while after heavy gales much seaweed, etc., is brought up from 40–50 fathoms. Other trawler observations to

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sea by the deposition of mud on either side, even the extension of a great delta seawards (cf. Mississippi river). The forces of the waves and currents in open oceans prevent the formation of great deltas, but it is conceivable that at the sides of a channel through the continental shelf the deposition of river-carried mud might accentuate the cañon appearance of that channel; the Congo may be a case of this, but its submarine channel was assuredly due to submergence.

It must also be remembered that submergence may be caused by subsidence, by an increase of water in an ocean, or by an increase of attraction of the water towards any shore owing to elevation of the land behind that shore, the oceans being in reality shallow basins.

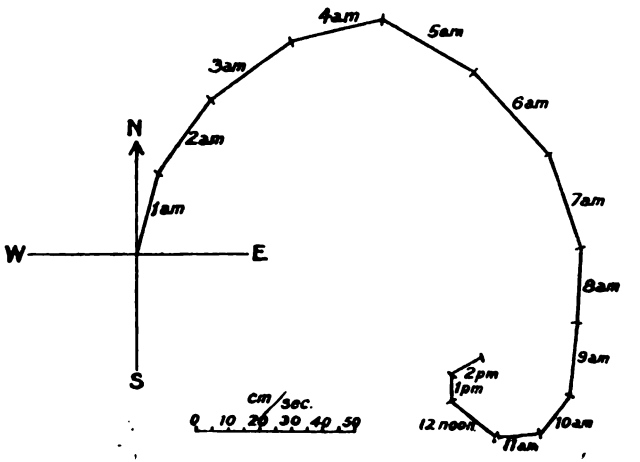
the north of these isles point to slight, but appreciable, movements to 60–100 fathoms, or even deeper, in accordance with the openness of the ocean, etc. This approaches, and indeed is in striking uniformity with, the depth of the edge of the continental shelf.*

The regular oceanic surface currents, produced by winds or other causes, may have an influence on slopes, but they do not generally extend to depths beyond about 200 fathoms. They may affect islands round which they swirl, but they generally act rather in banking backwaters against continental slopes than in directly affecting them. The banking is of course mainly a banking downwards, and the effect, for instance, of the Gulf Stream off Scotland is felt in a higher temperature continuing down to 800 fathoms, a temperature which elsewhere is found at approximately 300 fathoms. Regular undercurrents, such as the creep of the colder polar waters to the equator, are so slow that they cannot have any appreciable effects.

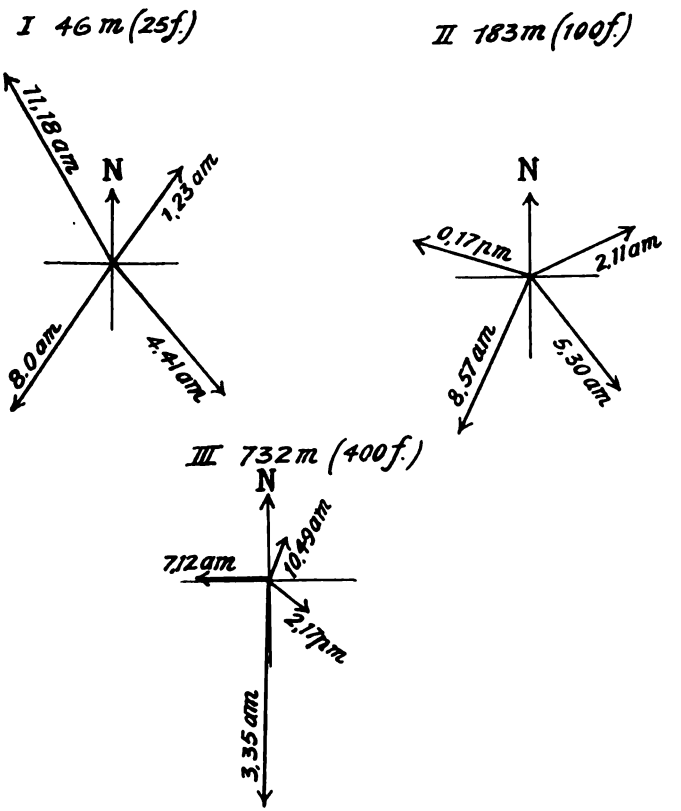
Next, we have to consider the effect of the tidal wave which, theoretically, from crest to crest is about 12,500 miles at the equator, while it actually approaches a length of 6000 miles in the great Southern ocean. Its effects are felt in the land as well as in the water, earth tides being quite appreciable and easily recognizable and measurable. In the Southern ocean the tidal wave has almost an open course round the world, being a forced wave dependent on constant external forces. In other oceans there is a free wave, generated by the above forced wave, and weakened, or reinforced, by the forced wave, which travels east to west in each. Such points require to be taken into consideration in studying the movements of the ocean at any spot, but it is essential to remember that in most parts of all oceans we are dealing with a wave in *exceedingly shallow water*, viz. in water seldom as deep as one-thousandth of its wave-length. Theory, however, may not agree with observation, and deductions from observations in experimental tanks may not apply to basins 1000 fathoms or more in depth. Indeed, caution is peculiarly requisite in applying the theory of, and observations on, waves to movements of ocean waters at different depths.

Tides on meeting an obstacle are translated into currents, as are seen in the tidal currents round our coasts. Except in very shallow water, they are not generally supposed to have any marked effects in transporting material, which might otherwise be deposited on the bottom. A current which transports material along its bed can and does abrade that bed, but it may leave heavier masses of material along its course, and the

* Direct observations could only be obtained by a vessel at anchor for a long period in one spot and in a variety of weathers. Indeed, they are almost impracticable. Records received by me from trawlers off the south-west of England point to movements at upwards of 200 fathoms, but they are difficult to analyze. They may be undercurrents, not directly due to wind waves, but owing their formation to the piling up of water against the land. Similar currents, undertows, after heavy monsoon weather were found by me off Minikoi to 120 fathoms in 1889.



THE DIRECTIONS AND RATES OF FLOW OF THE TIDAL CURRENTS AT 10 METRES FOR 14 HOURS. Sth. OF THE AZORES, 600–600 Fms.

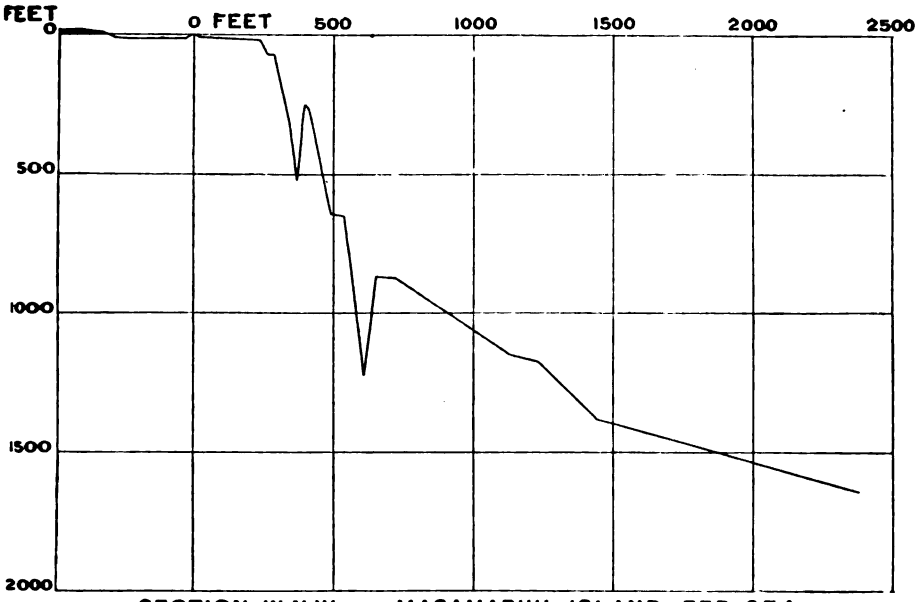


THE DIRECTIONS AND RATES OF FLOW OF THE TIDAL CURRENTS AT VARIOUS DEPTHS AT THE SAME STATION (SCALE TWICE THAT OF ABOVE.)

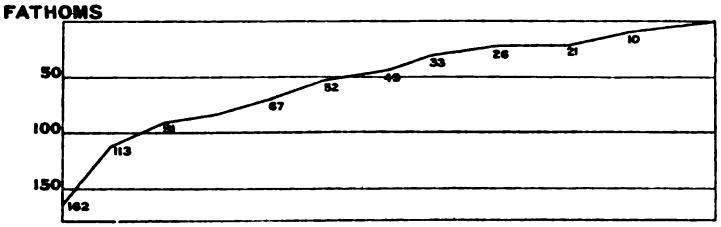
abrasion may for the most part be of this material rather than its underlying rocky bed. In the open ocean there is seldom such heavy material, and any abrasion must be of the underlying rock, if it be not protected by the remains of organisms.

Nansen and Hjort have shown that there are many forms of motion in the North Atlantic off Norway, horizontal currents of different sorts, vortices, and vertical oscillations, produced by the play of different forces, some tidal. Buchanan and Wolfenden made observations on tidal currents over the deep submerged Dacia and Gettysburg banks. Murray and Hjort carried them much further, and introduced considerable accuracy by the use of the Ekman current meter, which measures both direction and rate of flow of currents. Anchored in shallow water, they showed that the tides at different depths set to each point of the compass in the intervals between successive high tides. In addition they made a number of observations down to 1000 fathoms, allowing for the drift of their ship. These gave indications of currents of some speed, and showed accurately that their directions of set altered at intervals in a manner which can only be explained by their being tidal. They proved, indeed, the existence of deep tidal currents, nearly to the bottom in 500 fathoms, and to 1000 fathoms in a depth of over 2500 fathoms, the rates being $\frac{1}{2}$ and $\frac{1}{4}$ mile per hour. Such currents are quite sufficient to prevent the deposition of fine sediments, and they would be *greatly strengthened* over ridges and other elevations on the bottom. To them mainly is probably due the hard bottom found on the Wyville-Thomson ridge at 200–400 fathoms from the Orkneys to Iceland. They are complicated by an arm of the Gulf Stream in this region, and even yet few observers are disposed to allow over this ridge any material effect to this translation of the tidal wave into current, further pointing out that the wave is short and moving comparatively slowly, as the forced and free tidal waves are opposed to one another.

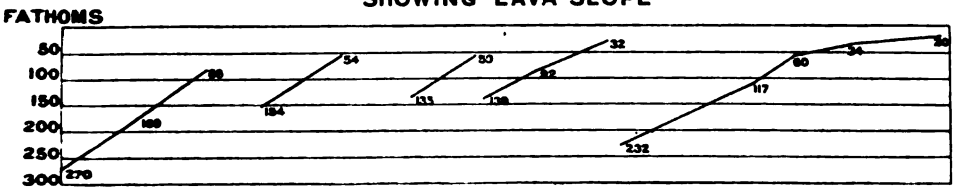
Yet we have through all oceans numerous soundings marked "hard bottom," and these particularly lie on any elevations even if only a few hundred fathoms above the general depth. The "hard bottom" is an inferred fact, as the sounding-tube has failed to bring up a sample, has come up dented, etc., or the snapper lead has secured nothing or perhaps has been broken. Often there are several "hard bottom" soundings in the same vicinity, and the lead is a 60-lb. one moving at 50–100 fathoms per minute. For recent soundings by the modern Lucas machine we must accept the inferred fact, which is further reinforced by a limited number of dredgings, some—my own, for instance—especially made with dredges with sharp swords, set at 45° or more. Manganese nodules freely form in the ocean, and in some cases it is possible that they are responsible for the "hard bottom." Their rate of accumulation must be slow, and I have not heard any suggestion to the effect that they are more abundant on elevations than in the deeper sea around. Indeed, the



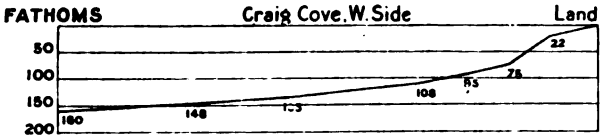
SECTION W.N.W OFF MASAMARHU ISLAND, RED SEA.

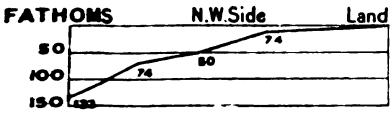


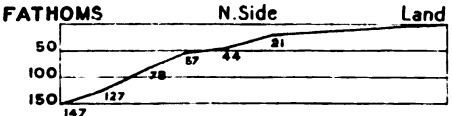
FUNCHAL BAY, MADEIRA. SECTION SHOWING LAVA SLOPE



PORTO SANTO BAY. SECTIONS SHOWING LAVA SLOPES







AMBRYM ISLAND, NEW HEBRIDES. SECTIONS SHOWING ASH SLOPES.

The section off Craig Cove is certainly that of an ash slope; the other two give no evidence of the nature of the bottom.

published suggestions are the other way, and I don't think I go too far in saying that this is generally supported by the result of dredgings. Under the circumstances, we are driven to explain these "hard bottoms" by the existence of currents. These currents, I suggest, are tidal, but the existence of specific-gravity currents, and of currents due to piling of water by winds, has to be remembered. The change in specific gravity is exceedingly slow, and any such currents would be too slow to account for a "hard bottom." Undercurrents due to wind-piling of water would not probably extend to any considerable depth. Their effect would be least in open oceans, and it is especially in open oceans where "hard bottoms" are found.

Tides, as seen in the rate of movement of the tidal wave, are greatest in open oceans, and I would ask you to bear this fact in mind in looking at the mass of sections, mostly off islands, which I have here, showing some of the most extraordinary slopes in the world. After their steepness, the prevalence of great areas between about 100 and 600 fathoms is their most striking feature. I may attempt to classify them so far as we can go :—

1. *Faulting slopes.*—A direct sinking of the earth on one side of a vertical split in the crust, as off Masamarhu island and the Brothers, both Red sea. There is fair evidence of such slopes, but less steep, having once existed off east Australia, now much masked by organic upgrowths in the form of reefs. Perhaps also faulting slopes occur also off the west of South America and in the East Indies, but there are not enough soundings to say. From the nature of the case such slopes are unlikely to have existed to any degree off oceanic islands, but it is probable that slopes similar to these have resulted from the direct upgrowth of corals and other sedentary organisms on suitable elevations of the ocean floor (cf. Dacia bank, Coral patch, etc.).

2. *Lava slopes.*—Generally convex with more or less of a cliff, varying in steepness with the constitution of the lava. Seen off many mid-Atlantic islands and in all volcanic groups.

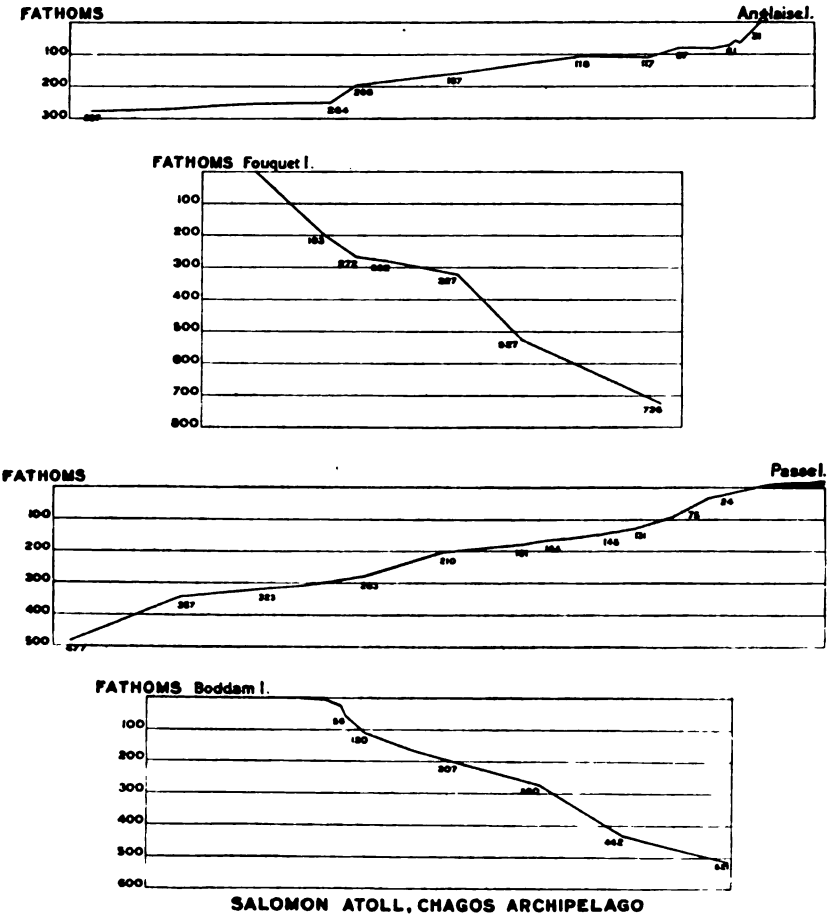
3. *Ash and mud slopes.*—The section of the bottom, more or less concave, as seen off Ambrym, New Hebrides, almost certainly represents an ash slope, while mud slopes are normally found where the continental shelf is extending seaward by the accumulation of talus.

Unfortunately, we don't know with certainty whether molten lava would split up under water, or whether ash would generally give a concave slope such as this. I confess that in these two slopes I am partially inferring from land slopes, though a large number of sections point to their existence. Off both classes of slopes there are soundings at 300–500 fathoms showing "hard bottom," but I have not got enough such soundings to establish the generality of this character.

4. *Organically-formed slopes.*—Here we have some admirable sections. All show a comparatively gradual slope to 30–50 fathoms, followed by a

steep to 120–250 fathoms. Then there is sometimes a less inclination, almost a second shelf, to 250–400 fathoms, followed by a second steep of 100 fathoms or so; and finally a tailing off to the bottom, 2000 fathoms or whatever it may be, gradually becoming less steep.

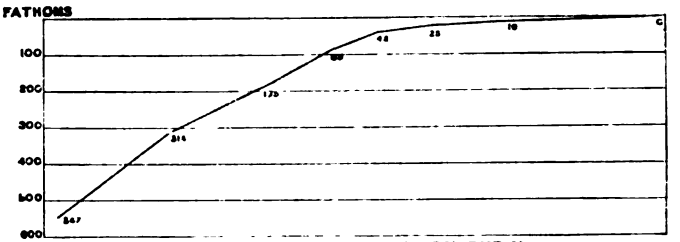
The top slope to 30–50 fathoms is covered by growing corals, plants, and other sedentary organisms. The steep to 120–250 fathoms has also



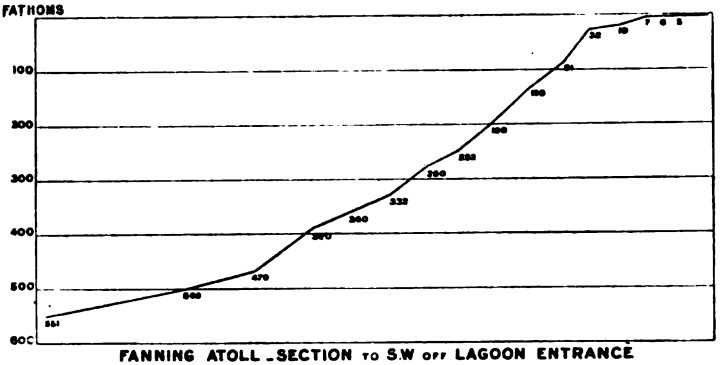
SALOMON ATOLL, CHAGOS ARCHIPELAGO

various branching growths of animals, but is mainly formed by the rough, rugged coral and other growths of the top slope; its inclination in the western Indian ocean certainly represents the angle at which this material may pile up under the sea. It is constantly by talus extending further and further seaward.*

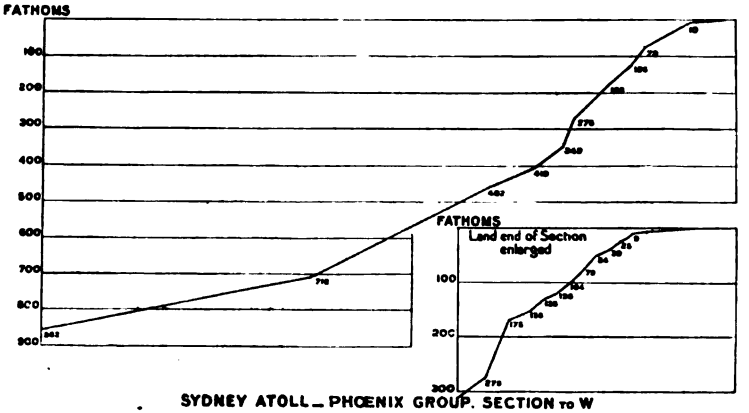
* While the continental shelf may in places be formed by talus, there are no known sections off it where comparable slopes occur in the absence of organically formed banks.



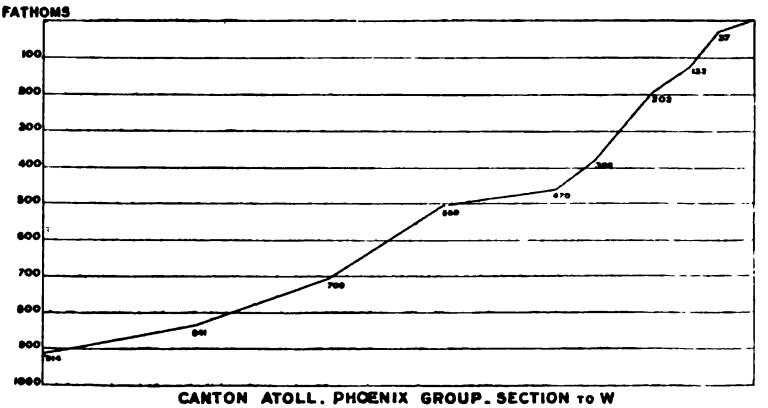
FARQUHAR ATOLL - SECTION DUE N



FANNING ATOLL - SECTION TO S.W OFF LAGOON ENTRANCE



SYDNEY ATOLL - PHOENIX GROUP. SECTION TO W



CANTON ATOLL. PHOENIX GROUP. SECTION TO W

(The horizontal and vertical scales are the same in all sections.)

The further slope may be convex or concave; that off Farquhar and off some other banks in the Indian ocean, obtained by H.M.S. *Sealark*, are convex, while the majority of slopes off coral islets in the Pacific ocean are concave. Whether these slopes are due to underlying bases of lava and ash (or mud) or other causes is at present impossible to determine.

The second shelf at 150–400 fathoms, or between these limits, shows smaller fragments of the same material as forms the above talus slope together with growing sedentary organisms in places. The second steep, and outside this to some depth, which increases with exposure of the whole bank to full oceanic conditions, but runs roughly to 600–800 fathoms, is almost all "hard bottom." * Dredging shows that it is fairly smooth. It should have over it smaller and smaller material until we get to deposits of coral mud, Pteropod and Globigerina oozes. Pieces of rock have been torn off a few times, and are mostly coral detrital material. One mass had a thin surface covering of manganese. Half a ton from one dredging from 740 fathoms was composed of land mud consolidated and covered with manganese, some in nodules. It was all polished and smooth.

The inferred fact that we are driven to is that there is some physical agency, clearly a current, extending to a depth of several hundred fathoms that sweeps the bottom clean round oceanic islands. We should be happier if we could refer such currents to known physical causes. Do I go too far in suggesting that we have in the tides a universal agency, which has moulded to a large degree the forms of the submarine slopes of oceanic islands, be they volcanic or organically formed? Round isolated land units in the deep sea, such as most oceanic islands are, they might well show maximum effects, for in the deep oceans the tidal waves reach their maximum lengths.

Probably in the present state of our knowledge I am rash, if a stronger term be not used, in suggesting the existence of submarine currents with strengths of which at present we have no conception. However, the matter is one which must be brought forward, if necessary progress in the collection of facts is to be achieved. It is extraordinary how few good sections of submarine slopes are available. Our own naval surveyors, stimulated by the late Admiral Sir W. L. Wharton, have given us some very excellent sections off islands, but off continents we have almost none of sufficient closeness of sounding to be of any value at all. May I be allowed to appeal that the oceanographer may some day, I trust in the not too distant future, after the tempest of war has rolled away, be put in

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* In charts of isolated islets the few soundings which give any record of the nature of the bottom from 50 to 500 fathoms are striking. This means that no bottom samples were obtained from which the nature of the bottom could be definitely stated. On H.M.S. *Sealark* in 1905 our records show sounding after sounding with no bottom record, though at times pieces of coral or calcareous alga were picked up.

possession of these facts, by means of which alone he can really consider the agencies which have moulded land with sea to form our present world?

The following discussion took place:—

Captain CARPENTER, R.N.: Prof. Gardiner's lecture has been most interesting to me, for I was for many years a naval surveyor, and I notice that he made use of some of my soundings. In taking a line of soundings out to 200 fathoms off a coast it is not very easy to fix positions exactly; you may easily be a little bit out, and that may make a difference in recording the proper slope.

With regard to the river Congo. I think that the shelf has been principally formed by the continued outflow of silt for generations, and that the strength of the stream has prevented any settlement of mud in the line of the flow, hence the banks have been piled up on either side of a deep trough. When sounding out the head of the Bay of Bengal I found the same sort of cañon. The waters of the rivers Ganges and Brahmaputra converge on this trough, and the soft mud in suspension is unable to settle. An interesting point was that the cold abyssal current that forms part of the circulation from the Antarctic ocean found its way up this cañon into comparatively shallow depths.

With regard to soundings taken on a current-swept shelf, it is difficult to get a true knowledge of the material of the bottom surface, for the leadsman always reports "rocky" when the lead on sounding tube brings nothing up. The only instance that occurs to me now is, that off the west coast of Southern India I found the shelf swept clean down to 100 fathoms.

On board H.M.S. *Challenger*, during her famous cruise, we frequently had an amusing argument with Prof. Wyville Thomson. When the trawl came up empty he would remark that it had not been to the bottom, whilst we, the officers who worked the trawl, maintained that there was nothing at the bottom to bring up.

One remark about the illustrations of sectional soundings in text-books. They are very deceiving owing to the necessity of exaggerating the heights or depths compared to the distances. In India, in 1889, when there was an exhibition by the Trigonometrical Survey, I thought to send them a plaster model of the Bay of Bengal which I had just sounded out. In moulding it to the real scale for distances and depths it gave practically no impression of an ocean basin, the depths appearing insignificant.

Rev. W. SPOTSWOOD GREEN: I am afraid I cannot say anything on the subject because, though I have been trawling out off the west coast of Ireland, I have not followed up the question of the lecturer to-night, who has had great opportunities. When trawling out to above 300 fathoms we come upon the edge of the slope, that sudden plunge down into the depths of the ocean. When we get beyond that slope we come to a comparatively level bottom at 1000 fathoms, and I have been trawling down to that depth. As far as my experience goes, which is only at odd times in three or four years, we got sand and mud out to about 50 to 100 miles from the shore, some places less. This was more or less of the nature of sand brought from the land, and we seldom got into any trouble with regard to the stones or rocks, but when we came to the edge of the slope and the plunge down began we lost our trawl several times; when we did get the trawl up we got polished boulders, some of them weighing a hundredweight, some so big they did not come up at all, but went through the net, and when we got beyond the slope we had the soft ooze which came up like whitewash in the trawl. The point which struck me is, so far as my experience goes off the west coast of Ireland, that the edge of that sudden dip down looks like a place that glaciers had moved out to in the old days, and dropped a kind of moraine on the edge. When we had got out as far as the sudden dip,

there seemed to have been evidence of an ice age, because the boulders look exactly like the boulders of a moraine, subangular, and unlike stones of the sea beach. These things struck me as worth following up, and I did bring home some of these large boulders, and we thought that we traced them to certain formations in Ireland. I have not thought of the subject very much, and it was of great interest to me, because when we were trawling there we had the matter often before us. With regard to the currents; I am not at all satisfied about the tidal currents causing these swirls (?) in the sea out far away from land, because I understand the tide would be a wave of elevation rather than transmission, and that that wave passing along caused currents only in narrow channels, but not so much in the open sea. Off the west coast of Ireland, where we have put down a dan buoy to lines, we were sometimes surprised to see how soon it goes under water with the tide pressure. I do not know whether the tidal current has very strong power out from the land; it might be it only goes about 100 miles off. It has struck me that it was the ocean currents, making kinds of convection currents as they move, that account for the swirls, because the Arctic water, for example, coming towards the equator, may come along in swirls and turn round the current meter in the way described, and not be the actual tidal current at all.

Dr. J. W. Evans: I should like to ask if Prof. Gardiner is aware of Mr. Mellard Reade's conclusions on the work of tidal currents in the neighbourhood of the British Islands (*Phil. Mag.*, vol. **25**, pp. 338-343, 1888; *Proc. Liverpool Geol. Soc.*, vol. **2**, pp. 50–72, 1874; *ib.*, vol. **5**, pp. 127–8, 1885). I quite agree with what Prof. Gardiner said as to the very great importance of tidal currents, but they are efficacious in shaping not only the sea bottom but also the coast-lines. When a shelf is formed by wave action on the coast it tends to protect the land from further loss, but where there are strong tidal currents sweeping along the coast, they will wear away the shelf and destroy the protection it affords to the land, and it is only where you have that conjunction of strong tidal currents and wave action that you get the very rapid destruction of the land which is characteristic of some parts of our eastern coast. The Straits of Dover, for example, are swept absolutely clear of all mud and fine sand, exactly in the way in which the author has described in other places, and I think personally there can be little doubt that the present width and depth of the straits is mainly due to tidal action. I shall be interested to see Prof. Gardiner's paper in print, and hope he will include some of the numerous illustrations he has shown us.

The President: I have wondered whether we should hear anything of the contours of the submarine mountains, and whether they at all resemble in their outlines those that meet our eyes on dry land.

Prof. Stanley Gardiner: The difficulty in laying off contours of submarine mountains lies in securing accuracy; the marine surveyor requires three fixed points, and he must either anchor beacons vertically or have fixed points on land. Many island groups form ranges of mountains, but their contours are affected as I have already indicated. Of submarine ranges perhaps the most interesting is that which Mr. Peake discovered to the east of Queensland, when he was surveying the route for the Pacific cable. It is of considerable breadth and length, but it would seem to be comparable to a plateau rather than to a range of mountains. Its outer contour lines are probably about the same distances apart as those of many mountain ranges, imagined complete before their subsequent dissection.

On isolated submarine mountains a large number of soundings have been run by Admiral Field to the north of Fiji, and by other surveyors elsewhere in the tropical waters of the Indian and Pacific oceans. Most of these mounds rise to within the 50-fathom line and are broadened out at their summits, their slopes partaking of

the same characters as those off coral reefs. To cable ships we owe the knowledge of mountains in the Atlantic, where coral reefs are absent; some appear to have almost vertical slopes around flat plateaus situated several hundred fathoms below the surface. An interesting feature of these deeply submerged mounds is that their presence is usually betrayed to the surveyor by movements in the surface waters over them. For instance, between Ceylon and Minikoi there is a small patch with depths of about 900 fathoms in an area about twice as deep. It is commonly mistaken by ships for a shallow-water area. I passed over it in 1899, in rather heavy weather, when the swirl and break of the seas exactly simulated what I would have expected over a bank 20 to 30 fathoms deep. I don't see what agency could produce these movements except tides, the possibilities of which I venture to think Mr. Green is rather inclined to minimize as well as the observations of the *Michael Sars*, which anyhow prove the existence of considerable currents at relatively great depths.

I was particularly obliged for the remarks of Captain Carpenter, for we owe so much to the *Challenger* and *Investigator*. However, the Congo must surely be considered with other cañons on the east side of the Atlantic. It is a question surely of specific gravity, the flowing out in this case of relatively hot fresh water into an open ocean of very salt cooler water. Surely there must be a rapid spreading out of the Congo waters over the sea, so rapid indeed that the undercurrent of cold salt water up its cañon should be quite considerable; indeed, I should expect it to be a case exactly comparable to the Ganges. Perhaps similar undercurrents in many submarine cañons materially assist in lessening the deposition of land detritus in their beds, while the coast platforms on either sides of them are so affected as to accentuate their cañon characteristics.

I am interested in the "moraine idea" off the Irish coast, and I searched vainly for soundings from which I could plot these slopes with some approach to accuracy. The slope may show a glacier edge, and indeed some of the stones show striæ which simulate those due to ice. What struck me particularly in Mr. Green's description was the hard bottom, which exists from the edge of the continental shelf to where the more gentle slope to the deep sea commences. I have not from charts been able to find definite evidence of such areas off continents except where faulting or recent land movements have taken place, of both of which there is no question here. The continued existence of such areas at the present day must be due to currents preventing the permanent deposition of mud and ooze.

The PRESIDENT: We are very much obliged to Prof. Gardiner for the very suggestive and careful series of observations he has laid before us. We are hardly a large enough meeting to move a formal vote of thanks, but I am certain he will realize that we have been very much interested in what he has told us.

Mr. R. E. PEAKE sends the following remarks:—

"The Continental shelf."

A very noticeable feature is the general similarity of the submarine contour, where the descent is made to the ocean bed, with that of the land of which it is a continuation. This is particularly noticeable on the south coast of Cuba, where the mountains rise almost directly from the water's edge, and where you find a depth of 1000 fathoms at less than a mile from the shore. There are many other instances that could be quoted, but the above is probably the most marked.

In the numerous examinations of coast formation that I have made for telegraphic purposes, I have only found one case of an entire absence of sloping shelf, this is at Turks island, in the West Indies. Several careful contour-lines were run on the west side of this island, and it was found that it not merely rose perpendicularly,

but in places even appeared to overhang. This may possibly come under the category of "Faulting slopes" referred to in the latter part of the paper.

"The channel off the mouth of the Congo."

Prof. Gardiner says: "It is quite inconceivable that a river of fresh water flowing into heavier salt water could cut for itself a deep channel below the surface of the sea." This is no doubt correct for almost any other river that could be mentioned, but surely not for the Congo. If you look at the enormous body of water forced through a comparatively narrow entrance it would be astonishing if it did not sweep away any soft material from its path. The fact that the cable, laid across the channel at a considerable distance from the land, was repeatedly broken, probably by the weight of *dèbris* carried down by the current, would seem to show that the channel has been cut and is kept clear by the river water.

"Hard bottom."

Prof. Gardiner is undoubtedly correct in saying that manganese nodules are responsible for many of the cases of "hard bottom." I found them such a nuisance in the Pacific, and had so many of the ordinary brass tubes damaged by them, that I adopted a heavy steel tube with a cutting edge; this generally sheared off the manganese, and, displacing the nodule, went on into the soft bottom. Dented tubes with manganese on them, in the Pacific at all events, are poor evidence of hard bottom, as is generally found if there is time to repeat the sounding.

"Currents in deep water."

It will be very difficult, if not impossible, to measure, by meter, currents which probably exist at great depths, say those approaching 3000 fathoms. The existence of such currents may, however, be fairly assumed if it can be shown that a difference of temperature takes place from time to time at a given spot; this direct evidence should be possible of attainment. In a paper written for the Royal Geographical Society on an Atlantic sounding expedition in 1889 it is shown that in two parallel lines of soundings, about 60 miles apart, and with an interval of about six weeks, there is a distinct difference of temperature. In the same paper two parallel lines of soundings in the Pacific, by the *Egeria* and the *Penguin*, are also quoted where there is a considerable difference of temperature; there is, however, an interval of eight years between the two sets of soundings. The above, however, is some evidence of the movement of water at these great depths—a subject which above all others deserves to be practically determined by those who have the time and means for the pursuit of oceanographical research.

BOLIVIAN EXPLORATION, 1913–1914.*

By Major P. H. FAWCETT.

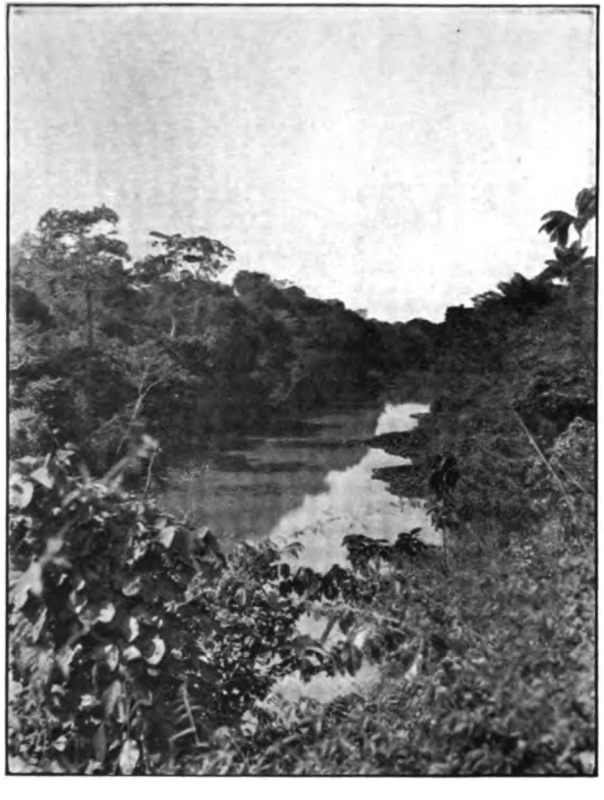
SOME account of the more recent explorations in which I have been engaged in South America has been requested for the *Journal*, and perhaps needs less apology in that three of the small party of four Englishmen are either at or destined for the front, including myself, and the record carries somewhat interesting information. Over certain details I must for the present draw a veil (lifted, however, for the confidential archives of the R.G.S.), because I think there is some probability of the scientific societies combining to prosecute investigations after the war, when, if I or

* Map, p. 272.

members of the party survive, some very necessary aid may be lent to such a purpose.

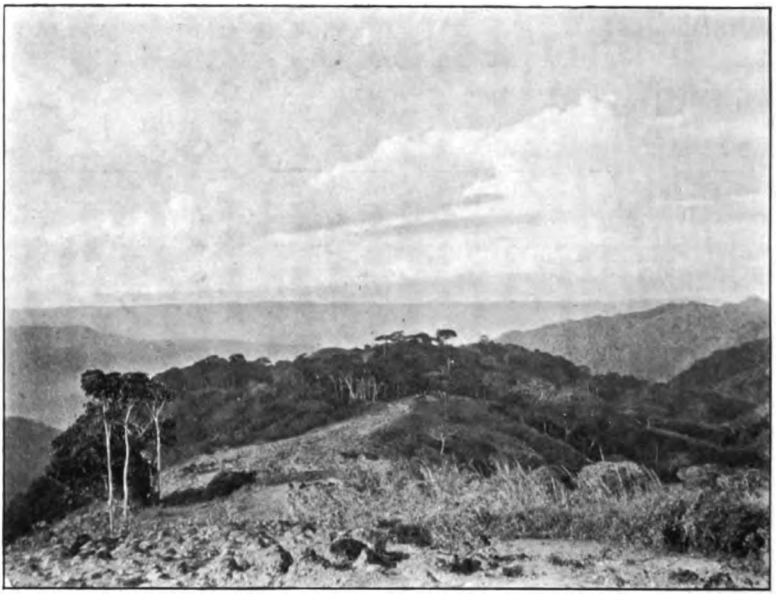
The year 1913 in Bolivia was exceptional by reason of the abnormal rainfall, which left an immense area of the country east of the Cordilleras of the Andes inundated and intransitable as late as the usually dry months of July and August—a year as disastrous to cattle ranchers as it was difficult for the freight service of the interior. Incidentally it deflected me from my original purpose, and sent me to complete an investigation of the Middle Caupolican, part of which was executed in 1910 and 1911, and which is now more completely detailed in the accompanying maps. The mountain system and rivers of this section are now fairly complete. Maps do not convey a very good idea of the difficulties inevitable in trackless forest. No part of the Caupolican can be claimed as new country, although much has not been mapped. The quinine bark hunter has pretty thoroughly traversed its hills, even as the rubber hunter has explored all navigable affluents of the Amazon and their tributaries where rubber may be suspected. It has remained for the surveyor only to put records upon paper in these places. The vexed problem of the Madidi river has been settled, however, and its source located, together with details of various minor affluents of the Beni and Tuiche. The Hundumo, shown on the maps as an affluent of the former, is nothing of the sort, but feeds a wide area of swamp lying between the two rivers.

The "Serrania" or hilly region of the Caupolican is excessively accidented, the hills being lofty, rising to between 3000 and 4000 feet from the level of the surrounding country, with sharp hog-backed ridges ending frequently in sheer precipice, making both ascent and descent a wearisome matter with heavy packs. It is chiefly noteworthy for the immense deposits of auriferous gravel, the relic of some far more extensive river system than exists to-day, lying west of the route followed by Dr. Evans in, I think, 1904 or 1905. The party experienced vicissitudes rather too startling to be pleasant, which need not, however, be referred to here. The wild Indians, Guarayos, who populate the high-lying portions of the Madidi and some of its tributaries, have been much exaggerated. A tribe of two or three hundred, which gave us rather a warm time in 1910 during the exploration of the Heath, and who have quite closed that river against Boundary Commissions or any other expedition ever since, are the only strong tribe now existing. The Madidi and its tributaries harbour only five small tribes of not a dozen souls in each, a terrible indictment against the rubber industry, chiefly responsible for their disappearance. For these people were once very numerous; Padre Armentia, the late Bishop of La Paz, himself remembering a population of some fifty thousand between Ixiamas and Covendo, whilst every "altura" or piece of land above inundation-level in the Beni province and Mojos is thick with ancient and broken pottery.

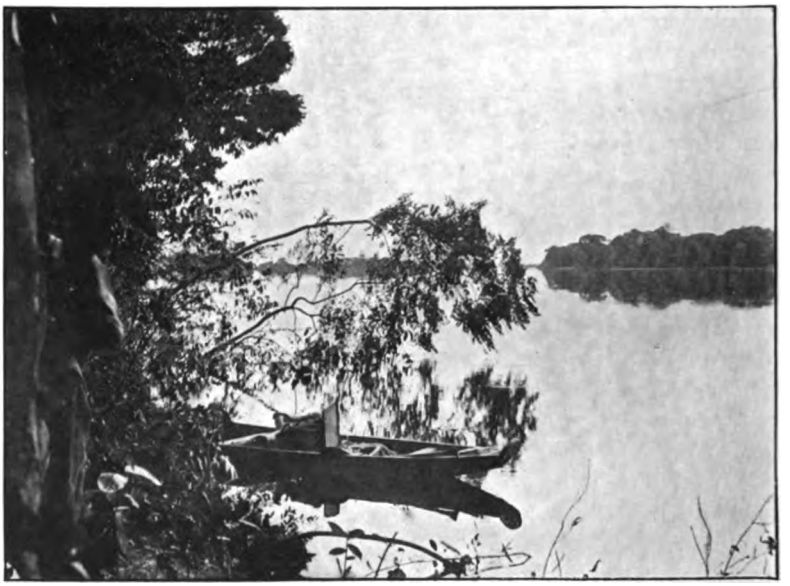


ON THE WAY TO THE SAVAGES.

GIANT CACTUS OF BOLIVIA, NEAR SANTA CRUZ.



FROM THE MOUNTAINS TO MAPIRI.



RIVER NAVIGATION.

After joining up the survey with that of 1911, already in the possession of the Society, we returned across country by the existing trail from Apolo to Rurenabaque.

The work of 1914 concerned a different region and was accompanied by very remarkable discoveries. Suffice it to say, regarding locality, that it concerns a very large area of forest country, so far as is known, unentered by any civilized man living or dead. Neither local knowledge nor history preserve any such record. The reason for this is not very far to seek. It is exceptionally difficult to reach, owing to the necessity of passing through a wide belt of low and swampy forest, in cutting through which carried food supplies are rapidly exhausted. Like all blank spaces, it had been credited with large populations of cannibal savages. Peons, or carriers, were, I may say, totally out of the question for carrying supplies. These people are not obtainable for journeys off trails and rivers. Moreover, they are unable to carry three weeks' food supplies for themselves alone, and are nervous and cowardly in the face of really bad Indians.

For journeys such as that of Colonel Roosevelt, where transport difficulties over roads and down rivers need not occur, they are useful and readily obtained, but it is always better to have white men accustomed to handle cargo animals or paddles. The man who cannot acquire these simple accomplishments and cook his own food is better left at home.

For three weeks after we said good-bye to the last outpost of what is locally known as civilization, and which the local people considered the limits of human possibility, we encountered no trace of a savage. We crossed and recrossed rivers by flimsy bridges of fallen trees to avoid entanglements of thorny undergrowth upon which "machetes" made scarcely any impression; we threaded on all fours mazes of creepers and tangled roots; we waded through swamps and fought the depression of a monotonously slow progress. Then we reached higher ground and ran up against an enormous rubber-tree showing signs of unskilled tapping—of the savages, as it turned out. Next day we struck a fine open trail. The trail led us into the middle of a large tribe, one of whose "malocas" (Portuguese for village) we most fortuitously entered at a moment when every man was out working in the plantation, and only women and children at home. Indeed, the first "savage" was a fat little kiddy, who toddled out of the small entrance of a huge communal dwelling, stone axe in hand, bent on cracking a nut.

I whistled. The child gave a screech and bolted, and the "maloca" was instantly in a tumult. We did not know, of course, that the men were away until afterwards, and had to prepare for emergency. It reads, I know, a small thing to visit these places in the security of a well-ordered country. But it is impossible to know if savages are going to be hostile or not, and the uncertainty involves exposure. One needs rather steady nerves, as a matter of fact.

These communal dwellings are very dark inside, partly because the people inside have a decided advantage in the case of attack, and partly because the ever-present and insatiable insect pest is thereby discouraged. We were therefore a very good mark outside in the brilliant sunshine for people we could not see inside, particularly as, in order to inspire confidence, we dropped our packs and sat on them. Eventually, however, I slipped into the house, to see, when my eyes grew accustomed to the darkness, only two women and a final contingent escaping by an opposite doorway. The women were engaged in brewing "chicha," or, in their own language, "averu," a sort of maize beer, and it says volumes for their pluck that they would not abandon it. Their fear, however, was pathetic. In the mean time, however, the alarm had been given, and the men would soon be back. I at once made signs for food, for we were very hungry, and received a quantity of boiled maize and a mixture of yuca, sweet potato, and monkey nuts. Probably none of us had ever tasted anything so good. We were engaged in eating when the warriors returned, surrounded the "maloca," and slipped one by one inside, arrows to bows. I went over to them and gave some small present to one or two; but what saved us from trouble was in reality the food: hospitality here, too, being the proof of amity.

We were taken subsequently from "maloca" to "maloca" over a perfect network of good trails. These "malocas" consist of one up to five communal dwellings, each of the latter measuring about 100 feet in diameter by 70 feet in height, conical in form and surmounted by a long sharp pole. The houses have a framework of wood thatched from the spire to the ground with palm leaf. Around the inside circumference live some twenty or more families, each with their own fire. Over them, around the dwelling, is a platform, about 8 feet from the ground, carrying the family share of the annual harvest. Around the thick central pole of the building are large earthenware urns used to store the "chicha." This particular tribe, whose name has been confidentially communicated, together with the record of the language, to the R.G.S., occupied apparently some fifty odd "malocas." As each house contains from fifty to one hundred souls, an estimate of three thousand souls to the tribe is not excessive. They are surrounded in the immediate vicinity by tribes whose names are duly recorded, numbering another five thousand at a reserved estimate. Within 30 miles square of us, therefore, were at least eight thousand savages, all cannibals, divided into four tribes, all at war with one another. Of those we met obviously not a man had seen a white man. Indeed, they were aware of no civilization beyond the surrounding tribes more or less akin to themselves. Our skins, clothes, arms, and equipment were objects of intense curiosity. Heralds preceded us to each "maloca," and invariably several other savages accompanied us.

The "maloca" was always entered in a rather ominous silence, all the warriors assembled, arrow to bow. The "maloca" chief received reports

from the escort and observed us carefully. Then he came over to the open space where we had been instructed to sit down, squatted down in front of me, stroked my hands, repeated the word "tabo" (welcome) several times, and ordered a woman to bring up a calabash of monkey nuts. We ate a few together, and then some of the others joined in and friendly relations were established. I don't think we stood much chance had there been any trouble. As a people these savages differ in language, customs, and appearance from any previously known. They are not tall, but are sufficiently well proportioned to carry that appearance. They have fine intelligent faces with very good features. Their colour is that of burnished copper. The people of each "maloca" have a singular family resemblance which suggests intermarriage within the "maloca." One boy had hair of a brilliant red, but the rest of the men have long, wavy black hair to the shoulders. A small horizontal tube of wood is worn through the partition of the nostrils, blocking the latter, and a thin spike, 2 or 3 inches in length, sticks upwards and outwards from the centre of the upper lip and downwards from the centre of the lower lip, something like a very waxed upended moustache. Bands of rubber, tinted red by the berry of the "urucu," are worn on the wrist and below the knee, and the leg below the knee is usually coloured by the same berry. The men wear necklaces of seeds, or of small perforated circular sections laboriously worked on stones out of hard black wood of the "chunta" palm, or the shell of the river mussel. The women wear the hair short and have no adornments. The lips, however, are painted black; but in spite of this some are very good looking. Feather adornment is not practised, nor is clothing of any sort worn. All smoke tobacco, which is freely grown in plantations. The brown leaf only is picked, dried over the fire, and rolled up in a strip of maize leaf to form a cigarette. It has an excellent flavour. It is varied by the use of snuff taken through a long tube with a small bowl at one end, the latter being placed in the nostril.

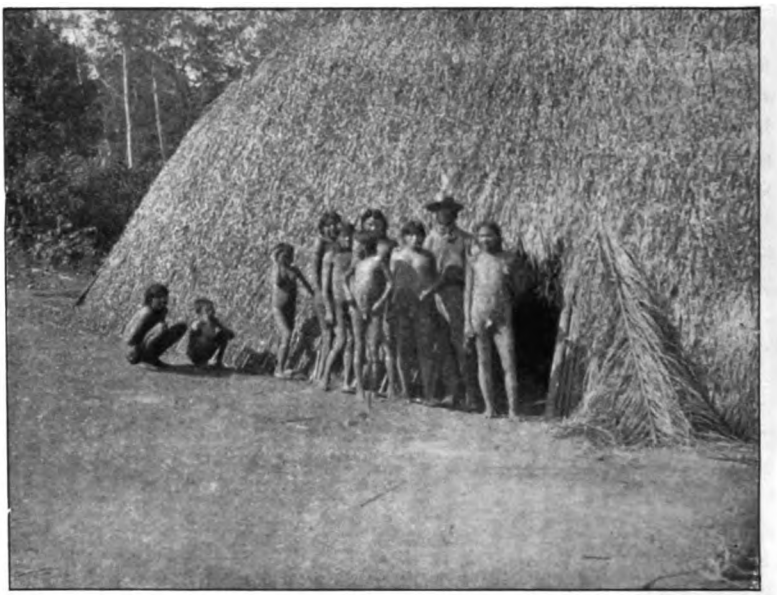
Low curved stools, cut with four legs out of solid wood with the assistance of stone axes only, are invariably employed for sitting upon, for this savage, in advance of his civilized prototype, never sits on the ground. Their bows of "chunta" palm are well fashioned and the arrows artistically finished, pointed with the sting of the sting ray, broad splinters of bamboo, or with fine "chuuta," decorated usually with barbs of large thorns. One or two of the "malocas" had blowpipes, and presumably poisoned arrows, but this arm is not commonly used. Stone axes are employed for general purposes and for felling trees. The handles are formed of vine bent around the stone and bound below it, the stone being held in place by a liberal application of the wax of the brown aggressive forest bee. The stones of these axes are brought from some distance, and the savages are very chary of parting with them, as their acquisition involves a passage through the territory of hostile tribes. Metal in any form is unknown. Knives were therefore a great curiosity.

The men sleep in hammocks made of netting of palm-fibre. Clothing of bark or any kind is unknown. Cotton is used, however, for binding arrows.

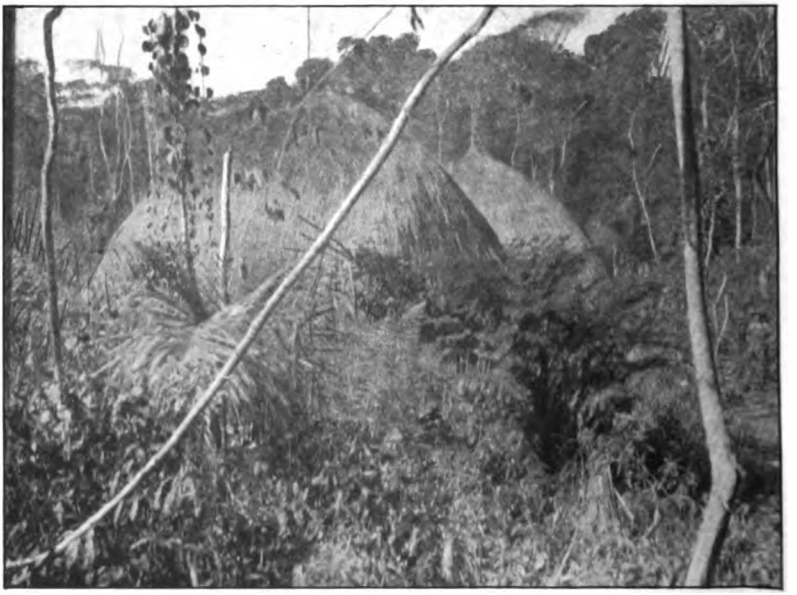
Although in this paper it is not possible to go into exhaustive details, certain remarkable points merit attention. The women are more or less on an equality with the men, relations being very affectionate. The tribe is also exceedingly musical. They have apparently no musical instruments, but sing a great deal. Every morning, about 3 a.m. or 4 a.m., one or two men of the "malocas" seated themselves outside and sang very melodiously to the rising sun. The chant was too long and complicated to record, although certain others have been noted. They are also sufficiently advanced to have perceived the difference between stars and planets, the prefix "pakari" being applied to the latter. "Pakari Newt'n," for instance, is Venus, and "Pakari Kapu" the moon. The sun is "Tajó," the "j" being the Spanish "hota." A star is "Víra-Víra," singularly suggestive of the deity "Víra-cocha" of the Incas. Records of the language were taken. Except in one or two words, it resembles nothing known. The tribe is anthropophagous, as are all the surrounding tribes, amongst whom exist a perpetual state of hostility. They had a doubtful appreciation of photography, and would not stay in the open when I talked to the stars, as I told them, with the theodolite. A flashlight picture of an interior created alarm and some suspicion. The staple food is "cumbri," or monkey-nut, cultivated in great size; but the plantations, which are extensive, produce maize, sweet potato, yuca, papaw, and a few bananas. The non-existence of bird or animal life in the surrounding forest is probably responsible for cannibalism. This particular tribe extract and bury the human entrails in earthenware urns. A neighbouring tribe eat the interior economy only, while a third tribe spit the victim on a long pole, roast him over a big fire, and while in that position pick the flesh off the body with their fingers. The latter two tribes are, however, exceedingly debased and brutal. We left this friendly tribe with regret.

Four days beyond their territory we encountered another tribe, estimated at 2000 to 3000 souls, considerably below the first one in development. These people live in shelters consisting of four poles, with a slightly slanting roof of palm-leaf. They are brutal and ugly. Their instinct is to attack strangers, and they followed it. We were saved by some luck from regrettable incidents—to ourselves—chiefly, I think, by the noisy discharge of the Mauser pistols. The brutality of savages of this kind leaves no possible measure but extinction. Various other tribes, about the same strength, inhabit the vicinity. Their utter brutality prohibited any knowledge of their customs or their language, which, however, is again quite distinct. The full area of this unknown region must contain at least a hundred thousand savages. They show neither sign of degeneration physically nor trace of the Mongol, which peculiarity is,

SAVAGES WHO HAD NEVER SEEN A WHITE CIVILIZED MAN.



A HUT OF THE NEW SAVAGES.



A MALOCA OF THE SAVAGES.

however, confined to the Indians of the Andean plateau and parts of the Caupolican and South-East Peru.

Our journey took us some distance beyond the tribes mentioned, from whose neighbourhood we discreetly withdrew. We reached, indeed, what appeared to be the proximity of another tribe, when sickness forced upon the expedition a premature return. One of my companions, Mr. Costin, narrowly escaped collapse, and the remaining two were much too ill to warrant advance. A heavy pack of over sixty pounds, perpetual insect attacks, all-day journeys, forest cutting, short food supplies, and constant alarms produce a severe nervous strain upon the greatest endurance. It is probably impossible to exactly describe what such conditions mean. They must be experienced. A single day's journey with such a pack through swamp with a few inches of mud, or cutting through the intricate mass of creepers and thorny undergrowth which makes bad forest, may be all right for the leader, who is more powerfully armed with enthusiasm, but it is killing for the rest of the party. Add other disabilities and it needs very exceptional men. The average British soldier is more than satisfied to occasionally carry a fifteen-pound pack over good roads! Rain, too, is disheartening, and there is plenty of it. In order not to court undue risk we were forced to make a wide sweep around the territory of the hostile tribes, now converted by self-defence measures into nests of angry hornets. Nor was it certain that we should avoid them or other tribes of a similar character. Fortune, however, favoured us. It is interesting to note the possibilities of forest navigation, for counting 2200 paces to the mile, and basing courses upon astronomical observation, we arrived at the original "maloca" with an error of 300 paces only, after a journey of about thirty leagues.

We returned at a most opportune moment. The two chiefs and (I suppose) the priest of the first "maloca" were sitting on their stools just inside the principal entrance totally oblivious of our presence, their eyes glassy. At intervals they made upward passes over their stomachs and were violently sick. To tell the truth, I fancied at first that there had been some drunken debauch. However, they suddenly came to and viewed us with amazement. They had been auto-hypnotized. We had struck the "maloca" during the ceremonies attending a death. A scrap, it appeared, had taken place with the second tribe we had met, resulting in the wounding and subsequent death of one of the tribe. He had been roasted over a big fire outside the "maloca," his entrails had been placed in an urn, closed by leaves, and tied up for burial, and the body had been cut up and divided amongst the various families. The ceremonies were designed to rid the "maloca" of the spook, which the chief informed me would return for three days to the scene of its former endeavours. The hypnotic ceremony and vomiting were repeated at intervals. The vomiting I could only surmise as having something to do with the "influence" consumed in the banquet. Subsequently a small screen of

plaited palm-leaf was erected inside the "maloca" in such a way that the light from the entrance fell full upon it. Opposite to it squatted on their stools the two chiefs and the priest. At the foot of the screen was placed a calabash of water with a few herbs.

The priest in the middle worked his hands in front of the screen so as to throw shadows upon it. This shadow was carefully studied and discussed. Every few minutes the three of them would apparently squeeze some "influence" from arms to finger-tips, legs to toes, head to ears, and so forth, gather it in the hand and throw it at the screen. This procedure continued until something in the shadow satisfied them. In the mean time all the women chanted in unison a weird and monotonous dirge. The ceremony was remarkable, indeed impressive. For three nights the two chiefs and the priest sat on their stools in the moonlight outside from sunset to dawn singing a melodious and infinitely pathetic chant, the last words of which were "tawi takni—tawi takni—tawi takni," in solo successively and then in harmony together. After the third night the spook was assumed to have hied itself to the far bourne.

This ceremony is known as "tapi." In another "maloca" the same ceremony was in progress, though here the victim had died apparently a natural death. Anyway, he was, as they said, "chimbibi koko," which means "food for the pot." In spite of large deputations of warriors with requests to visit their "malocas," I had to put a limit upon our stay. My small stock of gifts had run out and we were suffering from the repletion engendered by too abundant a food supply. Having loaded ourselves with ten pounds of monkey-nuts each and exchanged everything available for bows and arrows, stone axes, and necklaces, we left these interesting folk for the long tramp through low bad forest back to civilization.

On the way we fell in with a troop of "marimonos," the large black prehensile monkey, which augmented the larder. These monkeys, everywhere esteemed a great delicacy, rather upset us. The buoyancy of a vegetarian diet was, I remember, replaced by a sense of extreme lassitude after an abundance of meat. It is not improbable that monkeys are deleterious after being subjected, as these were, to the fright of a long chase. In these forests, by the way, exists an unusually large variety of the black howler, apparently unknown. Owing to the restriction of naturalists to the more accessible parts of the forest, I venture to suggest that much accepted data regarding the fauna of the interior requires modification or addition.

There are certainly species of the smaller animals which so far have not been recorded in the text-books—the "mitla," for example, a black mixture of dog and cat. Some of the monkey family have not yet been identified. There are, too, six distinct species of the cat family—the jaguar, the black panther, large puma, small puma, the "tigrecillo" or large cat, marked like a jaguar, and the "gato mielero" or honeysucker, variously

marked, rather smaller than the "tigrecillo," and hunting in troops of six to twelve. A wild dog, more like a wolf, and quite distinct from the fox, is not uncommon.

The giant armadillo, the great river tortoise, or "tartaruga," and the skunk are better known, but they are very rarely seen by travellers. Humboldt makes curious errors in the habits of the howler monkey, and Bates seems to have considered monkey-eating extraordinary, whereas it is esteemed a delicacy everywhere. It is a very necessary item of diet, for it is easy enough to starve. Edible palms or plants are not to be found everywhere, nor are fish always to be caught in the rivers, as some travellers imagine.

After three weeks of forest navigation we recovered our canoe, and had about twelve days of hard paddling before we reached a civilized trail. A fortnight later we heard rumours of the war, walked 500 miles, with very sore feet, to a point where transport was obtainable, and, subjected to many delays, returned home to take our part.

A thorough exploration of the region and tribes I have indicated is very desirable. It is risky, and, as such, attractive. It should, I think, be realized that ethnologists, boundary commissions, and river expeditions, albeit doing admirable work, are not "exploring." An extraordinary number of small tribes are scattered about on or in reach of the lesser navigable rivers, but almost without exception these are known to and have some sort of friendly intercourse with the rubber pickers. They are, however, being "discovered" again every year. The very retired forest sanctuary is not open to river expeditions; it is practically impossible for collectors; it has no rubber attractions; and here the large populations of savages still existent hold undisputed possession. I doubt if there is a single really wild savage, ignorant of the white man, within three weeks' journey on foot from a navigable river. To visit these people needs nerve and experience.

For these journeys, for all journeys, one might say, of "exploration" the refinements of surveying are impossible. Large instruments and wireless equipment are unthinkable. Any one who suggests such things has no knowledge of what the forest is. A large party invites disaster, because it is too great a tax upon the food supplies of the wild people and too easily victim to starvation, whilst a small party runs proportionate risks and is too easily destroyed. Experience alone can limit the risk. Insect pests are much exaggerated by "tenderfeet." Fortunately, numerous as they are, they are restrained by seasons and localities.

Diseases are more or less confined to civilized places, nor are fevers acquired in unexplored forest. Wild Indians need not necessarily be met with. A German living for thirty years within a few leagues of extensive tribes of savages has never yet seen one! I remember that a certain American traveller and writer of books doubted the existence of jaguars and savages because on his travels he had seen neither!

It is a curious continent of apparent contradictions. Any one can traverse the continent east to west or north to south by the recognized trade routes, with some discomfort, perhaps, but with no great risk. Yet within 15 leagues of Sta Cruz, the capital of a province, and close to a main trail, are hostile savages in the stone age, who necessitate half a dozen small garrisons for the protection of the traveller. Within 3 leagues of the much-navigated upper Mamore, on the Lake of Cusi, is a tribe of over (reputed) a thousand hostile Indians, quite unapproachable. The right bank of the lower Mamore, near the confluence of the Itenes, is closed by savages to all but a large force. The river Heath, an international boundary river, successfully defied the entry of boundary commissions. The Parecis Indians near Matto Grosso city may be entered with impunity by the white man, but are deadly enemies of the negro. They, however, are renegades from civilization. The populations of the Northern Chaco are little known, and difficult to visit.

Brutality has alienated some of the tribes. Only lately the "kultur" of a Peruvian official in the Madre de Dios inspired him to wipe out the harmless and amiable "chunchus" of the middle Tambopata. We who knew them regret it deeply. A curious bearded tribe in the river S. Martin in East Bolivia resented ill treatment by burning the rubber trees and disappearing, no one knows where. Many of these tribes, it is true, are intractable, hopelessly brutal, but others, like our friends of 1914, are brave and intelligent, deserving much consideration.

In closing I gladly acknowledge the services of my companions. Mr. Costin, who accompanied me four years, is at the front with the Rifle Brigade; Mr. H. Manley, who accompanied me two years, has enlisted; and Mr. Brown elected to remain in South America. That they formed so small a party is a recommendation of their worth.

DR. F. DE FILIPPI'S ASIATIC EXPEDITION.

FOURTH REPORT.

EARLY in September, 1914, the expedition left the Suget station in the valley of the Kara Kash, to the north of the Karakoram, to cross the Kug Art pass (16,160 feet) into the upper Yarkand or Raskem Daria valley. On reaching the river at Kirghiz Jangal we again divided into two parties. Major Wood went up the valley to join at Kufelang Mr. Spranger and Petigax, with whom he proceeded to explore the two western tributaries which they had seen in the preceding month.

Dr. De Filippi, Prof. Abetti, and Marchese Ginori went down-stream with the intention of reaching the Oprang by crossing the Aghil pass.

The hope that the bad weather experienced in the summer would

cease with the autumn was not realized. Every day fresh snow fell on the mountains, with rain in the valleys. The moist atmosphere hid the view of the peaks and ranges, rendering the topographical work most difficult. The most serious consequence of this persistent bad weather was that the summer floods did not decrease, as we had expected. On this fact we were counting, as the road follows the river-bed, and it is impossible to travel in these valleys when there is much water in the rivers.

During the two first days after leaving Kirghiz Jangal we were obliged to ford the Yarkand river eight times, but this was only possible in those parts of the valley where the river flowed in several channels; further on the valley, closing in, became a long gorge, and as the river flowed in one deep stream we were obliged to keep to the higher ground. With much difficulty we succeeded in passing over spurs on the right side of the valley, and six days from the time we had left Kirghiz Jangal we descended one of these more precipitous than usual, opposite the valley by which we were to ascend to the Aghil pass. But in front of us ran the swollen river, turbid, swift, and full of whirlpools. After wasting a whole day in vain efforts, we came to the conclusion that it was hopeless to get the caravan across. Some of the strongest horses managed to swim to the other shore, but the camels were carried away by the current. On account of this, to our great regret, we were compelled to give up the proposed exploration of the Oprang valley.

In the meantime Major Wood's party explored in succession the western tributaries of the Yarkand, mentioned above. Contrary to our surmises, these did not rise on the northern slopes of the Karakoram, but from a snow-bound chain to the north of it, which probably separates the basin of the upper Yarkand from that of the Oprang. When the map is drawn, we perhaps shall be able to judge what relation this chain has with the Aghil and the Karakoram.

In the northern of these tributary valleys, 5 miles above its junction with the Yarkand, the party found the deserted baggage of a previous traveller, including some copies of the Koran and a few letters. This valley is so narrow and gorge-like that for the entire length of it you have to travel in the stream-bed full of water, and it seems impossible, therefore, that it should ever have been used as a regular road of communication. Still, this discovery seems to tally with the tradition of a short cut between Kufelang and the Nubra valley, of which many ancient explorers make mention (G. W. Hayward, etc.), but which no one has verified up to the present. With the aid of the letters found by us, we are now having inquiries made at Yarkand and Kashgar, in the hope of gaining further information.

From the Yarkand river (Raskem Daria) both topographical parties crossed the western Kuen Lun by different passes leading to Kargalik and Yarkand.

From September 27 to October 10 our gravimetrical and magnetic observations were made at Yarkand. Here we received quite clearly the longitude time signals by wireless telegraphy from Lahore. On October 15 we reached Kashgar, and were received with European hospitality by the English and Russian consuls. We remained there eleven days to finish our geo-physical work. By means of the wireless apparatus we were able to obtain with great exactness the longitude of Yarkand and of Kashgar, two important stations which have served as base for all previous topographical work in Chinese Turkestan.

On October 27 we left Kashgar for the last caravan stage of our journey. In eleven days we crossed the mountainous region between Chinese and Russian Turkestan, finding the highest pass (Terek Dawan) already covered with the first autumn snow. At Andijan we reached the railroad after a journey lasting fourteen months.

In the observatory of Tashkent was made the last of the series of gravimetrical stations which had begun at Dehra Dun, and thus the Indian system was connected with that of Asiatic Russia.

The Tashkent Military Topographical Institute kindly consented to take charge of the scientific equipment of the expedition, and to keep it for us until normal means of communication—at present interrupted on account of the war—have been re-established. The expedition has brought back to Italy with it only the chronometers, the photographic lenses, the gravimetric instruments, all the scientific and topographic records as well as the exposed photographic plates.

Commander Alessio and Prof. Abetti are now busy making gravimetric observations at the Hydrographical Institute of the Royal Navy, Genoa, with the same instrument that was used during the expedition. This station was the starting-point of all our observations. Thus the whole of the system of stations in India, Central Asia, and Asiatic Russia will be united to a fundamental station of the European system.

General Outline of the Work of the Expedition.

The expedition was able to complete the whole of its programme in sixteen months and a half.

In the domain of geophysics, the gravimetrical survey (made by the Survey of India) in the plains of Hindustan has been joined to that of Russian Turkestan (made by the Military Geodetic Institute) by means of a chain of stations across the mountainous regions between Northern India and Central Asia, and through Chinese Turkestan. In addition the complete system has been connected with the European Gravimetrical Survey through the fundamental station of Genoa.

Fourteen stations were made, and in spite of the difficulties met with on account of the exceptional conditions under which we had to make our observations, they were carried out by the most precise scientific methods. Eight pendulums were always observed. The gravimetric

apparatus was always used without support, and usually rested on a large rock embedded in the ground, and with this method we obtained very small variations in the value of the flexion. Where buildings were lacking, a large tent specially constructed was used, in which temperature variations could be maintained within the necessary limits. The geographical co-ordinates of each station were rigorously determined, and topographical data of the neighbourhood were collected, with addition of photographic views and panoramas. The expedition was provided with chronometers and astronomical instruments.

On account of the peculiar features of the regions crossed by the expedition, the analysis of the results should lead to interesting conclusions on the influence that mountain masses, altitude, etc., exercise on the value of gravity. The stations were made at heights varying from 5000 to 17,000 feet above sea-level.

At all stations observations were also made to determine magnetic inclination, declination, and force—and at Skardu, taking advantage of the length of our sojourn, the daily magnetic variation was studied.

Wherever the expedition stopped to make geophysical observations, regular meteorological data were collected and pilot-balloons sent off, and, weather permitting, observations of solar radiation were made by means of various pyrheliometers. Particularly remarkable in this respect is the station of Skardu, which was open during four months of the winter 1913–14, and the one on the Depsang plateau at an altitude 17,500 feet, where uninterrupted observations were made for two and a half months.

In collaboration with us, pilot-balloons were sent up from various stations of the Indian Meteorological Department at similar hours, and it is hoped that these observations may lead to some conclusions concerning the circulation of the winds, more especially in regard to the monsoon.

Without the aid of maps and illustrations it is difficult or impossible to describe the geographical work, therefore I limit myself to a few short observations. The Eastern extremity of the chain of the Karakoram mountains was, previous to this expedition, very slightly known. About 1865, a topographer of the Indian Survey, Mr. Johnson, had made surveys of the caravan routes between Ladakh and Central Asia. He had seen the front of a glacier, from which rises the Shyok, one of the principal tributaries of the Indus, and had given it the name of Remo. But he had been unable to show either its extension or the direction and the position of the valleys through which it flows. Nor was he able to ascertain the position of the watershed. The exploration of this glacier and of the neighbouring portion of the Karakoram was the work that the Expedition accomplished last summer. The Remo is a glacier of unexpected size and importance. Its area is more than 300 square miles in extent and is formed by three large rivers of ice, each about 20 miles in length and 3 to 5 miles wide. The glacier has many peculiar

characteristics, and its basin is, as it were, a transition between valley and plateau. This is only an instance of a more or less general phenomenon which we found prevalent in our explorations of the region. The most interesting fact, undoubtedly, is that from the Remo rises the river Shyok, a tributary of the Indus, discharging its water into the Indian Ocean, and also the Yarkand, one of the large rivers that loses itself in the sands of Central Asia.

The discovery of the source of the river Yarkand led later to a systematic exploration of all its upper basin. This work was much hampered by persistent bad weather. Nevertheless, thanks to the sustained efforts of all, it was possible to triangulate and survey about 5000 square miles of country.

Particularly interesting was the determination of the differences of longitude by means of time signals sent by wireless telegraphy from the wireless station at Lahore, and received simultaneously at the headquarters of the Trigonometrical Survey of India at Dehra Dun, and by us at our various stations. Before and after the transmission local time was determined by star observation. Thus, the difference of longitude could be calculated very exactly, and so it will be possible to show—with the help of the latitudes—the deviation of the plumb-line at all our stations situated in the valley of the Indus, and on the Depsang plateau. Also exact co-ordinates of the Karakoram and Central Asia stations have been obtained, and this should be of the greatest use to correct the old maps, and for all future topographical work in the region.

The vast mountainous zone situated between Western India and Central Asia did not interfere with the transmission of signals, which were always received quite clearly, even in the distant stations of Yarkand and Kashgar.

I have still to mention the geological researches. These covered a much vaster area than that included in the itinerary of the expedition, viz.—a large portion of Baltistan and of Ladakh, some of the high plateaux of Western Tibet, and the Eastern extremity of the Karakoram. A large quantity of fossils was collected, which will make it possible to assign a date to the formations crossed by us; the extension and the limit of the past periods of glacial age were also especially studied. It is hoped that with the material collected it will be possible to form some sort of a rational classification of this complicated system of mountains based on their geological composition.

Prof. Dainelli, in his numerous geological excursions, also collected abundant material for the study of the anthropo-geography of Baltistan and of Ladakh. Up to the present time this has not been systematically studied, and so many contradictory assertions regarding the races that inhabit these regions have been circulated.

In addition, the expedition has brought back abundant illustrative matter referring to all the fields of its activity.

(Rome, December 15, 1914.)

THE HOUR-GLASS OF INDIA.

By Major C. H. BUCK, I.A., Punjab Commission.

In these strenuous days of war it is almost a relief to carry the mind occasionally to distant lands and former times. This is my apology for writing the following lines.

The momentous decision to remove the capital of India to Delhi, as announced at the great *darbar* held there in 1911, has been acted upon, and a new city, which promises to be the proudest and grandest of them all, is now being constructed on a site stretching along the west of the line of its seven predecessors. The tract in the vicinity of Delhi—that city of many names—has always held an important place in history. To grasp this fact, we must convey our thoughts to those past ages when the mysterious Aryans first entered India; when the remarkable Hindu and Buddhist religions—which now influence hundreds of millions—were moulded into shape; when the great Alexander, with his generals and forces, marched across mountains, plains, and rivers in that expedition, the longest and most hazardous ever undertaken by man; when the Scythian hordes from Central Asia swept through the Hindu Kush and made inroads into India; when the Mohammedan conquest set steadily towards that country from its north-western border, where the waves of invasion have so often broken.

Surely no other similar-sized tract in the world has witnessed such a series of soul-stirring scenes as that narrow strip of land which lies immediately to the north of Delhi. Here, from time immemorial, invaders—intent on acquiring territory, on exploration, or on gathering loot—have arrived in legions from the north-west; here rulers, for the time being, of India have assembled their forces to resist the intruders. It is indeed unfortunate that ancient India possessed no historians to give to posterity trustworthy accounts of the numerous wonderful events which must have occurred in this interesting quarter of the world prior to the advent of Alexander.

The first ray of light thrown on the history of India is contained in that celebrated series of poems the *Rig Veda*, which forms part of the great literary memorial of the early Aryan settlements in the land, and which tends to show that between 3000 and 1400 B.C. the Aryans advanced from the banks of the Indus, drove back the aborigines from the Punjab, formed colonies there, and secured possession of the stretch of country between the Thar desert and the river Jumna. The *Mahabharata*, another great collection of Indian legends in verse, some of them, perhaps, as old as the Vedic hymns, also enlightens us to some extent. Its main story deals with a period not later than 1200 B.C., and narrates a struggle between two families of the ruling lunar race. The sites of the battles and the scenes of the numerous dramas are described in its poems

as lying in the tract north of Delhi, a tract which has become the "holy land" of the Hindus, and to which they continually make pilgrimages.

The first recorded attempt by a foreigner to conquer India was that made by the proud and ambitious queen Semiramis, who, after obtaining possession of Bactria, spent three years in preparing for the passage of the mighty Indus, only to be driven back with severe loss directly she had crossed it. Darius, who was more successful, managed to bring a large portion of the Punjab under his sway, but had to give way to the advance of Alexander the Great in 327 B.C. It is only from this date that any trustworthy record and that a somewhat scanty one—of the history of India has been made, while it was subsequent to Alexander's expedition that the geography of this much-sought-after land first began to assume a regular and systematic form. The history of the past two thousand years, however, teems with accounts of the taking and retaking of Indraprastha, or Delhi, as it afterwards came to be termed; of the marching and countermarching through the region immediately to its north; of the great battles fought at Panipat, Karnal, Taraori, and Thanesar.

After Alexander's retreat, Seleukoe, the Græco-Bactrian ruler, was the next to attempt an entry into Central India, but he was defeated (probably north of Indraprastha) by Chandra Gupta, the grandfather of the great king Asoka, and forced to return to Bactria in ignominy. Thereafter India remained in possession of Buddhist or Hindu rulers until 1192, when Mahomed, an Afghan of Ghazni, defeated Prithwi Raj, the last Hindu king of Delhi, at Taraori in an engagement which proved decisive. In the following year Kutb-ud-din, Mahomed's slave general, captured Delhi, and, on his master's death in 1206, appointed it the capital of what has been termed the "Slave" dynasty. His memory has been perpetuated by the noble mosque which bears his name, and by that world-famed monumental tower, the Kutb Minar, which rises alongside it to a height of 238 feet.

The Slave dynasty ruled for almost a century, and thereafter Delhi was the scene of continuous changes; the enormous hordes of Timur poured through the Punjab from the north-west and sacked the city in 1398; over a century later Babar from Samarkand defeated Ibrahim, the last of the Lodi branch, in a great battle at Panipat; Sher Shah, an Afghan governor of Bengal, attacked Hamayun from the east and drove him from Delhi in 1540, but his successor was ousted a few years later by the Moghals, under Akbar, after another desperate encounter at the same place; in 1737 the Marattas from the south-west commenced to oppose the Moghals, and two years later Nadir Shah, from far-off Persia, effected a triumphant entry into the city and carried off an enormous quantity of plunder, including the celebrated peacock throne of fabulous value.

During the eighteenth century, Delhi became the alternate prey of Afghans and Marattas, between whom, in 1761, a savage battle was fought on a plain 3 miles north-east of the town of Panipat, where four mounds,

covering a front of about 1½ miles, are pointed out still by the villagers as being the gun emplacements of the Afghans. In 1803 the British, under Lord Lake, appeared at Delhi and vanquished the Marattas; they then took the emperor Shah Alam, who had been a prisoner in the hands of Sindhia, under their protection, and established themselves in the neighbourhood of Delhi. Excepting the Mutiny, the final wars of the British

in India were those with the Marattas in 1818, and with the Sikhs of the Punjab during a few years preceding 1849, when the frontier was advanced from Karnal, where it had been since the beginning of the nineteenth century, and where Ochterlony had been agent to the Governor-General. It was then that the Punjab was annexed.

Through all these ages the immediate vicinity of Delhi has been the point to which the forces of all invaders have converged; whether it

were the Aryans, Græco-Bactrians, Scythians, Mongols, or Mohammedans from the north and north-west, the Marattas or the British from the south-west and east; one and all focussed on Delhi. It is, therefore, evident that there must always have been some very strong geographical reasons for this long sequence of similarity, and for the fact that from remote times one great city after another has been erected near the site of the present city of Delhi.

Let us study the map of India, omitting its railways and canals, its modern towns and irrigated lands, its metalled roads and bridges. It must be remembered that the armies of former days depended for their supplies on the country they passed through, and that there were no safe means of transporting large invading forces by sea. Troops were only able to move through cultivated lands; to cross rivers by fording them, or by means of boats which took many months or even years to construct in sufficient quantities. Without a thoroughly organized system of transport and communication it was impossible for large bodies of men to penetrate the Himalayas at any point in India east of Kashmir. Before the construction of railways by the British, the Thar desert—including a fringe of sparsely cultivated land—stretching from the Arabian sea on the west to within 20 miles of the river Jumna on the east, formed an impenetrable barrier; and, even now, with a vast system of canals and railways, all except one of the land communications between the north-west and the rest of India converge on the tract between Hissar and Ambala, avoiding the great desert south of the Punjab. The Indus and the five rivers of the Punjab were only fordable in the plains at a short distance from the Himalayas, and then with much difficulty; the river Jumna itself, at most seasons of the year, was uncrossable owing to its breadth, its marshes and quicksands, its ravines and jungle-covered banks. Five hundred years ago the course of the Jumna lay 7 or 8 miles westward of its present bed, and it flowed near the towns of Karnal and Panipat; which fact is proved by the village records, the account of Timur's march in his autobiography, and in the *Zafar namah* and by the existence of old high banks.

The country north and south of Delhi may therefore be likened to an hour-glass, both as regards its shape and in respect to the manner in which the component parts of armies passing to and fro had to trickle through the narrow neck in the middle. A force advancing towards central India from the direction of Afghanistan had necessarily to pass by Thanesar, Taraori, and Karnal, or by Guhla and Kaithal to Panipat in order to reach Delhi. No commander would ever have risked attempting the passage of the Jumna for fear lest his army be attacked in rear or in flank from the direction of Delhi before it had effected a crossing, and, indeed, he would have gained no advantage by entering the tract between the Ganges and the Jumna before gaining possession of Delhi. Similarly, any force proceeding from Hindustan towards the north-west,

either to invade the Punjab or to meet an attack from that point, had perforce to utilize the neck of the hour-glass.

It is thus apparent why all the great battles, which so often decided the fate of India, were fought at or in the neighbourhood of Panipat, the outpost of Delhi, and the sole gateway through which an outsider could obtain an entry into India proper; it is also explained why the capital of almost every empire ruling India was situated at Delhi, where it could guard the key to its domains. The British, by means of canals and railways, so widened the neck during the last century that the hour-glass is not now so apparent, but Delhi has again become the capital, and thus impresses upon us her former geographical importance and her historical fame.

SPITSBERGEN: NOTES TO ACCOMPANY MAP.*

By GUNNAR ISACHSEN.

THE map is compiled from the following sources: For the stretch of coast from Loweness to Grey Hoek, Isachsen's map on the scale of 1:200,000 (in the press). In this map is included the Isachsen Mission map, on 1:100,000, from 1906 and 1907,† and a few details from Bruce's map of Prince Charles foreland, 1909, and from Staxrud-Hoel's map of the coast south of Cape Linné, 1913 (not yet published). The stretch of coast from Verlegen Hoek along Hinlopen strait, and southward along Stor-fjord to South cape, to and including Horn sound, as well as the west side of North-East Land, is taken from De Geer's map of 1900.‡ King Karl Land § and Hvitöy island || are taken from Nathorst, as also the map of Bear island,¶ van Mijen bay,** Recherche, and van Keulen bays.†† The map of the coast between Horn sound and Bell sound, the

* Map, p. 272.

† 'Résultats des campagnes scientifiques accomplies . . . par Albert Ier, Prince souverain de Monaco,' Fasc. XL., Part I., par Gunnar Isachsen. Monaco, 1912.

‡ G. De Geer, 'Om Gradmätningsnätets framförande öfver södre och mellersta Spetsbergen,' scale 1:1,000,000. Stockholm, *Ymer*, Årg. 20, 1900.

§ C. J. O. Kjellström och A. Hamberg, 'Karta öfver Kung Karl's Land upprättad under 1898 års svenska Polarexpedition,' scale 1:200,000. Stockholm, *Ymer*, Årg. 19, 1899.

A. G. Nathorst, 'Två Somrar i Norra Ishafvet,' I. Map on 1:500,000. Stockholm, 1900.

¶ C. J. O. Kjellström och A. Hamberg, 'Karta öfver Beeren Eiland uppmätt under 1898 års svenska Polarexpedition,' scale 1:100,000. Stockholm, *Ymer*, Årg. 19, 1899.

** C. J. O. Kjellström, 'Karta öfver Van Mijen Bay och Bell Sound upprättad under 1898 års svenska Polarexpedition,' scale 1:200,000. Stockholm, *Ymer*, Årg. 21, 1901.

†† 'Karte der Baie Recherche und van Keulen Bay auf Spitsbergen während der von A. G. Nathorst geleiteten schwedischen Polarexpedition 1898, photogrammetrisch aufgenommen,' scale 1:100,000. Stockholm, *Vet. Ak. Handl.*, Bd. 39, No. 6, 1905.

Wijde fjord and the rest of North-East Land, Barents and Edge islands, is based chiefly on the Admiralty chart No. 2751 (1911), and the Reichs-Marine-Amt chart No. 155 (1911). The eastern branch of the Ice fjord from and including Skans bay to Coles bay is taken from De Geer.* Ekroll harbour, on Edge island, is laid off according to Martin H. Ekroll's special map of his wintering-place, 1894–95. Scale 1:25,000. This map is not yet published, but will be included in the new edition of Isachsen's charts.

The mean variation of the compass at the east end of the base-line on Foreland plain on June 30 and July 16, 1910, was 12·6° W.; in Virgo bay on August 21, 1910, 13·5° W.; and at Sabine point on August 22, 1910, 13·2° W.† The magnetic variation is probably decreasing 10′–15′ annually, and is, according to the Reichs-Marine-Amt chart (1911), along a line Bear island—Cape Barkham (Barents island)—Cape Irminger (North-East Land), about $1\frac{3}{4}$° W., and along a line Dun islands—Cape Thordsen—Verlegen Hoek about $6\frac{3}{4}$° W. in 1914. The greatest difference between high and low water is about $1\frac{1}{2}$ metre (5 feet). The harbour time is about one hour.‡

With regard to the names on the map, the sites of mountains are indicated by a point and the name; the direction and extension of valleys and glaciers, where it has been possible, are explained by the direction and length of the names. With regard to the selection and the form of the names, reference must be made to the map; it would lead too far here to discuss the intricate and difficult nomenclature of Spitsbergen. In order to give an idea of the heights and depths, some figures are given on the map (feet and fathoms).

As will be seen, the highest mountains on West Spitsbergen are to be found in the Chydenii range, where Mount Newton and Mount Poincaré attain a height of 5676 and 5446 feet. Then we have Mount Eidsvoll on Haakon VII. Land, with a height of 4750 feet, and Mount Hornsundtind on Sydkap Land, 4690 feet.

Shallows close to the water-line are marked with a cross on the sea. Tourist steamers must not, even in waters where soundings have been taken, neglect to use great caution, and more "especially in regions where the geological structure is irregular." ‡ A good arrangement for the prevention of accidents, as some Norwegian tourist steamers do, to go two together. Since the sketch-map of van Keulen (*c.* 1710) the charts have often shown a sandbank or an island, sometimes two, in Storfjord, and although a depth of at least 50 metres (27 fathoms) has been

* G. De Geer, 'The Coal Region of Central Spitsbergen,' with a map on 1:300,000. Stockholm, *Ymer*, Årg. 32, 1912.

† A. Alexander, 'Observations Astronomiques faites par l'Expédition Isachsen,' *Kristiania, Vid. Selsk. Skr.*, I., No. 12, 1912, p. 4.

‡ G. Isachsen, 'The Hydrographic Observations of the Isachsen Spitsbergen Expedition, 1909-1910,' *Kristiania, Vid. Selsk. Skr.*, I., No. 14, 1912, p. 6.

sounded at the place where these shallows should be situated, it is not impossible that this bank "may sometimes be rediscovered at another place, and it is, at all events, better to have vague warnings than none at all." *

On the charts a shallow in 3 fathoms of water is shown at the entrance to Ice fjord; this shallow is, however, laid off too far north, as it is situated on a line with Mount Vardeborg and the mountains at Cape Delta.

Northward of Spitsbergen the bottom drops evenly towards the deep Polar sea. Southwards the Spitsbergen group of islands is connected with Bear island by the comparatively shallow Spitsbergen bank. While the soundings between this bank and Norway do not exceed 500 metres (275 fathoms), the depths of the Greenland sea are considerably greater. Geographically, Spitsbergen may therefore be considered as connected with Norway.

On comparing the modern map of Spitsbergen with earlier maps, it will be seen that the shape of the archipelago has of recent years undergone great changes. These changes are especially noticeable on the stretch of coast between Bell sound and the north coast. Nordenskiöld Land has been surveyed, and Oscar II. Land has got its natural limits to the north, Haakon VII. Land to the east, and Albert I. peninsula to the south.

Very few countries have a more interesting history of exploration than Spitsbergen. Of course it is out of the question to go into this matter in the present article; only I want to deal on this occasion with a single little locality, viz. the present *Hamburger bay*, whose history has just been fully investigated.

Hamburger bay was first marked by Giles and Rep on their map (*c.* 1710). Sir Martin Conway writes in his book, 'No Man's Land' (Cambridge, 1906, pp. 353, 354), "North of it (Hamburger bay) is a smaller bay not marked on any modern chart except the French chart No. 929. Vrolicq occupied the bay in 1633, and it is named on his map (1634) Port Louis or Refuge françois. In many Dutch charts, from Valk and Schenk's (*c.* 1662) to Giles and Rep's (*c.* 1710), it is named Baskes bay."

The survey made by me in 1907 shows, however, that there exists no bay between Hamburger bay and Magdalena bay. On the other hand, the bay which on Vrolicq's map is called Port Louis or Refuge françois, must obviously be the present Hamburger bay; this is also borne out by historical researches made by Dr. Arnold Ræstad.† In 1633, Vrolicq, who was fishing in French interests, was driven away by the Dutch from Kobbe bay or Port St. Pierre. Vrolicq then took up a new station in a more southern bay, which he called St. Louis or Refuge françois. In 1637 he was also expelled from this place by a Dano-Norwegian frigate under the

* G. De Geer, 'The North Coast of Spitsbergen, western part,' with map on 1 : 100,000. Stockholm, *Ymer*, Årg. 33, 1913, p. 14.

† A. Ræstad, 'Norges Höihetsret over Spitsbergen i ældre Tid. Kristiania, 1912,' pp. 48, 52, and 58.

command of Captain Corfitz Ulfeldt, who had been sent out by Christian IV. to enforce the supremacy of the Dano-Norwegian crown over Spitsbergen. The catch and fishing-gear of Vrolicq were confiscated, and Vrolicq with his ships was forced to leave the bay, which afterwards went by the name Ulfeldt bay, and was used by the Dano-Norwegian whalers. From the instructions issued to Captain Ulfeldt, it appears clearly that Port St. Louis is the subsequent Hamburger bay, as he had received orders to close the harbour by blocking it up. As a matter of fact, the entrance to the bay (Hamburger bay) is only 800 feet wide and 13 to 16 feet deep. Inside, the bay widens out, forming an excellent harbour with a depth of up to 10 fathoms. It is the same bay which in 1645 was assigned by the Dano-Norwegian king to those Hamburgers who by a royal licence had begun to fish at Spitsbergen in 1644, and which since that time has been called Hamburger bay.

During later years the bay does not appear to have been visited. The Swedish expedition of 1861 * could not make out the bay on the voyage from Magdalena bay to Cross bay, and as others had the same experience, it was generally believed that the glacier at the bottom of the bay had come down and filled it up. The bay was therefore only marked on the charts with dotted lines as iced down. As a matter of fact, the entrance is rather difficult to make out, the points on both sides being very low and join on to the high land at the back.

On the east coast of Spitsbergen alterations from previous maps are also very perceptible, the coast-line having been subject to great changes, and the bays have altered their form and extension. If one goes further back in time, say before 1898, King Karl Land was practically unexplored (Wyche's islands), and Hvitöy island was a geographical problem (Giles Land).

At the following places, commencing from the north and down along the west coast, there are one or more houses which have been standing, and will probably be standing for several years:—

At Cape Crozier, Treurenberg bay: Swedish station, 1899–1900.
„ Mossel bay: (Polhem) do. 1872–73.
„ Virgo bay: Camp Wellman and Mr. Pike's house.
„ Magdalena bay: north side: English mine.
„ Port Ebeltoft: German station from 1911.
„ Tinayre bay, north side: English mine.
„ Port Peirson, Blomstrand peninsula: English mine.
„ King's bay, Lovén island: English mine.
„ do. Coal haven: Norwegian coal-mine.
„ Cape Thordsen: Swedish station, 1882–83.
„ Mimer bay: Swedish coal-mine.
„ Advent bay: Advent city, English coal-mine, laid down.
„ do. Longyear city: American coal-mine.
„ Coles bay, east side: Russian coal-mine.
„ Cape Heer: Norwegian coal-mine.

* K. Chydenius, 'Svenska Expeditionen till Spetsbergen år 1861 under Ledning af Otto Torell,' Stockholm, 1865, p. 846.

At South of Cape Heer, *ibid.*
„ Cape Finnes, Green harbour: Norwegian whaling station.
„ do. Norwegian wireless telegraph station, Norwegian coal-mine, and American coal-mine.
„ do. the inner part of Green harbour: Norwegian coal-mine.
„ Muyden haven, at the coast under Mount Coal, at the south entrance to Braganza bay, at van Keulen bay, at Recherche bay, at Dun islands, at Horn sound, and on Thousand islands: English mines.
The houses at Magdalena bay, Tinayre bay, Port Peirson, on Lovén island, at Muyden haven, house south of Mount Coal, at Braganza bay, van Keulen bay, Recherche bay, Dun islands, and on Thousand islands belong to the Northern Exploration Company, London.
On Axel island: Norwegian station.
At Cape Barry, Braganza bay, north side: Swedish coal-mine.
„ Horn sound, south side; Russian station, 1899–1900.
„ Hvalros haven, Bear island: Norwegian whaling station, laid down.
„ North haven, do. Norwegian station.

In addition to these houses there is a lot of huts set up by hunters who have wintered there in order to catch bears, foxes, and reindeer. These expeditions generally consist of four to six men distributed on two to three stations. These primitive houses often remain standing at the same place for only one winter. The two huts at Freeman strait and the two at van Keulen bay have been erected by fishermen who during the summer have been catching white-fish (*Delphinopterus leucas*). As a rule these expeditions are only provisioned for one year. If it then happened that the hunters, owing to difficult ice-conditions, could not be taken back, or if they were themselves unable to get out with their vessel, the second winter was often fatal. We have many reports about hunters having been relieved in the nick of time, many remarkable rescues, while others perished from hunger and scurvy. During later years the hunting expeditions to Spitsbergen have considerably decreased owing to the poor economical result. We must therefore hope that the stock of game may soon commence to increase again, what is sorely needed.

The later Norwegian whaling at Spitsbergen and Bear island commenced in 1905 with sixteen whalers. As the catch gave a poor result, the fishing has gradually ceased, the number of vessels being in 1912 reduced to six. In 1913 and 1914 no fishing has taken place. There has only been one station on shore, viz. at Cape Finnes, the rest being floating oil refineries. The cod-fishing that went on at Spitsbergen during the years 1870–83 has since that time not been taken up again. The workable coal-beds are almost all of them situated on Nordenskiöld Land, between Ice fjord and Bell sound. Here will be found Norwegian, American, English, Swedish, and Russian claims. The Norwegian wireless station was built during the summer 1911, the first telegrams being exchanged on November 24 the same year with the corresponding station at Ingö, near Hammerfest. The station is at the same time a post-office,

the postal communication with Norway being kept up by subvention from the Norwegian Government.

The small map in the right-hand corner (scale 1:35,000,000) shows Spitsbergen in relation to the surrounding countries. Greenland is represented on this map according to the latest surveys made by the last Danish expeditions. On Greenland and Iceland numerous names are given. Norway and Sweden, on the other hand, only such names that may be of interest in connection with voyages to Spitsbergen.

Of railway lines in Norway and Sweden, only such lines have been laid off as lead to towns where voyages to Spitsbergen start. By broken lines is indicated the limit of ice in various years and seasons.

Deliberations have taken place between the countries most interested in Spitsbergen as to how the many remarkable features of nature, such as, for instance, the hot springs at Bock bay, discovered on Isachsen's expedition in 1910, the fauna and flora, are to be best preserved. Of course such measures will be more and more imperative as the number of industrial undertakings and tourist trips are increasing. At the Conference which took place at Christiania by representatives of Norway, Sweden, and Russia it was, among other things, agreed upon that places offering special scientific interest should not be occupied. Proposals for regulations relating to hunting and fishing, use of poison and explosives, and measures for the protection of the Arctic flora were also discussed.

REVIEWS.

EUROPE.

Alpine Climbs.

'Peaks and Precipices: Scrambles in the Dolomites and Savoy.' By Guido Rey. London: T. Fisher Unwin. 1914. 10*s.* 6*d. net.*

Monsieur Rey is known as the author of a spirited work on the most dramatic of all Alpine stories, the contest for the Matterhorn. The volume before us may best be described as the rhapsody of the modern mountaineer. The author has reversed the usual order of the mountaineer's progress, and turned in the middle of his career from the snow and icecraft afforded by the loftier peaks to the rock-scrambles, the desperate gymnastics, called for by their granite buttresses, the Aiguilles of Mont Blanc, or the dolomitic walls and pinnacles of the Venetian Alps.

Born an Italian, M. Rey writes with all the sustained eloquence which a language singularly emotional lends itself to, and his pages offer a contrast to the perhaps exaggerated reserve characteristic of the classical period of English climbing literature. Moreover, having outgrown the reckless, unconscious daring of early youth, he is better able to realize, and he enjoys fixing and recording, the mental impressions and depressions, the doubts and tremulous regrets, of those "bad five minutes"—to quote Leslie Stephen's phrase—when the issue of the adventure seems more or less uncertain.

The climbs described in these pages are among the most arduous that have been accomplished of late years within the Alpine region. They could hardly

have been more eloquently and vividly described, and a number of admirably selected photographs not only illustrate the narrative, but give an accurate picture of the structure and fantastic details of the conquered crags and buttresses, of the contrast between granite wedges and dolomitic blocks and spires.

It would be ungrateful and out of place to repay an author who has been the first to write a readable volume on acrobatic adventure (Mummery's work included snowcraft and exploration) by an argument against the particular brand of mountaineering he has taken up with conspicuous success both as a climber and a writer. It has its place; and for its criticism it is enough to quote M. Rey's own reflections on the one occasion recorded here when he returned to one of the great peaks—the Aiguille Verte. He writes (p. 110): "That day and that mountain have left in me a memory of perfect peace. . . . I found here a new example of the peaceful beauty that belongs to the greatest peaks, and the enjoyment it afforded me seemed to have gained in serenity and in dignity. My mind, weary of the ceaseless secret conflict between its pride and its weakness that is inevitable during the struggle against unending difficulties, opened out to receive wider impressions and clearer visions.

"Lawful and reasonable climbs such as these delighted the great pioneers, who were wiser than we, and who taught us how the Alps should be loved."

It is well for a man to rejoice in his legs and his muscles and his nerves so long as he can keep his mind open to the larger lessons of the mountains. M. Rey has shown he is able to do this. He is to be congratulated on a translator who has done a difficult job with altogether exceptional ability and success.

D. W. F.

ASIA.

Russian Turkestan.

'Le Turkestan Russe.' Par A. Woeikof, Professeur honoraire de géographie physique à l'Université de Saint Pétersbourg. Paris: Colin. 1914. *Maps and Illustrations.* 8 *fr.*

The author, who by associations and long study had qualified himself thoroughly to deal with the subject, took the opportunity in 1912 to visit Turkestan, and spent four and a half months in the province, in the course of which period he clearly made the very best use of his time, and collected a considerable amount of information which a non-Russian visitor would have had difficulty in acquiring. As is well known, the variations of temperature, geological and geographical features of Turkestan are considerable, ranging from the sands of the trans-Caspian deserts and the plateau of the Ust Urt to the highlands of the upper Oxus, where mineral resources are varied and fairly plentiful. Among the more important minerals are valuable marble quarries near Fedchenko, not far from Andijan, sulphur and deposits of petroleum in the Aralo-Caspian basin and in Ferghana. So far, however, much has not resulted financially from the attempts to develop these resources, but the scanty topographical knowledge of the country is chiefly responsible, no doubt, for the small progress hitherto made. Forests, too, have not yielded much, as Ferghana is, like England, rich in trees, but not in forests. The acquisition of the regions that go to make up Turkestan has been made necessary by the raids and incursions of the nomad aborigines, and has placed its masters in possession of a sunny and highly agricultural country yielding products which could not be cultivated in Russia in Europe or Siberia. At present Turkestan supplies nearly half the cotton used in Russian factories, as well as many other raw products, and forms an important market for the

manufacturers of the country. Moreover, since railways have been opened and brigandage abolished, adjacent countries such as Khorasan, northern Afghanistan, and Kashgaria have opened up a thriving trade with Turkestan, while Russian administration has given the land peace, security, and if not ideal government, at all events one vastly superior to that which preceded it. One conspicuous defect, in M. Woeikof's opinion, is that the upper government officials have a very imperfect acquaintance with the native languages, while their subordinates have no regular defined or permanent employment, with concomitant advantages as regards pay and annual leave, such as are enjoyed in the British and Dutch East Indies.

AMERICA.

The Upper Amazon Basin.

'The Upper Reaches of the Amazon.' By Joseph F. Woodroofe. London: Methuen & Co. 1914. Pp. xvi., 304. *Map and Illustrations.* 10*s.* 6*d. net.*

This book is the record by a young Englishman of between seven and eight years' residence in the upper Amazon basin, during which period he experienced many vicissitudes, at one time working his way up to the command of a prosperous business, but for the most part serving as an employé in the rubber-collecting industry. He ranged from Manaos to beyond Iquitos in the one direction, and to the Madeira-Mamoré railway in the other. In the course of his varied employment he became associated with the notorious company exploiting the rubber resources of the Putumayo. His participation in the business after he became aware of its character he excuses by explaining that he himself was "a victim of peonage," being accounted heavily in debt to his patrons.

Having this basis of experience, he has written this book with a twofold object—to warn other young Englishmen of the dangers of employment in the outlying parts of the Amazon basin, and to expose the evils attendant on the collection of rubber, not only in the Putumayo, but, to a greater or less extent, throughout the area which came within the range of the author's observation. About two-thirds of the book is occupied with the personal narrative; the rest is devoted to a generalized account of the conditions under which the rubber industry is carried on, natural history notes, and a few hints for travellers. Particularly instructive is a detailed description and estimate of the cost of starting and working a "seringal," or rubber estate, in the Amazonian forests. From this it appears that the workers are not the only sufferers from a vicious system, under which the masters themselves are often in a sorry position.

Apart from its main theme, the book is interesting for its ingenuous details of life and travel in the upper Amazon basin. Without literary graces, and lacking the scientific value of the record of a trained observer, it presents in popular form a good deal of information, and should do much to spread knowledge of a region which, in the ordinary way, comes little into the light, but which has already attained economic importance and has potentialities of vast development.

POLAR REGIONS.

Antarctic Domestic Economy.

'Antarctic Adventure. Scott's Northern Party.' By Raymond E. Priestley. London: T. Fisher Unwin. 1914. *Map and* 150 *Illustrations.* 15*s. net.*

Mr. Priestley's detailed account of the life of the members of Scott's Northern Party, under the command of Lieut. Campbell, presents many features of great

value. The expedition, originally destined for the exploration of King Edward Land, made itself famous in Antarctic history by the remarkable journey along the coast of Victoria Land after the failure of the relief ship to pick up the party. The book is disappointing in one way only, and we mention this to get it over, as it need not be dwelt upon. It does not read smoothly, there are repetitions of phrases with a very tiresome iteration, and the proof-reading falls short of perfection, occasionally failing to circumvent the diabolic ingenuity of the linotype machine, as on page 123. As other examples, "Armytage" appears for "Armitage" on page 34, "eyelids" for "eyebrows" on page 99, and "hydrometer" for "hypsometer" on page 373. Such trifling defects are more than compensated by the fine collection of photographs with which the work is profusely illustrated, and these are worthy to stand beside the best that the Antarctic, always a happy place for photography, has yielded to any expedition.

This is not the official record of the Northern Party, and thus it would be unappropriate to deal here with such questions as the choice of a landing-place or the provisioning of the sledge-party landed in the second year, though these are points of much interest in the history of Polar exploration.

Mr. Priestley does justice to the work of the Southern Cross expedition under Mr. Borchgrevink, who was the first to land at Cape Adare and to winter on the Antarctic continent. Scott's Northern Party of six found, in the course of the year they spent on that inhospitable beach, abundant corroboration of Borchgrevink's statements as to the impossibility of carrying on exploration thence either by land or over the sea ice, and, except by supplementing the collections and adding another year to the meteorological record, the stay of the second wintering party contributed little to our knowledge. One interesting fact referred to is the extraordinary barrenness of the dredgings off the beach, explained by the tidal currents constantly driving great icebergs ashore and thus scraping away any forms of organic life that may have found a footing on the coastal slopes. As a result of the frequent severe gales, a heavy swell breaks upon the beach, carrying with it great boulders of ice, which as the breakers curl over are flung violently on shore far above high-water mark; as Mr. Priestley observes, "pieces the size of a cricket-ball were thrown like a stone from a catapult past our heads to break in fragments on the pebbles behind." Nor was this the only form of bombardment to which the dwellers on the beach of Cape Adare were subjected. In the heavy gales pebbles were caught up by the wind and hurled with terrific velocity. One remarkable instance is given of such a pebble being driven through the vacuum bulb of a solar radiation thermometer, not breaking the glass like a stone, but cutting a clear round hole like a rifle bullet. It says much for the strength of the huts that no serious damage was done to that constructed by the party, while Mr. Borchgrevink's hut, which had stood the storms of thirteen years, was found sufficiently sound to serve as a storehouse and workroom after slight repair. Further light is thrown on the extraordinary local character of these terrific winds, and a most interesting account is given of an occasion at Cape Penelope where the snow lay undrifted and unruffled by wind while blizzards were raging with their characteristic ferocity at Cape Adare less than 10 miles away.

The greatest value of Mr. Priestley's book lies less in his remarks on scientific observations than in the detail with which he sets forth the shifts and expedients of a camp life, such as the pioneers of geographical exploration never imagined. The compensation for the terrible weather experienced where the ice-clad land of Antarctica meets the sea lies in the abundance of food and fuel yielded by the animal life nourished in the waters. Although practically

limited to seals and penguins, the resources are more numerous and more sufficient than one could imagine. Already, at Cape Adare, experiments had been made, and important improvements effected in the use of blubber for giving light and heat, but it was not until the second winter that the art of living and preserving health on a minimum of the necessities and none of the comforts of life was brought to a pitch that can almost be designated perfection. The six men were landed by the *Terra Nova* at Evans Coves, about midway between Cape Adare and Scott's main base at Cape Evans, on January 8, 1912, for a short trip, and on February 7 they began to feel anxious regarding the return of the ship, and reference is made later to their provisions being only sufficient for six weeks' sledging. The ship did not return, and by the end of February the party set themselves to prepare to pass their second winter, without a hut, without adequate clothing, and without either fuel or food for more than a few weeks. It is the description of this wintering which forms the unique interest of the book, recalling in many ways Nansen and Johansen's wintering in Franz Josef Land, after leaving the *Fram* in 1895. The winter residence was a cave excavated in a snow-drift, so low in the roof that none of the party could stand upright, though why it was necessary to submit to this uncomfortable condition is not made clear, but, no doubt, there was some good reason why the cave could not be dug down deeper. Pebbles from the neighbouring beach were spread upon the floor and covered with quantities of dry seaweed, which was fortunately found in the neighbourhood, and furnished a non-conducting carpet for the sleeping-bags. Except a small ration of biscuits, the food brought with the party was saved for the spring sledging back to the main base, and during the winter the party resolved to live upon the country. A fascinating account is given of the gradual development of blubber lamps and cooking-stoves, the great difficulty being the supply of wicks, as there were no spare textiles of which to make them. At length the brilliant discovery was made that the old much-weathered bones of the bleached seals' skeletons were porous enough to serve the purpose, and the light and fuel problem was triumphantly solved. Yet at the best the burning blubber emitted a peculiarly acrid and irritating smoke, to which one of the party applied the appropriate west-country name of "smitch."

A sufficient, although barely sufficient, number of seals and penguins was secured before the autumn migration to provide food and blubber to last until the return of the animals in the spring, and although some of the party suffered severely from ptomaine poisoning, they managed to pull through, and found the livers and seals' brains attractive articles of diet, the latter having been used for the first time in Antarctic history. Water melted from sea-water ice was used in default of salt in cooking the food, and only one of the party found any bad effect from the use of brine containing so large a proportion of sulphates and magnesium salts.

Although on the whole fair health was maintained during the three months of darkness, the life must have been one of unceasing physical misery. The spirits of the party, however, rose superior to their environment, and, contrary to all precedent, the six men grew in friendliness and good-nature as time went on to such an extent that their attachment to each other was the cause of not a little chaff when they rejoined the surviving members of the main party and returned on board the *Terra Nova*. Mr. Priestley sums up his experience as follows:—

"I do not for a moment say that any of us would care to repeat that winter. Indeed, I believe that another similar experience would kill most of

us, or drive us mad; but it is certain that our pleasures during the hardest winter any of us are likely to see were as acute as our pains. We could get as much pleasure out of an unexpected lump of sugar, or a peaceful day after the trials of a day as messman, as the most costly luxury or the most entrancing holiday could give to us now.

"Half the fascination an Antarctic expedition possesses is to be found in the sharpness of the contrasts experienced during its course, for it appears to be true that a hell one day is liable to make a heaven the next. It is probable, indeed, that here we have another of the clearest notes that together make up that elusive something we term, for want of a better name, 'the Call of the Antarctic.'"

H. R. M.

GENERAL.

Educational Books.

(1) 'Environment: A Natural Geography.' By G. R. Swaine. Pp. 226. *Maps and Pictures.* Ralph, Holland & Co. 1*s.* 9*d.*

There are three forces which manifest themselves in regard to human occupation of the Earth: the control due to the environment, the inherited customs and habits of man's forerunners, and the caprice of the present generation. To teach geography, it is necessary to present a survey of the globe so ordered that the effects of these forces may be readily perceived, grouped, classified, and set in due perspective. The tradition has been to teach in relation to political boundaries, and there is much to be said in favour of retaining the political boundaries in order to maintain the due perspective which involves the appreciation of relative importance. A break away from tradition occurred when it became usual to attempt to determine geographical regions; and this attempt allows for the necessity for perception and classification but tends to ignore the question of perspective, the need for outlook. Hence, we have most frequently a compromise between regions and countries. Mr. Swaine assumes a knowledge of countries topographically and presents all the examples of a type of region together in a chapter; *e.g.* North island (New Zealand) is in one section and South island elsewhere, Chile is divided between two sections. The net result is a general scrappiness and lack of proportion which appear to militate against the use of Mr. Swaine's book in schools.

(2) 'A Regional Geography of the Six Continents.' Book 1. Europe. By E. W. Heaton. London: Ralph, Holland & Co. Pp. 127. *Maps and Diagrams.* 1914. 1*s.*

"What is a natural region?" To many teachers of geography this is a perplexing question, to which they fail to find a satisfactory answer, and this little book will not avail them much. Take the chapter "The North Sea as a Natural Region"; the sole basis for the selection of this region appears to be the shallowness of the sea and the consequent fisheries. The region is divided into four portions: (*a*) the German outlets to the North sea; (*b*) the German Rhine; (*c*) Holland; and (*d*) Belgium; and the bulk of the description of each section of the region refers to topographical facts based upon the connecting link of a river.

"The first striking peculiarity of Mediterranean climate is that the rain

falls chiefly in winter and rather before Christmas than after. The rain-bearing wind starts as a south-west warm wind from the dry belt of North Africa. It is thirsty as it blows over the Mediterranean sea, and picks up much water-vapour as it crosses. Those mountain ranges which run north-west to south-east catch the full force of the wind and, where they rise 6000 to 8000 feet, lead to copious condensation" (p. 73). This naïve explanation of the winter rains on the Dalmatian Alps does not agree with the wind directions shown upon Buchan's map. "Thus, in winter, there is an average difference of 10° F. between the North sea temperatures and those of the French seas" (p. 52). Hann's map gives the air temperature over the North sea in January as approximately 37° F., and over the Bay of Biscay as over 43° F. Our own official statistics give the temperatures of the surface waters of the North sea and English channel as respectively 43° F. and 49° F. in January.

(3) The Atlas Geographies. Part III. Senior Geography. No. 1*a*, 'British Isles.' By T. Franklin, E. D. Griffiths, and E. R. Shearmur. Pp. 120. 1*s*. 10*d*. *net*. No. 4, 'Africa.' By T. Franklin and E. D. Griffiths. Pp. 116. 1*s*. 6*d*. *net*. W. & A. K. Johnston, Ltd.

These books combine the atlas and the text-book; the text is based upon a consideration of the maps, and is supplemented by sets of exercises which require the pupil to carry out in similar reasoned fashion additional inquiries. The maps are numerous and some of them distinctly helpful, but a protest should be lodged against the reproduction of the maps such as that entitled the position of Edinburgh; the route maps also contain too much detail for school use. In the volume on Africa the maps are models of what school maps should be; but in the climate maps (p. 7), the isotherms should have the symbol for degrees added to the numbers, and the isobars are given without reference in words and without the symbol for inches.

The method adopted by the authors ensures that no statements of fact are made in isolation, there is a causal connection given in all cases, so that the pupil will obtain a reasoned inlook over the country studied. The net result is that the pupil's attention is called to details which appear unnecessary, and that he is not directed to the wide sweep of an outlook over the country in relation to the rest of the world. The facts are studied intensively as it were *in situ*, without emphasis upon their relative importance.

THE MONTHLY RECORD.

THE SOCIETY.

Alien Enemy Members and Fellows.—At the meeting of the Council on February 8 it was resolved that the names of alien enemies resident abroad, who are Honorary Members, Honorary Corresponding Members, or ordinary Fellows of the Society, should be removed from the list of the Royal Geographical Society during the continuance of the war.

EUROPE.

Lake Oulujärvi, Finland.—A minute study of the coast features of this lake, the third largest in Finland, has been carried out by Dr. I. Leiviskä, who has set

forth the results in the *Annales* of the Finland Academy of Sciences, Series A, vol. 3, No. 12. The lake consists of a main portion running north-west (divided in two by the large island of Manamansalo) and a smaller portion running north-east; the maximum breadth being about 24 kilometres, and the total length about 62. Its area is 1002 square kilometres, and the greatest depth about 34 metres. The lake lies between the lower and more level coastal region and the higher and more hilly interior, and the nature of its shores varies accordingly—extensive moors alternating in the west and north-west with stony, wooded, morainic deposits, while the eastern part is immediately bordered by lines of heights. The whole district is also traversed by a belt of sand-ridges. The rock formations likewise vary greatly between the west and east, being chiefly granite to the west, while to the east there is much more variety. The form of the coast naturally varies greatly, and Dr. Leiviskä distinguishes no fewer than eight main types, from rocky shores and shingle beaches, and flat marshy or wooded coasts, to eroded sandy cliffs. Each of these, with its subdivisions, is minutely described and illustrated. Whereas the formations are very similar to those on the coast of the Gulf of Bothnia, which Dr. Leiviskä had previously studied, the forms of the shores show considerable differences, those due to erosion preponderating, on the lake, over those due to deposition. A special section is devoted to the erosion forms, which are seen chiefly where the sandy belt touches the coast. Apart from the nature of the material and its exposure to the considerable waves of the lake, an explanation of the intensity of erosion is suggested in the great fluctuations of level, which between April (low water) and June (high water) exceed 1 metre, and even approach 2 metres. The occurrence of high water immediately after the disappearance of the ice is another factor favourable to erosion. The eroded material is piled up by the surf in sandy or gravelly banks which may be found practically all round its circumference. The influence of the ice on the forms of the shores is clearly traceable, though much of its effect is soon removed by the waves. Among the most characteristic effects are the ramparts of angular blocks and shingle, which cannot be thrown up solely by the surf.

AMERICA.

Recent Subsidence of the New Brunswick Coast discredited.—It will be remembered that the question of supposed recent changes of level on the North American coasts has been taken up within the past few years by Prof. D. W. Johnson of Harvard, who has held that the facts supposed by some to bear witness to such changes of level can be otherwise explained (cf. *Journal*, vol. **40**, p. 335; vol. **42**, p. 152). A study of the question has lately been undertaken, with special reference to the coasts of New Brunswick, by Mr. J. W. Goldthwait, who, during field work in 1911, visited a number of localities where so-called evidences of modern subsidence are to be seen. Before doing so he had conferred with Prof. Johnson, and co-operation was arranged between the Canadian Geological Survey and the Shaler Memorial investigation already in course of prosecution under Prof. Johnson's direction. Mr. Goldthwait's conclusions, as set forth in *Museum Bulletin* No. 2 of the Canadian Survey, appear to be in entire agreement with those of his fellow-investigator. He examines each of the arguments for the subsidence theory in turn, and finds that in each case the evidence is at least inconclusive. The rapid recession of cliffs and beaches which has been described is only, he thinks, what might be expected if the coast had been stable for centuries. The existence of drowned valleys shows that there has been subsidence in the past, but this proves nothing as to modern movements; the valleys being apparently products of pre-glacial or inter-glacial erosion sub-

sequently drowned deeply and only partially uplifted again. Barrier beaches, again, are normal features of the simplification of an irregular shore-line; the lagoons behind them being most naturally explained as bays shut off by the growth of reefs between headlands. The disappearance of the hooked ends of recurved spits beneath the surface of lagoons is what necessarily occurs on shores where no change of level is in progress. Where trees are said to be dying through submergence by salt water, this may be due to recent increase in the range of tide; and the phenomenon is certainly not general along the coast, as it would be if this were rapidly subsiding. The peat-bogs, whose bottoms have been said to reach 10 or 15 feet below high-tide mark, were found to extend only 2 or 3 feet below that level, and may have been formed in closed fresh-water basins whose floors were not below mean-tide level. Lastly, a detailed survey of the beaches on Grande Plaine, Miscou island, indicates, in Mr. Goldthwait's view, that so far as these are true wave-built beaches they testify rather to coastal stability than coastal subsidence.

Oceanographical Cruise of the "Grampus," 1914.—Continuing the work of the previous two seasons under the auspices of the Bureau of Fisheries, the U.S. schooner *Grampus* carried out oceanographical investigations in the coastal waters of the eastern United States during the summer of 1914, under the direction of Dr. H. B. Bigelow. The results, as outlined in *Science* for December 18 of that year, will evidently be of considerable interest when worked out, although the work had to be curtailed to some extent owing to the war. They include investigations of currents, salinities, temperatures, and plankton of the waters in question. According to the programme for 1914, special attention was to be devoted to George's bank, important oceanographically because of its position as a rim between the cold water of the Gulf of Maine and the Gulf Stream; to the effect of the St. Lawrence water both on the coast water further south and on the Gulf Stream; and to the possible influence of the Labrador current on the coasts of the United States. The vessel was provided with a thoroughly modern outfit for the work, and the method of procedure was to run successive sections in a direction normal to the coast; this was carried out as far as Halifax. The first two sections, outward and return, were concerned with the Gulf of Maine and George's bank as far as the continental slope, well within the sweep of the Gulf Stream. Another, of great interest, led across the deep gully between George's and Brown's banks, which forms the only connection between the basin of the gulf below the 100-fathom contour and the deeps of the Atlantic. Observations off Shelburne, Nova Scotia, were also valuable as revealing a strong set of the water to the south-west—an index of the long-shore flow of St. Lawrence water. Later, work was carried south down to and beyond Cape Cod, and a section across the continental shelf was started from No-Mans-Land, just south of Martha's Vineyard. Altogether the distance sailed was about 2000 miles, and complete data were taken at fifty-two stations, between the depths of 15 and 250 fathoms.

Broughton's Survey of the Colombia River, 1792.—Although the actual first discovery of the mouth of the Colombia is to be credited, in all probability, to the Spanish voyager Heceta, and it was also seen by the American Captain Gray, who gave it its name, the first exploration of its lower course was that of Lieut. Broughton, who commanded the *Chatham* under Vancouver during the first year's work of the latter on the coast of North-West America. An account of Broughton's ascent of the river is given by Vancouver in vol. 2, chapter 3, of his 'Voyage of Discovery,' evidently from a report made to him by his subordinate, and the question has lately been raised whether such original report, or other document describing Broughton's survey, might not exist at the Public Record Office. To settle the question the Hydrographer to the Admiralty, Captain J. F. Parry, instituted

a careful search in the Record Office among the captain's logs, captain's and lieutenant's letters for the year 1792, and he has obligingly communicated the results to us. If, he says, Broughton wrote a detailed account of the survey, this would probably have been sent under cover of one of Vancouver's letters of proceedings, since Broughton does not write directly to the Secretary of the Admiralty until his arrival off Cadiz in 1793. Now Vancouver's letters of proceedings from March, 1791, to February, 1793, are not to be found at the Record Office, but this is probably of less importance for the matter in question from the fact that such letters as are preserved deal little with the discoveries of the expedition, and any account of the survey of the Colombia would no doubt be but brief. A more important source of information would probably be Broughton's Journal, and this has been found at the Record Office. Captain Parry has sent us a copy of the entries in this between October 19 and 24, covering the period during which the *Chatham* entered the Colombia. The details given differ considerably from those embodied in Vancouver's narrative, and thus form an interesting supplement to the latter,* though unfortunately no account is supplied of the experiences of the boat parties, which started up the river on October 25. From this date the log records only the minor events of the ship's daily routine.

Earthquakes at Charleston.—The Charleston earthquake of August 31, 1886, is of special interest as it occurred in a district that might almost have been called aseismic. Mr. S. Taber (*Bull. Seis. Soc. America*, vol. 4, 1914, pp. 108–160) has investigated the history of the district, and, excluding the immediate precursors of the great earthquake, finds records of not more than eight shocks (only two of which were regarded as strong) during the two centuries preceding 1886. After the great earthquake, however, shocks occurred more frequently. From 1886 to 1897, there were 318 shocks, and from 1898 to 1913, 77. The greater part of Mr Taber's memoir is occupied with an inquiry into the effects of various meteorological and astronomical phenomena on the frequency of these earthquakes. Though it is an inquiry which should extend over many districts, the main results are worthy of notice. Mr. Taber considers that most of the earthquakes are probably due to adjustments along a fault running from near Woodstock in a north-east and south-westerly direction, but that many of the minor shocks are caused by the adjustment of stresses set up by the more important movements. Changes of pressure, which affect differently the rocks on the north-west and south-east sides of the fault, are the chief factors influencing the frequency of earthquakes, and among these factors Mr. Taber regards rainfall, the level of the underground water-surface, and the barometric gradient as the most important; and changes in sea-level, variations in sunspot frequency, and the attraction of the sun and moon as of little or no consequence.

Miss Keen's Explorations in Alaska.—We regret that through inadvertence, when speaking in the January number (p. 79) of Miss Keen's glacier explorations in Alaska, her previous ascent of Mount Blackburn was described as a partial one. This was correct as regards her first expedition to the mountain, but the ascent was successfully completed during her second expedition in 1912, as described in the *Bulletin* of the Philadelphia Geographical Society for April, 1913, and elsewhere.

AUSTRALASIA AND PACIFIC ISLANDS.

Explosive Sounds in Australia.—The much-discussed question of the mysterious sounds heard by travellers and others, principally in arid regions like the centre of Australia, is once more raised in a paper by Mr. Thomas Gill, read to

* A fact that does not seem to be mentioned by Vancouver is the finding of another vessel—the *Jenny* of Bristol—at the entrance to the Colombia river.

Section E of the Australasian Association for the Advancement of Science in 1913, and since printed in the Report of the meeting (pp. 352-361). In 1912 reference was made in the *Journal* (vol. **39**, p. 615) to a discussion of the same subject by Dr. J. D. Cleland, who brought together a considerable number of cases in which the phenomenon had been observed. Mr. Gill, who does not refer to Dr. Cleland's paper or other general discussions, has likewise for a number of years collected reports on the subject, both from the published works of travellers, and personally from explorers and old bushmen, and his contribution is useful as placing these on record. He makes no attempt to offer an explanation of the phenomena, though quoting various suggestions made by those who have heard the sounds. These suggestions, like the descriptions of the sounds themselves, are so diverse—the cause being variously ascribed to earthquakes, electrical discharges, meteors, and other terrestrial and atmospheric phenomena—that there can be little doubt that the sounds are not all attributable to one and the same cause.*

Point Samson, N.W. Australia.—The copy of a despatch from the Governor-General of the Commonwealth of Australia has been forwarded to us from the Colonial Office, calling attention to the recent decision of the Government of Western Australia with regard to the spelling of the above name. Point Samson, near Cossack on the north-west coast, was named after an old resident of Freemantle, and is correctly spelled as above, although the form Sampson has been introduced into recent maps of Western Australia, as well as the Admiralty charts.

POLAR REGIONS.

The Macmillan Expedition in Search of Crocker Land.—News of this expedition (cf. *Journal*, vol. **42**, p. 496) was received in the United States towards the end of 1914, and is summarized in the January number of the *Bulletin* of the American Geographical Society. Mr. W. E. Ekblaw, geologist and biologist to the expedition, wrote on August 29, 1914, to the American Museum of Natural History, stating that the leader, Prof. D. B. Macmillan, had started over the ice in search of the reported land (apparently about the middle of March), accompanied by Ensign F. Green, engineer and physicist. From Cape Thomas Hubbard, at the northern extremity of Axel Heiberg island—the point from which Peary believed that he saw land in the far north-west—they sledged in that direction for 125 miles. During two days they thought they saw land ahead, but it finally proved to be mirage, and as they arrived nearly at the place where Crocker Land was placed by Peary without discovering it, they concluded that either it does not exist, or it is not in the locality supposed. The journey over the ice, which with the return occupied two months, was both difficult and dangerous. Most of the dogs were lost, and many leads had to be crossed on thin ice; while the day after the return to Cape Thomas Hubbard, in the middle of May, the ice broke up, and became a grinding chaos in which, if caught, the travellers must certainly have perished. Speaking of the party as a whole, Mr. Ekblaw reported that they were well and contented, fully provided for the year's work, in completion of their programme, which still lay before them. He himself, with Tanquary, had spent the summer at Umanak, North Star bay, studying the geology and biology. At the time of writing he was on Rasmussen's motor boat, 15 miles south of Etah, this Danish explorer having brought supplies and letters for the expedition so far. His help and courtesy to the party is spoken of in the warmest terms.†

* For a reference to somewhat similar sounds in Haiti, there usually ascribed to seismic influences, see *Journal*, vol. **41**, p. 389.

† Rasmussen is believed, from other information, to be planning a new expedition to Northern Greenland in 1915, with a view to continuing the work of his 1913 trip (*Journal*, vol. **42**, p. 546).

Russian Arctic Expeditions.—We are informed that the Russian press has published news received by wireless from Yugor Shar (Novaya Zemlya), to the effect that two Russian vessels which set out from Vladivostok in 1914 to repeat the attempt of the previous year to complete the navigation of the Siberian Arctic sea from east to west are wintering in 100° E., 15 miles apart. They had discovered *en route* a new island near Bennett island. The *Eclipse*, Captain Sverdrup's ship (cf. February number, p. 163), is said to have established winter quarters in 92° E. in the west of the Taimyr peninsula. It will be remembered that his voyage was undertaken for the purpose of searching for the lost Russian expeditions under Brussilof and Russanof respectively. As regards the first of these, the statement is made in *Petermanns Mitteilungen* for October last (quoted in the *Bulletin* of the American Geographical Society for January) that it has already met with a tragical ending. From two members of the expedition brought home by Sedof's ship, the *Saint Phoka* (*Journal*, vol. **44**, p. 411), from Franz Josef Land, it was learnt that Brussilof's ship, the *Saint Anna*, was caught in the ice of the Kara sea in 71° N. in August, 1912, drifting for a year and a half until she reached Franz Josef Land. The mate Albanof (one of the two rescued men) had left the ship on April 23, 1914, with thirteen sailors, at a point in 83° N., 60° E., north of Crown Prince Rudolf Land. Most of the party reached Alexandra Land, in the west of the archipelago, but here they separated, some going eastward by land, others endeavouring to reach Cape Flora in boats, but of the latter party only two reached their destination. All efforts on the part of the crew of the *Saint Phoka* to find either the remaining men or the ship were in vain. It is also stated that the *Hertha*, which went to Franz Josef Land last year in search of Sedof's party, found records concerning the fate of Sedof's expedition.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Rate of Continental Denudation.—A note in *Science* of December 25, 1914, by Dr. Charles Keyes, deserves attention as a warning as to the untrustworthy nature of estimates of the rate of denudation based on calculations of the matter carried down by a large river, in suspension or solution. In forming such estimates, the case of the Mississippi valley has been a favourite one with geologists, owing to the attention paid to this by Humphreys and Abbot more than half a century ago; but Dr. Keyes points out that factors have been left out of consideration which are specially important in the case of the Mississippi, rendering the choice of this as a typical example the most unfortunate that could be made. In particular it appears that the wind-borne dusts from the western deserts are alone probably depositing materials over the entire Mississippi valley faster than the river and its tributaries are carrying rock waste to the sea. Movements of elevation, again, such as have affected much of the Upper Mississippi valley since glacial times, have not, Dr. Keyes holds, been taken sufficiently into account. The elaborate stream measurements give no clue whatever to the absolute rate of continental lowering through erosion, but merely emphasize the relative impotency of stream work in general. It may be doubted whether the neglect of the other factors spoken of by Dr. Keyes is quite so general as he supposes, and in any case the work of rivers is at least one of the main factors in the geographical cycle by which the net result is produced, and it is surely permissible to endeavour to evaluate its individual effect, apart from that of other forces in play.

GENERAL.

Polar Medal for the Mawson Expedition.—As announced early in February, the King has approved of the award of the Polar Medal to the officers and men who took part in Sir Douglas Mawson's recent Antarctic expedition. It

will be remembered that the medal was awarded in 1913 to the members of Captain Scott's expedition of 1910–13.

The American Geographical Society.—The appointment of Prof. Isaiah Bowman to the post of Director and Librarian of this society has lately been announced. Prof. Bowman is widely known as one of the most energetic and capable of the younger American geographers, and valuable developments of the work of the American Geographical Society under his direction may be anticipated. It will be remembered that he has done good research work in the Andine region of South America, both in association with Prof. Hiram Bingham and independently (cf. *Journal*, vol. **44**, p. 232). As noted below, he is also secretary of the Association of American Geographers, and the two bodies are working in harmony towards the improvement of geographical education and cartography in the United States, an object towards which much thought and attention is being directed at the present time.

Association of American Geographers.—The eleventh annual meeting of this association was held at Chicago on December 29 and 30, 1914. The attendance ranged from thirty-eight to seventy-two, and the number of papers read was twenty-eight, out of a total of forty-two of which the titles appeared on the programme. From a copy of the latter with which we have been favoured, it is evident that the recent development of geographical study in the United States continues to be well maintained, and the nature of the subjects discussed shows that it is proceeding on satisfactory lines. Particularly striking is the attention now being paid to the applications of geography to social and economic questions, present-day students of the subject being not content to restrict themselves to the relatively barren fields of Mathematical and Physical Geography, important as these are as ways of approach to the more fruitful ground beyond. Among the subjects of this kind included in the programme may be noted: "Some Geographic Factors influencing Brazilian trade" (Prof. W. S. Tower); "West Indian Trade as a factor in the early development of certain ports" (Mary J. Lanier); "The influence of Trans-continental highways on the price of wheat" (N. A. Bengston); "Natural Economic Regions" (Prof. C. R. Dryer); "Regional characters in the growth of American cities" (Prof. Mark Jefferson); "Influence of geographic conditions upon Ancient Mediterranean Agriculture" (Ellen C. Semple); "Human relations in the Glacial Lake Plains of Ohio" (Frank Carney); and several others. The officers elected for 1915 include Prof. R. E. Dodge as president, Prof. Isaiah Bowman as secretary, and Prof. H. H. Barrows as editor of the Annals of the Association; Prof. Dodge having resigned the last-named post after five years' occupancy, during which he devoted much painstaking and efficient effort to the securing of a high standard of publication. A conference conducted by Prof. Fenneman on the definition of Physiographic Provinces in the United States resulted in definite progress towards that end, and among decisions arrived at it was resolved that a non-membership list of students and others desirous of receiving the programmes of the Association is to be maintained, at present limited to a hundred and fifty names; while the sum of $500, or about half the total inactive funds of the Association, was assigned to the joint research fund of the Association and the American Geographical Society. Steps were also taken for the appointment of a committee to assist Mr. Cyrus C. Adams in preparing a report on the raising of the Standards of Geographical Education in the United States, this report to form the basis of a discussion in December, 1915. The place of meeting for the next annual meeting in that month will be fixed later.

The Geographical Society of Philadelphia.—We are informed that this society has decided to hold monthly meetings for study and research, in addition

to the usual illustrated lectures on travel and exploration. The first meeting of the kind was held in January, when Prof. D. W. Johnson spoke on "The Physiographic Features of Western Europe, and their influence on the Campaign against France." The Philadelphia Society, under its energetic president, Mr. H. G. Bryant, has shown a decidedly progressive spirit for some years past, and the step just taken will no doubt conduce still more to its usefulness in popularizing geographical ideas and methods.

OBITUARY.

Vice-Admiral Sir George Strong Nares, K.C.B., F.R.S.

We regret to announce the death of Vice-Admiral Sir George Nares, on January 15, at the age of eighty-four. G. S. Nares was born in 1831, entered the navy in 1845 and served a commission in the Pacific on board H.M.S. *Havannah*. In 1851 he passed the examination for Lieutenant, and returning to England soon afterwards was appointed a mate in H.M.S. *Resolute*, Captain Sir Edward Belcher, in command of an expedition to the Arctic in search of Sir John Franklin and his companions. His early training thus gave him a knowledge of managing sailing vessels in all circumstances of wind and weather and experience in ice navigation. During his service in the *Resolute* he took part in sledge journeys, and became acquainted with conditions of Arctic travel.

Returning from the Arctic in 1854, he was promoted to Lieutenant on October 21 of that year, and served in the Mediterranean 1854 to 1856, when he was transferred to the *Illustrious*, a training ship for naval cadets—which was then being established at Portsmouth—and afterwards to the *Britannia*, which took her place. It was during this time that he compiled 'The Naval Cadets' Guide,' afterwards expanded into the well-known 'Nares' Seamanship,' a text-book which is still in use.

He had a remarkable influence over the young cadets, and a cruise with him in the sailing launch for instruction was always eagerly looked forward to and enjoyed. His zeal and energy were an irresistible stimulant to them in their training, and their admiration of him was great. He was promoted to Commander in 1862 for his good work in the training ships, which he continued in command of H.M.S. *Boscawen*, then a training ship for boys.

Nares next commanded the *Salamander*, a paddle-wheel vessel on the Australian station, engaged in keeping open communication with a party of marines established at Cape York. On his voyages backwards and forwards between Sydney and Cape York he did some useful surveying work, and on his return to England in 1867 he commissioned the *Newport* for hydrographic work on the Mediterranean station. While at this work he was promoted to Captain on June 1, 1869.

The approaching completion of the Suez canal necessitated a survey of the Gulf of Suez, and the *Newport* was selected to carry this out. At the opening ceremony in November, 1869, the French Imperial yacht *l'Aigle* headed the procession of sixty-eight vessels, and was the first ship through, but one of the large vessels grounded at the entrance of Lake Timsah, and all the ships following her had to secure to the banks of the canal. Nares went on in a boat to look at

the grounded vessel, and found there was a very narrow passage between her and the east bank, which he thought he could manage to get the *Newport* through, she having a right-handed screw. This was eventually done, and about 9 p.m. the *Newport* joined up with the leading ships which had anchored in Lake Timsah.

Nares next commanded the *Shearwater* on the same station, and a survey from Suez to Koseir was completed by April, 1872. On the voyage from England the *Shearwater* embarked Dr. W. B. Carpenter to assist, on behalf of the Royal Society, in an investigation of the Gibraltar current. This work was so well done as to mark Nares out for other scientific work, and when in 1872 the Government decided to commission a ship for exploration of the oceanic basins of the world, he was selected by the Admiralty to command the expedition, and was ordered home to prepare the *Challenger* for the cruise. The results of this expedition have been published, and it is only necessary to say here, that to the energy, tact, constant care, and watchfulness shown by Captain Nares, were due the initiation and success of work in the carrying out of which very few on board had any experience, and also the happy relations which existed throughout the voyage between the naval and scientific staffs on board.

Nares' qualities as a sailor were shown in a marked degree during this voyage, most of which, except when actually sounding and dredging, was carried out under sail; and they were especially conspicuous when the *Challenger* proceeded to the south from the Cape of Good Hope, across the Antarctic Circle, and all on board had an opportunity of appreciating his skill in handling the vessel amongst icebergs. Gales and snowstorms were not infrequent, and, the ship not having been strengthened for ice navigation, there were one or two occasions when quick decision was necessary, and was forthcoming.

The *Challenger* reached Hong Kong towards the end of 1874, when Nares bade farewell to that ship, having been recalled to England to head an expedition to the Polar sea. He was the youngest survivor of the officers who had gained Arctic experience in the expeditions sent by Government in search of Sir John Franklin. On this account, and because of his reputation as a fine seaman, and the ability with which he had conducted the work in the *Challenger*, he was selected for the command. The two ships employed were the *Alert* and *Discovery*, and the primary object of the expedition was, if possible, to reach the North Pole.

Leaving England on May 29, 1875, the vessels proceeded through Davis strait to Smith sound, where, a secure harbour having been found in 81° 44′ N., the *Discovery* was left to form a base of retreat, and the *Alert* pushed northward as far as possible to 82° 27′ N., and was there secured inside grounded floe bergs off the coast of the Polar sea, September 1, 1875.

Throughout the preparation of the expedition and the successful voyage of the two ships from England to their winter quarters, the old energy, zeal, and thoroughness which had characterized Nares' whole career were more than ever prominent; nothing was forgotten, nothing was overlooked, and both before the start and later on, with infinite patience and friendly tact, he brought the officers of the two ships to understand, by his personal example and leading, what were the principles of ice navigation in the narrow waters of Smith sound. No two ships have ever been so far north in company and returned undamaged to the port they sailed from.

On his return from the Arctic, Captain Nares was made a K.C.B. by Her Majesty Queen Victoria in recognition of his services, and he received the Gold Medal of the Society at a special meeting held in St. James' Hall. The account which he there gave of the work done by the expedition was more fully described in the 'Voyage to the Polar Sea,' which he wrote, and which is, as he says in the

Preface, "a plain and faithful account of the voyage of H.M. ships *Alert* and *Discovery* to and from the Polar sea." He was, in fact, himself a plain man in his modesty, in his quiet reserved nature and lack of fluency in speech, but he was essentially a man of action, of clear thought and quick decision, indefatigable, and unsparing of himself when work had to be done. His superiors deemed him a man of sound sense and good judgment, and those who served under him loved him for his equable temper, patience, and thoughtfulness, believed in him, and trusted him in all things.

He was buried at Long Ditton on January 19, 1915. The funeral was attended by Captain T. F. Parry, R.N., the hydrographer, representing the Admiralty, and by the following officers, all of whom had served under him in the Arctic: Admirals Sir Albert Hastings Markham, Sir Lewis Beaumont—who represented the Society—Sir Henry Stephenson, Pelham Aldrich, and George A. Giffard, and many naval officers and others who appreciated his sterling worth.

Captain W. H. I. Shakespear, C.I.E.

The Public Service has sustained a severe loss by the death of Captain W. H. I. Shakespear, C.I.E., who was killed in action on January 24. The deceased was a most promising officer, and was known to geographers for his recent adventurous journey across northern Arabia (*Journal*, vol. 44, p. 96), when returning to this country on furlough from his post as British Resident at Koweit, on the Persian gulf. It was hoped that Captain Shakespear would describe this journey to the Society early in the present session, but this was prevented by his recall to his post shortly after the outbreak of the war. Captain Shakespear was the eldest son of Mr. W. H. S. Shakespear, formerly of the Indian Forest Service. He entered the army in 1898, but after a few years joined the Consular Service, becoming in turn Consul at Bandar Abbas and at Muskat, and subsequently Consul and Assistant to the Political Resident in the Persian gulf.

Dr. John Muir.

The well-known naturalist-traveller and glaciologist, Dr. John Muir, died last year at Los Angeles, California, in his seventy-sixth year. Born at Dunbar in Scotland in 1838, he went to the United States with his parents at an early age, and, after studying at the University of Wisconsin, gave play to his love of wild nature by travelling in many of the remoter parts of the United States. Eventually he joined the United States Coast and Geodetic Survey and began his acquaintance with Alaska, with the exploration of which his name will chiefly be associated by geographers. It has fittingly been given to the largest of the glaciers debouching on Glacier bay, Alaska, the main trunk of which has a width of some 25 miles. In 1881 he took part in the Arctic cruise of the U.S. revenue cutter *Corwin*, in search of the ill-fated *Jeannette*, and so extended his knowledge of the glacial conditions of the far north, which he described in a section of the official report of the voyage. He also supplied the "Botanical Notes on Alaska" included in the same report—an indication of the wide range of his interests. Much later (1899) he was one of the scientists who accepted the invitation of Mr. Harriman to accompany him on his expedition to Alaska, his special study being again the vast glaciers of that country, on which he supplied a memoir for incorporation into the general narrative of the expedition. Muir's love of nature and natural scenery made him an enthusiastic champion of the preservation of natural monuments in

the United States, especially in California, in which state he resided for many years, and whose magnificent mountains exercised on him a potent attraction. They were sympathetically described by him in his 'Mountains of California,' published in 1894.

CORRESPONDENCE.

"Cartographic Needs of Physical Geography."

MANY will have read with interest the account of Mr. Ogilvie's address on "Cartographic Needs of Physical Geography," published in the *Journal* for January. Doubtless most will regard his full scheme as at present impossible owing to expense, but it is none the less valuable, for we make better progress when we have ideals at which to aim. Part of his scheme, at any rate, is within the range of practical accomplishment. On p. 47 he refers to the fact that the teaching of land-forms is hampered owing to the high price of official maps. It is a difficulty which many schoolmasters have felt. It is true that schools can obtain Ordnance Survey maps at reduced rates by taking large quantities of the same sheet, but these are so bad because of inferior printing, or shoddy paper, or absence of colour, or for all reasons combined, that they are next to impossible to use, and I can only conceive of them producing violent distaste and boredom in the youthful mind. I know of more than one school where these sheets have been tried and abandoned. Moreover, these "home study" sheets are only part of what is needed. Mr. Ogilvie suggests an atlas containing parts of Ordnance Survey sheets illustrative of types of land-forms similar, in fact, to the fine atlas of such topographic maps published in the United States a year or two ago. It would, of course, contain far fewer maps, at any rate at first, so that it could be within financial reach of the classroom; it should be "printed in colours." The best instruction is on the ground; the next best is on good maps. The impression from the map is more vivid, the picture more true, the results wider and more lasting, the *educational* value far and away greater than anything that can be obtained from books or verbal description. Is it too much to hope, therefore, that the influence of the R.G.S. will be brought to bear on one step forward to Mr. Ogilvie's goal?

C. C. CARTER.

Marlborough College, Wilts.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Seventh Meeting, February 8, 1915.—DOUGLAS W. FRESHFIELD, Esq., President, in the Chair.

ELECTIONS.—*Charles Camsell; Dr. A. J. Chalmors; Dillon Coste; Herbert Jones; Arthur Lee Knight; Charles Monroe Lincoln; Rev. William Paxton; Leslie F. Taylor.*

THE SOCIETY AND THE WAR.

The PRESIDENT spoke as follows: We have had several excellent and instructive lectures lately from Professors, dealing with questions connected with the war, and

particularly with the delimitation of European frontiers. Now, it is certain that in a relatively near future the delimitation of frontiers will have to be considered, not only in Europe, of which we have been talking lately, but all over the world. I for one must refuse to admit for a moment that in this settlement the Allies will not have a determining voice. I think it would be ridiculous to doubt it, remembering that the four great Powers engaged have all declared they do not mean to stop the war until they can have that determining voice. But it is surely very desirable that before this great task is thrown on diplomatists, the public mind should be informed as far as possible of what are the conditions, the geographical conditions, the racial and social and commercial conditions, the conditions of future development of railroads and waterways, which ought to influence the instructions to be given to our delegates at any Peace Congress. With this aim in view it has been arranged that we should have in our present session lectures and discussions treating generally of large areas in the Pacific and Africa. To-night we are going to hear a lecture dealing with the details of his late journeys in Persia from Colonel Sykes. But on this day fortnight a lecture will be given on the general aspects of the Pacific by Sir Everard im Thurn; and two days afterwards, on Wednesday, the 24th of this month, we are going to have a lecture from Sir Harry Johnston on the Future of Africa.

To some persons it may seem to be premature to discuss the future. To any such I am content in reply to point out the result of not being premature as illustrated by certain recent experiences. We had reason to know—it is proved by a recent publication of the Foreign Office—that there was the strongest circumstantial evidence in the development of frontier railroads that Belgium was likely to be invaded by Germany, yet, unfortunately, we took no precautions to provide a force adequate to fulfil our pledge and defend Belgium. The consequences have been indescribably lamentable. There is a case of not being premature. I might quote other recent cases hardly less unfortunate.

Our friend Mr. Roosevelt uses a very good phrase when he talks of the "Apostles of Unreadiness." There is some truth in the proverb that "Premature is the watch-word of the Purblind."

For these reasons I cannot think it out of place for this the first Geographical Society of the Empire to press on our statesmen and the public the importance of obtaining some clear realization of the facts, and some clear conception of the broad principles, by which we and our allies should be influenced in the rearrangement of frontiers outside Europe—when the time comes for such a rearrangement. Unless these matters are considered beforehand it will be difficult, if not impossible, to give clear and adequate instructions to our delegates at a Peace Congress, such instructions as may enable them not only to maintain our own proposals, but to criticize the alternative proposals sure to be put forward.

Changes in political geography there must be in the future interests of our Empire and of the peace of the world. These may be rectifications, or exchanges, between friends, as well as forfeits by the enemy. I should be sorry, were it inferred that any territorial ambition, any earth-hunger, underlay these suggestions. Germany has played for the Empire of the world, and in doing so has lost her own soul. But we hope there may be a day when she may regain it and free herself from Prussian militarism. Then we shall not grudge her a place in the sun; only she must not ask the other nations to sit in her shadow. Our general aim should be peace and, as far as possible, goodwill in the future for all concerned.

The paper read was:—

"A Seventh Journey in Persia." By Colonel P. Molesworth Sykes, C.M.G., C.I.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Historical. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 157–169. **Weber.**
Die Bedeutung des Pilatus in der Alpenkunde. Von P. X. Weber. *Illustrations.*

Alps—Morphology. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 214–234. **Ludwig.**
Terrassen, Stufen und Talverzweigung in den Alpen. Von A. Ludwig. *Illustrations.*

Carpathians. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 108–127. **Täuber.**
Wanderungen in den Karpathen. Von C. Täuber. *Illustrations.*

Europe—Geography. **Philip.**
Philips' Model Geography. The soldier's geography of Europe. 5th edition. London: George Philip & Son, [1915]. Size 7½ × 5, pp. 96. *Maps and Illustrations. Price* 3*d. net. Presented.*

Europe—Oysters. *Ymer*, 1914: 214–240. **Hillman.**
Ostronets förekomst, odling och tillgodogörande i Europa. En ekonomisk geografisk studie. Af Adolf F. Hillman. *Sketch-maps and Illustrations.*

Europe—Political. *National G. Mag.* **26** (1914): 191–192. ——
Map of Europe, including the New Balkan States.
The letterpress gives statistics of the States of Europe, and the map (size 18 × 22 inches) shows the Balkan boundaries in 1914.

France—Isère. *Recueil Travaux I.G. Alpine (Grenoble)* **2** (1914): 299–334. **Allix.**
La foire de Goncelin. Par A. Allix. *Sketch-maps.*

France—Isère. *Recueil Travaux I.G. Alpine (Grenoble)* **2** (1914): 335–351. **Marchal.**
Uriage, étude géographique d'une station balnéaire. Par J. Marchal.

France—Isère valley. **Blache.**
Recueil Travaux I.G. Alpine (Grenoble) **2** (1914): 353–407.
Le bord d'auge glaciaire du Grésivaudan (rive gauche): étude de morphologie glaciaire. Par J. Blache. *Sketch-maps, Diagrams, and Illustrations.*
On the features due to glaciation.

France—Language. **Passy.**

A French phonetic reader. By Paul Passy. London: University of London Press, 1914. Size 7½ × 5, pp. viii. and 42. *Price 2s. net. Presented.*

Germany—Language. **Egan.**

A German phonetic reader. By Alfred Egan. London: University of London Press, 1913. Size 7½ × 5, pp. xvi. and 142. *Price 5s. net. Presented.*

Hungary. *National G. Mag.* **26** (1914): 311–393. **Townley-Fullam.**

Hungary: a Land of Shepherd Kings. By C. Townley-Fullam. *Map and Illustrations.*

Iceland—Guide. *Aarbog Nordisk Oldkyndighed, III.*, **3** (1913): 50–105. **Kålund.**

En islandsk Vejviser for Pilgrimme fra 12 Århundrede. Ved Kr. Kålund.

Italy—Atlas. *La G., I. G. de Agostini* **2** (1914): 202–218. **Gortani and Toniolo.**

Per un "Atlante del paesaggio geografico italiano." By M. Gortani and A. R. Toniolo.

Italy—Early cartography. *Riv. G. Italiana* **21** (1914): 640–656. **Almagià.**

La cartografia dell' Italia nel Cinquecento, con un saggio sulla cartografia del Piemonte. By Roberto Almagià.

Italy—Tuscany. *Riv. G. Italiana* **21** (1914): 657–667. **Stefanini.**

Sulle "biancane" del Volterrano e del Senese. By G. Stefanini. *Illustrations.*

On a curious morphological feature consisting of a labyrinth of small mounds and cones formed in a clayey or marly soil.

Italy—Vesuvius. *B.R.S.G. (Rome) V.* **3** (1914): 753–805. **Malladra.**

Nel cratere del Vesuvio. By Alessandro Malladra. *Illustrations.*

Describes the conditions of the past two years in the crater of Vesuvius, illustrating them by a large number of photographs.

Portugal. **Hargrove.**

Progressive Portugal. By Ethel C. Hargrove. London: T. W. Laurie, Ltd., [1914]. Size 7½ × 5, pp. 276. *Map and Illustrations. Price 6s. net. Presented.*

Switzerland—Mountaineering. **Abraham.**

Swiss Mountain Climbs. By George D. Abraham. London: Mills & Boon, [1912]. Size 7 × 4½, pp. xvi. and 432. *Diagrams and Illustrations. Price 5s.*

ASIA.

Arabia. *B.S. Neuchateloise G.* **23** (1914): 1–252. **Cart.**

Au Sinaï et dans l'Arabie Pétrée. Par Léon Cart. *Maps and Illustrations.*

China—Language. **Jones and Woo.**

A Cantonese phonetic reader. By Daniel Jones and Kwing Tong Woo. London: University of London Press, [1912]. Size 7½ × 5, pp. x. and 96. *Price 5s. net. Presented.*

Eastern sketches. **Claudel.**

The East I know. By Paul Claudel. Translated by Teresa Frances and William Rose Benét. London: Humphrey Milford, 1914. Size 8 × 4½, pp. xiv. and 200. *Price 5s. 6d. net. Presented.*

India—Bengal—Cartography. **Hirst and Ascoli.**

A memoir upon the maps of Bengal constructed from 1764 onwards by Major James Rennell, F.R.S. In explanation of Rennell's Atlas of 1779; that of 1781; and a Companion Atlas of 1914 which contains those remnants of Rennell's work not published previously. By Major F. C. Hirst; with a chapter upon the legal value of Rennell's maps by F. D. Ascoli. Calcutta, 1914. Size 13 × 8, pp. ii. and 29. *Price Re.*1–2 (*1s. 9d.*).

The atlas of 1914 has not yet been received.

India—Cotton. *J. East India Assoc.*, N.S. **6** (1915): 1–54. **Summers.**

Development of Cotton in India: Sind, a second Egypt. By T. Somers. *Map and Diagrams.*

India—Kashmir. **Parbury and others.**

The Emerald set with Pearls. Being reminiscences of the beautiful land of Kashmir, with illustrations from water-colour drawings by Florence Parbury.

Also Thomas Moore's "Lalla Rookh," with musical additions by Florence Parbury and Guido Zuccoli. London: Simpkin, Marshall & Co., N.D. Size 12 × 10, pp. 218 and 38. *Presented by Douglas Freshfield, Esq.*

India—Madras—Coast. **Spring.**

Min. of Proc. I. Civil Engineers **194** (1914): 153–246.

Coastal sand-travel near Madras Harbour. By Sir Francis Joseph Edward Spring. *Sketch-maps, Sections, and Diagrams.*

India—N.-E. Frontier. *R. Engineers J.* **21** (1915): 1–28. **Gunter.**

The Mishmi Mission Survey Detachment. By Captain C. P. Gunter.

India—Punjab—Language. **Bailey.**

A Panjabi phonetic reader. By T. Grahame Bailey. London: University of London Press, 1914. Size 7½ × 5, pp. xviii. and 40. *Price 2s. net. Presented.*

India—Rivers. *Records Geol. Survey of India* **44** (1914): 234–240. **Fermor.**

On the probable future beheading of the Son and Rer Rivers by the Hasdo. By L. Leigh Fermor. *Map and Illustrations.*

Malay Archipelago—Java. **McMillan.**

A journey to Java. By M. McMillan. London: Holden & Hardingham, [1914]. Size 9 × 5½, pp. x. and 286. *Illustrations. Presented.*

Russia—Caucasus. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 128–154. **Schibler.**

Eine Durchquerung des Kaukasus. Von W. Schibler. *Illustrations.*

Tibet—Kinthup's journey. **Oakes.**

Note in vindication of Kinthup. By Captain G. F. T. Oakes. (To be included in the *Records of the Survey of India* for 1913–14.) Dehra Dun, 1914. Size 10½ × 8½, pp. 5. *Portraits.*

See note in vol. **44**, p. 503.

Turkey—Babylon—Archæology. **Koldewey.**

The excavations at Babylon. By Robert Koldewey. Translated by Agnes S. Johns. London: Macmillan & Co., 1914. Size 10 × 6½, pp. xx. and 336. *Maps, Plans, and Illustrations. Price 21s. net.*

AFRICA.

Abyssinia. **Castro.**

Dr. Lincoln de Castro. Nella terra dei Negus. Pagine raccolte in Abissinia. 2 vols. Milan: Fratelli Treves, 1915. Size 10 × 6½, pp. (vol. 1) x. and 388; (vol. 2) 583. *Maps and Illustrations. Price 25s.*

An important work, by an Italian long resident in the country.

British East Africa—Kisumu. **Oswald.**

Alone in the Sleeping-sickness country. By Dr. Felix Oswald. London: Kegan Paul & Co., 1915. Size 9 × 5½, pp. xii. and 220. *Map and Illustrations. Price 8s. 6d. net. Presented.*

Egypt—Desert. *B.R.S.G. (Rome)*, V., **3** (1914): 727–745. **Cortese.**

Una escursione nel deserto arabico. By Emilio Cortese. *Illustrations.*

Morocco—Map. *B.R.S.G. (Madrid)* **56** (1914): 8 sheets. **Ardanuy.**

Mapa de la región S. O. de Marruecos al S. del rió Tensift, por el Teniente Coronel (retirado) de Estado Mayor D. Eduardo Alvarez Ardanuy, en escala de 1 : 150,000.

Morocco—Shawia. *B.S.G. d'Alger* **19** (1914): 38–72. **Tubert.**

La Chaouia. By P. Tubert.

North Africa—Boundaries. *B.S.G. d'Alger* **19** (1914): 14–20. ———

Délimitation de la Lybie.

Portuguese East Africa—Quillimane. **Durão.**

B.S.G. Lisboa, 1914 (1914): 32 Série: 139–189.

O distrito de Quelimane. Por A. de Portugal Durão.

Rhodesia—Guide. ———

Guide to Rhodesia for the use of tourists and settlers. First edition. Issued by authority of the Beira and Mashonaland and Rhodesia Railway. London: British S. Africa Comp., 1914. Size 6½ × 4½, pp. xvi. and 396. *Map, Plans, and Illustrations. Price 2s. net. Presented.*

Rhodesia—Geology. *T. Geol. S. South Africa* 17 (1914): 39–54. **Wagner.**
The Geology of a Portion of the Belingwe District of Southern Rhodesia. By P. A. Wagner. *Map, Plates, and Diagram.*

The area dealt with embraces the De Beers ranch, south of the Bulawayo-Gwelo railway, and its neighbourhood. Two of the plates represent ruins in this district.

Sahara—Bilma. *B.S.G. d'Alger* 19 (1914): 21–37. **Gardel.**
La Liaison avec Bilma. By Lieut. Gardel. *Map.*

Sahara—Borku. *S.G. Com. Paris, B. Mensuel* 36 (1914): 523–558. **Ferrandi.**
Description du Borkou méridional. By Jean Ferrandi. *Illustrations.*

South Africa—Ethnology. *J. African S.* 14 (1914): 24–34. **Mendelssohn.**
Judaic or Semitic Legends and Customs amongst South African Natives. By Sidney Mendelssohn.

South Africa—Place-names. *South African J. Sc.* 11, 1914 (1915): 95–106. **Pettman.**
South Africa place-names. By Rev. C. Pettman.

South Africa—Whales. **Olsen.**
Bergens Museums Aarbok, 1914–1915 (1914): Nr. 5, pp. 50.
Hvaler og hvalfangst i Sydafrika. Av Ørjan Olsen. *Illustrations.*

South and East Africa—Guide. **Brown.**
The guide to South and East Africa . . . Edited annually by A. Samler Brown and G. Gordon Brown for the Union-Castle Mail S.S. Co. 1915. (21st edition.) London: S. Low & Co., [1915]. Size 7½ × 5, pp. liv. and 694. *Maps and Plans. Price* 1*s. net. Presented.*

Spanish Sahara. *B.R.S.G. (Madrid)* 56 (1914): 129–347. **d'Almonte.**
Ensayo de una breve descripción del Sáhara español. Por Enrique d'Almonte. *Sketch-maps and Illustrations, and Maps separate.*

The general map, in four sheets, is on the scale of 1 : 1,000,000.

Zanzibar—Agriculture. *B. Imperial I.* 12 (1914): 407–429. **McClellan.**
Agricultural resources of the Zanzibar Protectorate. By F. C. McClellan.

NORTH AMERICA.

Alaska—Glaciers. *Sc.* 41 (1914): 32–33. ——
First Exploration of an Alaskan Glacier.

Brief account of Miss Keen's expedition (*Journal*, January, 1915, p. 79, and *supra*, p. 251).

Bermuda. *American J. Sc.* 38 (1914): 189–206. **Pirsson.**
Geology of Bermuda Island; the igneous platform. By L. V. Pirsson. *Section and Diagrams.*

Canada—Boundaries. **Klotz.**
Boundaries of Canada. By Otto Klotz. Waterloo Historical Society, 1914. Size 9 × 6, pp. [13].

Canada—Historical. **Knox and Doughty.**
An historical journal of the campaigns in North America for the years 1757, 1758, 1759, and 1760. By Captain John Knox. Edited with introduction, appendix, and index by Arthur G. Doughty. Vol. 2. (Publ. Champlain Society, vol. 9.) Toronto, 1914. Size 10 × 6½, pp. x. and 618.

Canada—Hydrography. **[Hazen.]**
Report of the Department of the Naval Service for the fiscal year ending March 31, 1914. [Ottawa], 1914. Size 10 × 6½, pp. 95. *Maps and Illustrations. Price* 10 *cents.*

Canada—Quebec. **Departments of Lands and Forests.**
Report of the Minister of Lands and Forests of the Province of Quebec for the twelve months ending June 30, 1913. Dept. of Lands and Forests, Quebec, 1913. Size 10 × 7, pp. 155. *Illustrations.*

Newfoundland—Surveys. **Rupert-Jones.**
Hydrographic Ann. No. 2, 1913 (1914): 11–18.
An historical sketch of H.M. Newfoundland Survey, 1714–1912. By Lieut. J. A. Rupert-Jones. *Illustration.*

North America—Early Travels. **Douglas.**

Journal kept by David Douglas during his travels in North America, 1823–1827, together with a particular description of thirty-three species of American oaks and eighteen species of Pinus. Published under the direction of the Royal Horticultural Society. London: William Wesley & Son, 1914. Size 10 × 6, pp. 364. *Portrait. Price* 21*s.*

These interesting journals, by the well-known botanist traveller who gave his name to the Douglas fir, are now printed for the first time. The volume includes, as an appendix, an account of a visit to the Hawaiian volcanoes.

North America—Forestry. *Popular Sc. Monthly* **85** (1914): 338–361. **Harper.**

The coniferous forests of Eastern North America. By Dr. Roland M. Harper. *Illustrations.*

Rockies—Geology. **Daly.**

Geology of the North American Cordillera at the Forty-ninth Parallel. By Reginald Aldworth Daly. Part II. (Dept. of the Interior. Appendix 6. Report of the Chief Astronomer, 1910.) Ottawa, 1913. Size 10 × 6½, pp. xxvii. and 857. *Illustrations; Maps separate.*

United States—Arizona. **Noble.**

The Shinumo Quadrangle, Grand Canyon District, Arizona. By L. F. Noble. (U.S. Geol. Surv., Bulletin 549.) Washington, 1914. Size 9 × 6, pp. 100. *Maps and Illustrations.*

United States—Arizona. *American J. Sc.* **38** (1914): 491–501. **Gregory.**

A Reconnaissance of a portion of the Little Colorado valley, Arizona. By Herbert E. Gregory. *Illustrations.*

United States—California. **Wood.**

The tourists' California. By Ruth Kedzie Wood. New York: Dodd, Mead, and Comp., 1914. Size 7½ × 5, pp. 396. *Map and Illustrations. Price* 5*s.* 6*d. net. Presented.*

United States—California—Lassen peak. **Diller.**

B. Seismolog. S. America **4** (1914): 103–107.

The Eruptions of Lassen Peak, California. By J. S. Diller. *Illustrations.*

Cf. note in vol. **44**, p. 505.

United States—Cape Cod Canal. *National G. Mag.* **26** (1914): 185–190. **Miller.**

The Cape Cod Canal. By J. W. Miller. *Sketch-maps and Illustrations.*

See note in the January number, p. 79.

United States—Colorado river. *National G. Mag.* **26** (1914): 99–184. **Kolb.**

Experiences in the Grand Canyon. By Ellsworth and Mary Kolb. *Illustrations and Sketch-map.*

United States—Columbia river. **Marshall.**

Profile Surveys in the Basin of Clark Fork of Columbia river, Montana-Idaho-Washington. Prepared under the direction of R. B. Marshall. (U.S. Geol. Surv., Water Supply Paper 346.) Washington, 1914. Size 10 × 6, pp. 6. *Maps and Sections.*

There are twenty-two sheets of maps and profiles.

United States—Eastern Seaboard. *Science* **40** (1914): 881–883. **Bigelow.**

Oceanographic Cruise of the Schooner *Grampus*. By Henry B. Bigelow.

See note in the Monthly Record, *supra*, p. 250.

United States—Expansion. **Department of the Interior.**

Areas of Acquisitions to the Territory of the United States. Areas of the States, Territories and Possessions, Diagram showing the Historical Development of the States. Department of the Interior, Washington, 1914. Size 9 × 6, *folding diagram. Price* 15 *cents.*

United States—Geological History. *Science* **40** (1914): 827–830. **Jones.**

The Geologic History of Lake Lahontan. By J. Claude Jones.

United States—Mississippi—Fisheries. **Coker.**

Water-Power Development in relation to Fishes and Mussels of the Mississippi. By Robert E. Coker. (Appendix VIII. to the Report of the U.S. Commissioner of

Fisheries for 1913. Bureau of Fisheries Doct. No. 805.) Washington, 1914. Size 9 × 6, pp. 28. *Illustrations.*

United States—New York—Finger Lakes. **Birge and Juday.**

A Limnological Study of the Finger Lakes of New York. By Edward A. Birge and Chancey Juday. (From *Bulletin* of the Bureau of Fisheries, vol. 32, 1912, pp. 528–609.) Washington, 1914. *Maps and Diagrams.*

United States—Pacific Coast. *Science* 41 (1915): 48–57. **Diller.**

The Relief of our Pacific Coast. By J. S. Diller.

United States—Rainfall. *Scottish G. Mag.* 30 (1914): 582–595. **Wallis.**

The distribution of rainfall in the North-Eastern United States: its causes and results. By B. C. Wallis. *Sketch-maps and Diagram.*

United States—Snowfall. *Monthly Weather Rev.* 42 (1914): 318–330. **Brooks.**

Distribution of snowfall in cyclones of the eastern United States. By Charles F. Brooks. *Maps.*

United States—South Carolina—Earthquakes. **Taber.**

B. Seismolog. S. America 4 (1914): 108–160.

Seismic Activity in the Atlantic Coastal Plain near Charleston, S.C. By Stephen Taber. *Sketch-maps, Diagrams, and Illustrations.*

United States—Washington—Mt. Rainier. *Masama* 4 (1914): 10–13. **Prouty.**

Mount Rainier. By H. H. Prouty. *Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine and Chile—Railway. **Henderson.**

Min. of P.I. Civil Engineers 195 (1914): 151–212.

The Transandine railway. By Brodie Haldane Henderson. *Diagrams and Sections.*

Bolivia—Administrative. **Ballivián and Pinilla.**

B. Dirección Gen. Estadística, etc. (Bolivia), No. 89 (1914): 193–294.

División Política de la República. Por Manuel V. Ballivián y Casto F. Pinilla.

Bolivia—Omasuyu. **Paredes.**

La Altiplanicie. Descripcion de la Provincia Omasuyu. Por Rigoberto Paredes. La Paz, 1914. Size 10 × 6½, pp. 73.

Brazil—Lower Amazon. **Lange.**

The Lower Amazon. By Algot Lange. With an Introduction by Frederick S. Dellenbaugh. London: G. P. Putnam's Sons, 1914. Size 8½ × 5½, pp. xxvi. and 460. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented.*

A new work by the author of 'In the Amazon Jungle' (cf. *Journal*, vol. 40, p. 635).

Colombia—Political. **Thomson.**

Colombia and the United States. (First edition.) A juridical study of another "Scrap of Paper" and its supersession by the Colombian indemnity treaty for the settlement of the Panama question. By Norman Thomson. London: N. Thomson & Co., [1915]. Size 7½ × 5, pp. xxiv. and 176. *Price* 1*s. net. Presented.*

Colombia—Scientific Expedition. **Fuhrmann and Mayor.**

Dr. O. Fuhrmann et Dr. Eug. Mayor. Voyage d'exploration scientifique en Colombie. Vol. 5 des "Mémoires de la Société neuchâteloise des Sciences naturelles." Neuchâtel: Attinger Frères, 1914. Size 11½ × 9, pp. 1090. *Map and Illustrations. Price* 48*s. net.*

This Swiss expedition, which set out in 1910, was referred to in vol. 35, p. 198. The present publication opens with a narrative of the journey, but is mainly concerned with the scientific results (botanical and zoological, etc.); a section treats of determinations of altitude.

Falkland Isles—Whales. **Salvesen.**

Scottish National Antarctic Expedition. The Whale Fisheries of the Falkland Islands and Dependencies. By Theodore E. Salvesen. (Reprinted from 'Report on the Scientific Results of the Scottish National Antarctic Expedition,' vol. 4, pp. 475–486.) Edinburgh, 1914. Size 12 × 9½. *Price* 3*s.* *Illustrations and Sketch-map.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Gullett.**

The opportunity in Australia. By H. S. Gullett. With an Introduction by Lord Chelmsford. London: Horace Cox, [1914]. Size 8½ × 5½, pp. xviii. and 150. *Illustrations. Price* 3*s.* 6*d. net.*

Valuable for the intending settler and others interested in the economic development of Australia.

Australia—Desert sounds. *Rep. Australian Ass.* **14** (1913): 352–361. **Gill.**

Phenomenal sounds in the interior of Australia—are they terrestrial or atmospherical? By Thomas Gill.

See note in the Monthly Record, *supra*, p. 251.

Cocos-Keeling islands—Fauna. **Wood-Jones.**

Nature's Colonists. By Frederic Wood-Jones. (Reprinted from the *London Hospital Gazette*, 1909. *Sketch-map.*

New Guinea—Ethnology. *P.R.I.* **20** (1914): 765–775. **Rawling.**

The Pygmies of New Guinea. By Captain Cecil G. Rawling.

New South Wales—Geology. **Süssmilch.**

An introduction to the geology of New South Wales. By C. A. Süssmilch. 2nd edit., revised and enlarged. Sydney: Angus & Robertson, 1914. Size 7½ × 5, pp. xviii. and 270. *Sketch-map, Sections, and Illustrations. Price* 7*s.* 6*d. net.*

Pacific islands. **Friederici.**

Malaio-Polynesische Wanderungen. Von Dr. Georg Friederici. (Vortrag gehalten auf dem XIX. Deutschen Geographentage zu Strassburg i. E. 4 Juni 1914.) Leipzig, 1914. Size 9½ × 6, pp. 88.

Pacific—Ocean island, etc. *Nautical Mag.* **93** (1915): 22–28. **Erskine.**

The Richest Island in the Pacific. By — Erskine.

Ocean island has been found to consist of almost pure phosphate of lime.

Queensland—Coal Resources. **Dunstan.**

Coal Resources of Queensland (a General Review). (Queensland Geol. Surv., Publ. No. 239.) Brisbane, 1913. Size 10 × 6, pp. 29.

See note in the Monthly Record, February.

South Australia—Geology. *Rep. Australasian Ass.* **14** (1913): 148–178. **Howchin.**

The evolution of the physiographical features of South Australia. By Walter Howchin. *Sketch-map and Sections.*

Torres Strait. *Popular Sc. Monthly* **85** (1914): 209–231. **Mayer.**

An Expedition to the Coral Reefs of Torres Straits. By Dr. Alfred Goldsborough Mayer. *Sketch-maps.*

See note in the January number, p. 80.

Victoria—Discovery. *Rep. Australasian Ass.* **14** (1913): 343–351. **Fowler.**

Notes on the discovery of the Victorian coast-line. By Thomas Walker Fowler.

Victoria—Geology. **Herman.**

Economic Geology and Mineral Resources of Victoria. By H. Herman. (Bulletin of the Geological Survey of Victoria, No. 34.) [Reprinted from 'Handbook to Victoria, British Association for the Advancement of Science, Australian Meeting, 1914.] Melbourne, 1914. Size 9½ × 6, pp. 36. *Maps and Illustrations. Price* 1*s.*

Western Australia—Monte Bello islands. **Montague.**

P. Zool. S., 1914 (1914): 625–652.

A Report on the Fauna of the Monte Bello Islands. By P. D. Montague. *Plates.*

Mr. Montague gave an account of these islands in the *Journal*, vol. **42**, p. 34.

POLAR REGIONS.

Antarctic—Australasian Expedition. **Mawson.**

The Home of the Blizzard. Being the story of the Australasian Expedition, 1911–14. By Sir Douglas Mawson, D.SC., B.E. 2 vols. London: Wm. Heinemann,

1915. Size 10 × 7, pp. (vol. 1) xxx. and 350; (vol. 2) xiv. and 338. *Maps and Illustrations. Price* 36*s. net. Presented.*

Arctic—Early voyages. **Naber.**

Reizen van Jan Huyghen van Linschoten naar het Noorden (1594–1595). Uitgegeven door S. P. l'Honoré Naber. (Werken uitgegeven door de Linschoten-Vereeniging, 8.) The Hague: M. Nijhoff, 1914. Size 10 × 6½, pp. lxxxiv. and 308. *Map and facsimiles.*

A welcome reprint of this rare narrative of Barents' Arctic voyages.

Arctic—Greenland—Godthaab. *Ymer* 1914 (1914): 189–213. **Klinckowström.**

En sommar i Godthaabsnejden. Af Axel Klinckowström. *Illustrations.*

Arctic—Spitsbergen. *Scottish G. Mag.* 31 (1915): 1–22. **Isachsen.**

Green Harbour, Spitsbergen. By Gunnar Isachsen. *Sketch-map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography. **Partsch.**

Die Internationale Weltkarte in 1 : 1,000,000. Ein Rückblick—ein Ausblick. Von J. Partsch. (Sonderabdruck aus den "Mitteilungen der Gesellschaft für Erdkunde" zu Leipzig, 1913, pp. 19.)

Orientation. **Tilney.**

Marching or flying by night without a compass, with time-table of direction stars for use in the British Isles, January 1 to December 31, 1913–1918, latitudes 40° N. to 55° N. By Lieut.-Col. W. A. Tilney. London: Hugh Rees, 1914. Size 5½ × 3½, pp. [60]. *Plan and Charts. Price* 2*s.*

Tables. *Smithsonian Misc. Coll.* 63 (1914): No. 6, pp. xxxvi. and 356. **Fowle.**

Smithsonian physical tables, 6th revised edit. Prepared by Frederick E. Fowle.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Pettersson.**

Climatic variations in historic and prehistoric time. By O. Pettersson. (Ur Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Häft. V.) Göteborg, [1914]. Size 19 × 12½, pp. 26. *Map, Sketch-map, Illustrations, and Diagrams.*

Geomorphology—Coasts. *Ymer*, 1914: 241–270. **Ahlmann.**

Strandzonens allmänna morfologiska utveckling med särskild hänsyn till insjöar. Af Hans W:son Ahlmann. *Illustrations.*

On the morphological development of coast zones.

Geophysics. **Pettersson.**

On the occurrence of lunar periods in solar activity and the climate of the Earth. A study in geophysics and cosmic physics. By O. Pettersson. (Ur Svenska Hydrografisk-Biologiska Kommissionens Skrifter, Häft V.) Göteburg, [1914]. Size 19 × 12½, pp. 20. *Diagrams.*

Icebergs. *P.R.I.* 20 (1914): 523–542. **Barnes.**

Icebergs and their Location in Navigation. By Howard T. Barnes. *Illustrations.*

Landslides. *La G. (I.G. de Agostini)* 2 (1914): 218–226. **Almagià.**

Le frane e il loro studio dal punto di vista geografico. By Roberto Almagià.

Meteorology. **Danish Meteorological Institute.**

Monthly Meteorological Data for ten-degree squares in the Atlantic and Indian Oceans. Computed by the Royal Netherlands Meteorological Institute from Swedish and Dutch observations 1900–1912, and from international observations January–June, 1913. (Koninklijk Nederlandsch Meteorologisch Institut. No. 107A.) Utrecht: Kemink & Zoon, 1914. Size 12½ × 9½, pp. iv. and 24.

Physical geography—Text-book. **Lake**

Physical geography. By Philip Lake. Cambridge: University Press, 1915. Size 9 × 5½, pp. xx. and 324. *Diagrams, Sections, and Illustrations. Price* 7*s.* 6*d. net. Presented.*

BIOGRAPHY.

Flinders. **Scott.**

The life of Captain Matthew Flinders, R.N. By Ernest Scott. Sydney: Angus & Robertson, 1914. Size 9 × 5½, pp. xviii. and 492. *Maps and Illustrations. Price* 21*s.*

GENERAL.

Bibliography. **Fordham.**

Studies in Carto-Bibliography, British and French, and in the bibliography of itineraries and road-books. By Sir Herbert George Fordham. Oxford: Clarendon Press, 1914. Size 9 × 6, pp. 180. *Price* 6*s. net. Presented.*

Commercial—Waterways. **Hepburn.**

Artificial waterways of the world. By A. Barton Hepburn. New York: Macmillan Company, 1914. Size 8 × 5, pp. viii. and 172. *Illustrations. Price* 5*s.* 6*d. net. Presented.*

The title is somewhat misleading, as the greater part of the book deals with canals in the Eastern United States.

Eastern travel. **Thompson.**

A Pilgrim's Scrip. By R. Campbell Thompson. London: J. Lane, 1915. Size 9 × 5½, pp. 346. *Map and Illustrations. Price* 12*s.* 6*d. net. Presented.*

Experiences during journeys of archæological research in Asiatic Turkey, with a chapter on the Sudan.

Education. *Scottish G. Mag.* **31** (1915): 23–34. **Mackie.**

The Study of Land-Forms in the School. By G. B. Mackie. *Sketches and Diagrams.*

Education—Maps. **Myres and others.**

Rept. Brit. Ass., Birmingham, 1913 (1914): 156–161.

Atlas, Textual and Wall maps for School and University use. Report of the Committee, consisting of Prof. J. L. Myres and others, appointed to inquire into the choice and style thereof. *Diagram.*

Geography. *B. American G.S.* **46** (1914): 801–816. **Roorbach.**

The Trend of Modern Geography. A Symposium, conducted by G. B. Roorbach.

Gives the results of inquiries addressed to a number of leading geographers, as to the main tasks of present-day geography.

History of navigation. **Bensaude.**

Histoire de la science nautique Portugaise à l'époque des grandes découvertes. Collection de documents publiés par ordre du Ministère de l'Instruction Publique de la République Portugaise. Par Joaquim Bensaude. Vol. 1. Munich: Carl Kuhn, 1914. Size 11 × 7½, pp. 64. *Facsimiles. Presented.*

Miscellanea. **Santarem and Freitas.**

2° Visconde de Santarem. Inéditos (Miscellanea) colligidos, coordenados e annotados por Jordão de Freitas, e trazidos á publicidade pelo 3° Visconde de Santarem. Lisbon, 1914. Size 11 × 8, pp. 582.

Historical memoirs and jottings on a variety of subjects, many referring to the history of voyages and geography.

Nautical terms. **Delbos.**

Nautical terms in English and French and French and English. By Leon Delbos. New and cheaper edition. London: Williams & Norgate, 1914. Size 7½ × 5, pp. xiv. and 462. *Illustrations. Price* 5*s.*

A new and revised edition of this useful work.

Voyage. **Du Baty.**

15,000 miles in a Ketch. By Captain Raymond Rallier du Baty. London: T. Nelson & Sons, [1915]. Size 6½ × 4½, pp. 374. *Price* 1*s. net. Presented.*

The author is known for his surveys of Kerguelen island (*cf. Journal*, vol. 39, p. 618).

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

ASIA.

Malay Peninsula. **F.M.S. Survey Dept.**

General map of Straits Settlements, Federated and Protected Malay States. (Provisional issue.) Scale 1 : 760,320 or 1 inch to 12 stat. miles. 2 sheets, each 18 by 31 inches. Kuala Lumpur: Federated Malay States Survey Department, 1913. *Presented by the Surveyor-General of the Federated Malay States.*

A useful general map, printed in colours, compiled from the trigonometrical, revenue, and topographical surveys of the Federated Malay States and Straits Settlements; topographical survey by the colonial survey section, Anglo-Siamese Boundary Commission; information supplied by the superintendents of surveys of Kedah, Johore, and Kelantan, and by the general manager Federal Malay States railways; Admiralty charts; and reconnaissance surveys by Mr. H. Berkeley in Upper Perak, Mr. N. T. Gray in Pahang, and Mr. W. Dunman in Trengganu, and by others. Relief is represented by brown shading, with heights in figures. The map also shows railways open, under construction, and proposed; roads metalled and unmetalled; paths; state and district boundaries, and other information. No attempt has been made to overcrowd the map, and in certain districts it is rather remarkably bare considering the amount of detail that is to be found in the same parts on other maps. However, much of this is perhaps of doubtful reliability.

Federated Malay States. **Surveyor-General, F.M.S.**

Topographical Survey of the Federated Malay States. Scale 1 : 63,360 or 1 inch to 1 stat. mile. Sheets: 3 F-8, Seremban; 3 F-12, Pasir Panjang. 1913. Size 18 by 19 inches. *Price* $2.50 *each sheet.* Scale 1 : 31,680 or 2 inches to 1 stat. mile. Sheet: Seremban and environs. 1912. Size 10 by 10 inches. Kuala Lumpur: Central Survey Office. *Presented by the Surveyor-General, Federated Malay States.*

Additional sheets of the new Federated Malay States Survey which was noticed in the *Geographical Journal* for February, 1914. Sheet No. 3 F-8 comes above No. 3 F-12, and together they include the coast country immediately to the north of the boundary of Malacca. Each sheet comprises 15′ of latitude and longitude. Seremban and environs is given as a separate sheet, on twice the scale of the others.

All the sheets are well produced and printed in colours. Relief is shown by contours in brown at 50-feet intervals, and "spot" heights are in figures, with a letter indicating how the height has been obtained. Information concerning the progress of this survey is given every year in the Annual Report of the Colonial Survey Committee.

Malay Peninsula. **Jackson.**

Anglo-Siamese Boundary Commission. Map showing the boundary-line between the Kingdom of Siam and the Malay States under British Protection, as surveyed, agreed to, and beaconed by the Joint Commission appointed under the Treaty of 1909, 1910–1912. Compiled under the direction of Colonel H. M. Jackson, R.E. (Retd.), British Commissioner for the Delimination. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Size 27 by 48 inches. Kuala Lumpur: F.M.S. Central Survey Office, [1913]. *Presented by the Surveyor-General, Federated Malay States.*

Shows the boundary-line across the peninsula and the country on either side for about 5 miles, from surveys of the Anglo-Siamese Boundary Commission. The boundary is in a black pecked line, form lines are in brown at approximately 100 metres vertical intervals, with trigonometrical heights in figures; and roads and paths are in red. Boundary beacons, trigonometrical stations, and intersected trigonometrical points are clearly shown.

AFRICA.

Egypt. **Survey Department, Cairo.**

Egypt. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: 1-E, North-West Delta; 1-F, North-East Delta; 2-E, South-West Delta; 2-F, South-East Delta. Size 18 by 23 inches. Cairo: Survey Department, 1914.

These four sheets comprise the whole of the delta from Helwan and Cairo to the Mediterranean, and together form a general map that will doubtless prove very useful

at the present time. The desert region for about 25 miles to the east of the Suez canal is shown and contoured in brown at intervals of 10 metres. The map is printed in colours, and gives canals, drains, railways, boundaries, travellers' routes, wells, ferries, relative importance of towns by different symbols, and other information.

AMERICA.

Alaska. **Alaska Road Commission.**

Map of Alaska. By the Alaska Road Commission, 1913. Scale 1 : 125,000 or 1 inch to 19·7 stat. miles. 4 sheets, each 29 by 35 inches. [Washington, D.C., 1913.]

This map has been compiled from surveys of the Alaska Road Commission, the U.S. Coast and Geodetic Survey, the U.S. Geological Survey, U.S. Army Surveys, and the Canadian Geological Survey. Relief is shown by contours in brown at intervals of approximately 1000 feet; however, too much reliance should not be placed on these, as the information available for drawing them is, in many parts, very scanty. Rivers are in blue, but owing to imperfect registering in printing many of the smaller streams are shown as taking impossible courses with reference to the contour lines. Roads and trails are clearly laid down, as are also railways, and telegraph and telephone lines.

America. **Unstead and Taylor.**

Philips' Comparative Series of Wall Atlases. Edited by J. F. Unstead, M.A., D.SC., and E. G. R. Taylor, B.SC. North America; South America. Scale 1 : 9,000,000 or 1 inch to 142·04 stat. miles. London : George Philip & Son, Ltd., 1914. *Price 27s. 6d. for each set of eight maps. Presented by the Publishers.*

These two sets of maps form part of an excellent educational series now in course of publication, notices of which have from time to time appeared in the *Geographical Journal*. With the exception of the British Isles set, which has special maps, each set consists of eight boldly drawn maps mounted on linen, with rings for hanging in class-room, and arranged so as to fold compactly in a box when not in use. Each map measures 43 by 33 inches, and shows by means of bold symbols and carefully selected contours the special information with which it deals, which is as follows: 1, Relief of land and communications; 2, political divisions; 3, climate, summer conditions; 4, climate, winter conditions; 5, temperature; 6, natural vegetation; 7, economic; 8, density of population. The whole series has been arranged to comprise seven sets, as follows: British Isles, Europe, Asia, Africa, North America, South America, and Australasia; and of these only the last, Australasia, now remains to be published. Each set is accompanied by an explanatory handbook for the assistance of teachers.

British Guiana. **Hohenkerk and Fowler.**

Map of British Guiana. Scale 1 : 633,600 or 1 inch to 10 stat. miles. 2 sheets, each 29 by 35 inches. Published by authority of His Excellency the Governor, Sir Walter Egerton, K.C.M.G. Revised and corrected to date from the records of the Department, by L. S. Hohenkerk, Government surveyor in the Department of Lands and Mines, Georgetown, Demerara, under the direction of Frank Fowler, F.G.S., Commissioner of Lands and Mines, 1913.

A useful general map giving considerable amount of detail from the latest information. Apart from the boundary, which is in red, the map is in black and white only. The hills are shown by vertical hachures, and it would have been an advantage if they could have been printed in brown, as in places where the shading is heavy the names are not easily legible.

Canada. **Dept. of Mines, Ottawa.**

Geological Survey of Canada. Map 118 A, Pleasant river, Barrens Gold District, Lunenburg County, Nova Scotia. Economic Geology. Scale 1 : 6,000 or 10·56 inches to 1 stat. mile. Ottawa : Department of Mines, Geological Survey, 1914. *Presented by the Department of Mines, Geological Survey of Canada.*

Canada. **Dept. of the Interior, Ottawa.**

Map showing Elevators in Manitoba, Saskatchewan, and Alberta. Prepared in the Railway Lands Branch, F. C. C. Lynch, Superintendent. Scale 1 : 1,584,000 or 1 inch to 25 stat. miles. Size 16 by 35 inches. 6th edit. Ottawa : Department of the Interior, Railway Lands Branch, 1914. *Presented by the Department of the Interior, Railway Lands Branch, Ottawa.*

Canada—British Columbia. **Dept. of Lands, B.C.**

New Westminster and Yale. Scale 1 : 253,440 or 1 inch to 4 stat. miles. Size 30 by 40 inches. Victoria, B.C. : Department of Lands, 1914. *Presented by the Surveyor-General of British Columbia.*

ATLANTIC OCEAN.

Madeira. **Power.**

General map of the Island of Madeira, constructed by Charles Power from other maps, greatly improved, corrected, and brought up to date, 1914. Scale 1:100,000 or 1 inch to 1·6 stat. miles. Size 12 by 24 inches. London: George Philip & Son, Ltd., 1914. *Price* 1*s.* 6*d.*

This map is published by Messrs. G. Philip & Son, and not by Messrs. E. Stanford, Ltd., as stated in the January number of the *Geographical Journal*.

WORLD.

World. **Bacon.**

Bacon's Sixpenny Contour Atlas. South Scotland Edition. Size 10 by 7½ inches. London: G. W. Bacon & Co., Ltd., [1915]. *Presented by the Publishers.*

CHARTS.

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, January, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Burma. **Hunton, Smith, and Ashton.**

Rangoon river and approaches. Surveyed 1913 and 1914 by A. S. Hunton, F.R.G.S., and V. G. Smith, F.R.G.S., under the direction of H. G. G. Ashton, F.R.G.S., Deputy Conservator of the Port. Scale 1 : 53,390 or 1·19 inch to 1 stat. mile. Rangoon: Commissioners for the Port, 1914. *Presented by the Deputy Conservator of the Port, Rangoon.*

Central America. **U.S. Hydrographic Office.**

Pilot chart of the Central American Waters, January, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, March, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Norway. **Norges Geografiske Opmaaling.**

Kystkarter: No. 68, Fra Steigen til Tranöy; 79, Fra Harstad og Kvæfjord til Risoysund og Senjen; 217, Romsdalsfjordene; 227, Fra Beiaren og Saltfjorden til Bodö og Folla. Christiania: Norges Geografiske Opmaaling, 1915. *Presented by the Norwegian Geographical Institute.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, March, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China. **Doodha.**

Seven photographs of south-west China taken by N. B. Doodha. *Presented by N. B. Doodha, Esq.*

These are silver prints measuring 2¾ by 3¾ inches.

(1) Miao woman; (2) Miao bride and bridesmaids; (3) Miao village and children; (4) Miao band; (5) Miao boats; (6) Miao boat ascending a rapid; (7) Ricefields.

France. **Delbanco.**

Two photographs of the Cirque de Gavarnie, Pyrenees, taken by David Delbanco. *Presented by David Delbanco, Esq.*

Two clear little photographs showing the scenery of this beautiful district. They measure 3 by 4 inches.

Persia. **Sykes.**

Set. 1. Fifty-three photographs taken on a tour from Meshed to the Elburz mountains, 1912. *Set.* 2. Twenty-eight photographs taken on a tour from Meshed

to the Darragaz district. By Lieut.-Col. P. M. Sykes, C.M.G., C.I.E. 1913. *Presented by Lieut.-Col. P. M. Sykes, C.M.G., C.I.E.*

The journeys during which these most important photographs were taken were described by Colonel Sykes in the paper he read before this Society last month. As may be judged from the titles, they are full of geographical and archæological interest, and form a valuable addition to our collection. They are all one size, measuring 4¼ by 6¼ inches. Most of the photographs quite unique, as the districts were to a great extent unexplored before Colonel Sykes's visit.

Set 1. (1) Family of Kurds in the Isfarayin valley; (2) Group on the Kurd-Turkoman frontier; (3) Kurd group; (4) In a Kurdish village; (5) Kurdish musicians; (6) Village of Zard, on the Bujnurd-Gurgan frontier; (7) Near the Gurgan defile; (8) At the village mosque, Semalgan valley; (9) The Yuzbashi or Centurion, near the Gurgan defile; (10) Kurd Shikarries; (11) At the Gurgan defile; (12) The governor of Nardin; (13) Nardin Sowars; (14) In the Pursian valley, between Nardin and Ramian; (15) In the Pursian valley; (16) Geraili Turks in the Pursian valley; (17) Geraili Turks; (18) Kala Maran, possibly ancient Dareion; (19) On the summit of Kala Maran; (20) Looking north from Kala Maran; (21 and 22) In the heart of the Elburz; (23 and 29) Geraili Turks; (24) On the outskirts of Ramian; (25–27) Ramian; (28) Drying barley, Ramian; (30) Funeral of a Sayyid, women's procession; (31) Ricefields in the heart of the Elburz; (32) Refugees from the Turkoman; (33) Gurgan pass, leading from Nardin into the Elburz; (34) Musicians in the Isfarayin valley; (35) Governor of Isfarayin; (36) Indian sowars in the Isfarayin valley; (37) Kurdish types; (38) Cotton crop at Jajarm; (39) Mill near Bann; (40 and 41) Jalayir Turks; (42) A Bactrian camel; (43) Meshed from the east; (44) Meshed from the city wall; (44A) Meshed from the roof of the Consulate-General; (45) A Berberi type; (46) In the Kashaf Rud valley; (47) Gulistan; (48) A typical villager near Meshed; (49) Fas, the birthplace of Firdausi; (50) The supposed site of Firdausi's tomb; (51) The walls of Tus; (52) The Chashma-i-Sabz.

Set 2. (2) The chief of the Ismailis of Khorasan; (3) Indian sowar and natives of Khorasan; (4) On the Meshed-Askabad road, Kurd of Chinaran; (5) The Bahmangan valley, near the sources of the Atrek; (6) Village Elder of Yadak; (7) Village elders of Yadak; (8) Yadak fort; (9) Boys at Yadak; (10) Lower fort at Yadak; (11) Guna Zu leading to Mian Kuh district; (12) Burning rue to avert the evil eye in Mian Kuh; (13–15) Kupkan; (16) View up valley from Kupkan; (17 and 18) The Nardaban or "Ladder" of Nadir; (19) Nomads descending from the Allah ho Akbar range to Darragaz; (20) Nomad women descending the Allah ho Akbar range; (21) Ruins of the "Maulud Khana" or birthplace of Nadir; (22) A Chapaahlu Turk; (23) At the base of Yarim Tappa; (24) Yarim Tappa from the south-west; (25) The chief of the Chapashlu-Masud Khan; (26) Stone base found at Yarim Tappa; (27) Stonework found at Yarim Tappa; (28) Site of Shahristana, city in Darragaz valley destroyed by Chengiz Khan; (29) Tomb of Hazrat Sultan, in Darragaz valley.

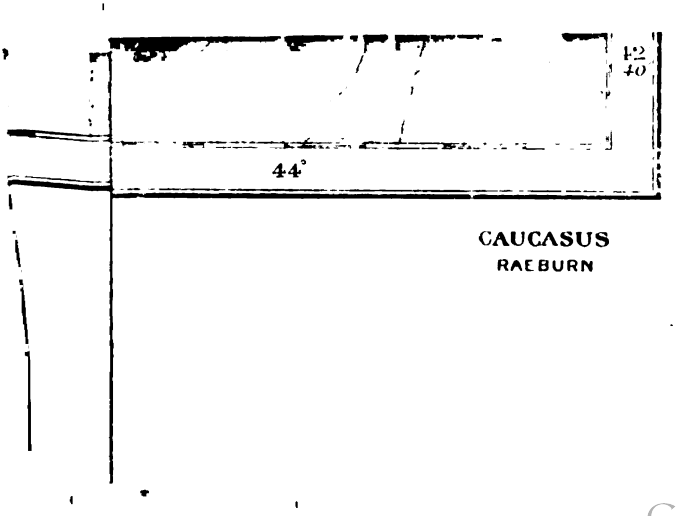
Pratas island. **Eldridge.**

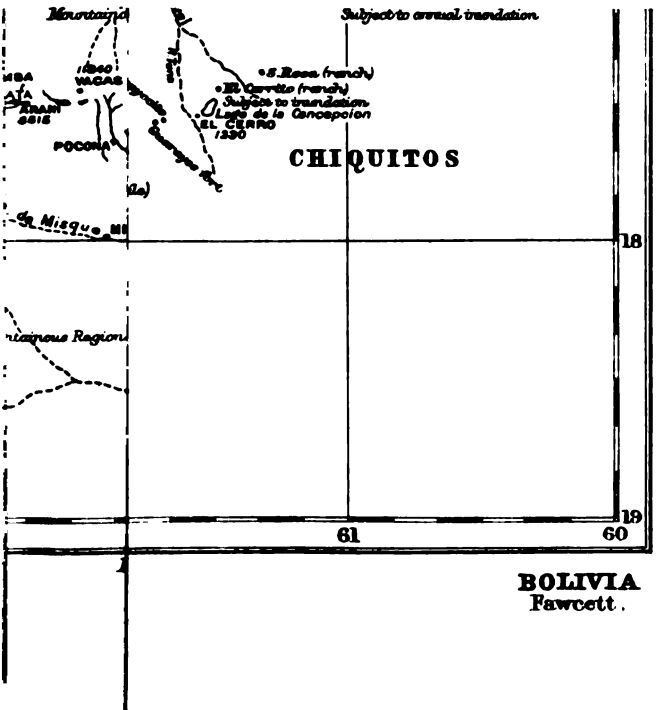
Five photographs of Pratas island, China sea, taken by E. J. Eldridge. *Presented by E. J. Eldridge, Esq.*

Pratas island is about 200 miles south-east of Hongkong. Although not over-clear specimens, these photographs are interesting as it is not likely that many others of the spot exist. They measure 2 by 3 inches.

(1) View from the south; (2) Scrub that covers eastern end of island; (3) Specimen of large tree; (4) Seabird on its nest; (5) Central mast, 120 feet, with look-out platform.

N.B.—It would greatly add to the value of the collection of Photographs which have 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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THE POLITICAL GEOGRAPHY OF AFRICA BEFORE AND AFTER THE WAR.*

By Sir HARRY H. JOHNSTON, G.C.M.G., K.C.B.

For many years preceding the outbreak of the war in 1914, a custom with the force of an unwritten law had grown up in the Royal Geographical Society that all addresses delivered from its rostrum should be as international in outlook as possible, as devoid as might be of national prejudice and predilections. But a new and temporary condition of things has arisen, and we have just now to remember that we deal with all phases of geography, and cannot exclude political and economic geography any more than we might deprecate the intrusion of anthropology, zoography, botany, or meteorology into our discussions. Perhaps I might add that we cannot any more logically exclude (if we are to deal with political geography at all) racial questions, such as suitability of this and that land for colonization, and the position and interests of non-Caucasian peoples when the white man is invading their lands. So they perforce enter into my address of to-night.

To some it may seem that, though a review of the past political geography of Africa is quite permissible, an attempt to forecast its immediate future in the present undecided issue of the great struggle going on in Europe, Asia, and Africa, is premature or presumptuous.

To this I would reply that we cannot all remain silent spectators of events, in Africa especially. Day by day our Empire is impelled to fresh action against the Germans in South-west, West, Central, and East Africa, and such actions must be to a great extent guided by the ultimate results at which we are aiming. The ministers of to-day do not aspire, I imagine, to impose a secretly conceived policy of their own on an Empire containing

* Royal Geographical Society, February 24, 1915. Maps, p. 356.

many millions of highly-educated people—Europeans, Canadians, Australasians, South Africans, Egyptians, Arabs, Indians, and Negroes—but to put on the statute book and into the Acts of a great peace Congress the well-considered wishes and opinions of this vast electorate, as well as the views of our allies. Therefore, even whilst the struggle is going on, we must be certain in our own minds what we are aiming at; so that in the ultimate settlement following the conclusion of peace the determinations now guiding us may, as far as possible, become accomplished facts.

To all who have studied Africa it is painful to write or speak harshly of Germans; so much do we owe to them as pioneers of science in that continent—as, indeed, throughout the world. Before we discuss what is the measure of restraint which the rest of Europe—belligerent and neutral—must endeavour for its own safety to impose on the German Empire, let us glance at German achievements in African exploration, if only to enter into the frame of mind of the German people who at last demanded African colonies, and of the British statesmen and diplomatists who down to July 1914 were endeavouring to facilitate the extension of German power in the Dark Continent, perhaps as a safety valve for ebullient ambition.

The Principal Areas of German Exploration in Africa.

This refers in the main to pioneer work, and makes no distinction between work done purely under German auspices, and explorations undertaken by Germans at the request and the expense of British Missionary Societies or of the British Government. Beginning with North Africa, reference is made more especially to the achievements of Gerhard Rohlfs in Morocco, Tuat, Ghadames, Fezzan, Tibesti, the Libyan desert, and Kufra; Friedrich Hornemann who crossed the Sahara in 1800, died at some Nupe town, and nearly solved the Niger mystery; Barth in Tripoli, Fezzan, Air, Agades, Timbuktu, the Middle Niger, the Komadugu, and the Upper Benue; Overweg on Lake Chad; Vogel on the Bahr-el-Ghazal of Chad and in Wadai; Dr. E. Rüppel in Abyssinia and Sennar; Ferdinand Werne and Ignatius Knoblecher on the White Nile; and von Heuglin, Kiezelbach, Munzinger, and Steudner elsewhere in the Egyptian Sudan and Western Abyssinia; the great Georg Schweinfurth, who revealed to us much of the geography of the west and south-west Bahr-el-Ghazal (Egyptian Sudan) and the river Ubangi-Welle in its upper waters, and whose subsequent services as an explorer of the flora of the Egyptian deserts, the Red Sea coasts, Abyssinia, and West Arabia have been of inestimable value; Sigismund Koelle of Sierra Leone and Western Liberia, one of the greatest of African philologists; W. H. I. Bleek, the founder of Bantu and Bushman studies; Dr. Wilhelm Peters, the explorer of the fauna, flora, and languages of Portuguese East Africa; Adolf Bastian of Loango, and Hildebrandt of the Comoro islands; Ludwig Krapf and Johann Rebmann, who discovered Kenya and Kilimanjaro, and first circulated

definite stories of the great Nyanzas; von der Decken, who explored much of the Zanzibar coast and southern Somaliland, and made the first accurate survey of Kilimanjaro; Albert Roscher, who died on the south-east coast of Lake Nyasa, and almost forestalled Livingstone in 1859 in the discovery of that lake; C. Hugo Hahn and other German missionary explorers of Damaraland; and Karl Mauch (Zimbabwe) and Eduard Mohr in Southern Rhodesia and Portuguese South-east Africa. Coming nearer to modern times there have been the productive journeys of von Bary to Ghat, and of Nachtigal in Tripoli, the Tibesti Highlands, Wadai and Darfur; of G. A. Krause in the regions of the Volta rivers behind the Gold Coast; of Pechuel-Loesche in Loango; of Emin Pasha (E. Schnitzer) in the Nile-Congo water-parting; Dr. Franz Stuhlmann in the same region; Count von Goetzen, who discovered the Equatorial volcanoes of the Mufumbiro region and Lake Kivu, and Dr. Kandt of the same region; von Wissmann, Dr. Pogge, von François, and Ludwig Wolff of the southern basin of the Congo—more especially the Kasai and its great affluents; Paul Kollmann, of the South Victoria Nyanza; Captain Berenger, who first proved the existence of the gorilla in East Equatorial Africa; G. A. Fiegel, of the middle Niger; and Dr. Zintgraff, Lieuts. Morgen, Kund, Tappenbeck, von Stettin, and Uechtritz, Dr. Passarge, Lieut. Hutter, Dr. Hoesemann, and von Danckelmann of the Cameroons Hinterland, Gunter Tessmann of the Fang countries, and Dr. Leonhard Schultz of Namakualand, the Duke Adolphus of Mecklenburg; and Hans Schomburgk of Liberia and Northern Rhodesia. I ought also to include for the geographical value of their work: Carl Meinhof, the Bantu grammarian; Dr. A. Seidel and Bernhard Struck, brilliant exponents of African philology; together with Professor E. Fraas, the palæontologist; Dr. Fülleborn, the anthropologist; and Professor von Luschan, the ethnologist; and even now I have only mentioned a selection, and have quite possibly omitted the inclusion of the names of many Germans who have assisted to put Africa on the map, and, more than that, have provided the world with first-hand information of far-reaching importance, on the geology, fauna, flora, peoples, and languages of Africa.

My own acquaintance with Africa, and with what Germany was doing and desiring in regard to Africa, goes back to the year 1879, when I first landed on the coast of Algeria. In 1880, I spent eight months in Tunis, and between 1897 and 1911, I have visited much else of North Africa between Tripoli and Morocco. In these journeys of the eighties and nineties I became aware of the presence of numerous German agents at the head of mysterious scientific expeditions; encountering them quite unexpectedly in Berber towns in the south of Tunis, in Western Algeria, or south of the Atlas mountains in Morocco. Undoubtedly the reports of these agents encouraged the German Government to believe that once it got a foothold anywhere in North Africa, either in Tripoli on the east, or Morocco on the west, it would very soon be able to push the French out of North

Africa. And but for the alliance between France and Britain it would certainly have succeeded in doing so; perhaps not now, but in earlier years when the French reforms and police work had been drastic, though highly beneficial, and when the benefits of this civilizing work had not been sufficiently appreciated by the rising generation. Ten years ago—twenty years ago, even more—there was a profound discontent against the French, just as there has been from time to time a similar dislike to British reforms in India, in Egypt, and in other Muhammadan countries. I dealt out full justice in my mind to the remarkable ability of the Germans, their great courage, intelligence, and adaptability to local circumstances. But not only have I felt in recent years that the slightest concession to them—even such as a coaling station on the coast of Morocco—would entail eventually a losing battle on the part of the French, but that it would be even more fatal to British interests. If Germany had got possession of Morocco, she would have been able before long to bar the British sea route to the Mediterranean, Egypt, and the Suez canal; and secondly, she would have menaced most seriously the British sea route to the Cape of Good Hope, the West Indies, and South America. In short, the Germans were good enough geographers to realize that Morocco was the necessary basis on which their world power must be reared.

From the point of view of the natives of North Africa—and it is the natives', the indigenes' point of view on which I intend to base my principal arguments—it is far preferable that French rule over North Africa should continue. There have been defects and shortcomings, tiny injustices here and there in the French administration and development of North Africa since it began in 1830; just as there have been similar defects in the British administration of many Muhammadan and Negro countries. But both British and French rule have been immeasurably superior to the anarchy or misrule which preceded their advent in these lands of Asia or Africa. Championship of the so-called "native" cause has not infrequently been mistaken sympathy shown with the cause of a dynasty or of a usurper quite as foreign in race and blood to Africa or to Southern Asia as is the Briton or the Frenchman.

German ambitions in regard to over-sea, and especially African, possessions arose as far back as the middle of the nineteenth century, when for all practical purposes the voice—the then somewhat feeble voice of Germany—was the voice of Prussia. The great commercial success of the Hamburg house of Godeffroi in the Pacific islands not unnaturally suggested to Germans that they, like the French and the British, should take a share in the colonization and government of Oceania. The splendid exploration work achieved by Germans, both missionary and lay, in the African service of British Missionary Societies or of the British Government, and later still the independent journeys of men like von der Decken and Nachtigal, inspired modern Germany quite legitimately with the hope that she too some day might become a successful colonial Power in Africa.

This inclination might have remained in the limbo of vague unsatisfied aspirations had it not been for a certain sharpening of commercial rivalry which followed the industrial expansion of the German Empire after 1871. At the beginning of the eighties the French not only extended their African Empire, but began to display similar intentions in regard to Indo-China, and at the same time established or intensified differential protective tariffs. Once again there arose in Britain the cry for what was called "fair trade," in other words, differential duties throughout the Empire exclusively to favour the commerce of the British Empire. Far-sighted Germans began to recognize a time when, if Germany wanted vast areas for the obtaining of raw materials or for the sale of her industries without differential treatment, she must herself step in and take under her flag as much of the waste places of the world as she could obtain without armed conflict with other Powers. American tariffs, and at a later date still the Chamberlain proposals for protection or for an imperial customs union and preference for the Mother-country, served to inflame and intensify this adventurous foreign and colonial policy. The first direct German efforts were conceived in 1883, and carried into effect with some abruptness in 1884. Sir John Kirk, all powerful at Zanzibar, the virtual administrator and peace-keeper throughout East Africa from the Portuguese possessions on the south to Somaliland on the north, suddenly found his dream of a vast British-protected East Africa shattered by the intrusion of Dr. Peters and Count Pfeil. Until this making of more or less sham treaties in Usagara—at any rate, those of Dr. Peters were virtually shams—Sir John had only feared the ambition of France as the European Power likely to come in conflict with his schemes—schemes, be it noted, known to and approved of by the Sultan of Zanzibar. France had a treaty lien over the Zanzibar dominions as over those of Maskat in Eastern Arabia. Consequently, when I went out to Kilimanjaro in the opening months of 1884, it was rather with the idea of forestalling France (represented at that moment by a very energetic traveller, Mons. Révoil, the explorer of Somaliland) than with any thought of German ambitions. It was more to defeat French projects than German that I hoisted the British flag on Kilimanjaro and at Taveita. Soon afterwards, however, the Peters and Pfeil treaties were made known. Similar action was taken by Dr. Nachtigal on the Cameroons coast, and bold attempts were made to secure footholds in south, south-east, and south-west Africa, in Senegambia, and as near as possible to the delta of the Niger. The objections of the British Government were checked almost in their utterance by a reference to the awkwardness of our position in Egypt, and the possibility of a Franco-German interference in that quarter. But if you will read attentively the voluminous diplomatic correspondence published in Blue Books or the inspired leading articles of the newspapers of those days, you will find that our objections to a German Africa largely partook of sheer surprise at Germany wishing to become a colony founder or a foster-

mother; and once the surprise was got over we proceeded with no great amount of ill-will to make clear the path of Germany for colonial enterprise. We did nothing to prevent her getting hold of the north-east third of New Guinea or of various archipelagoes in the Pacific. We ceded to her our little colony of Ambas bay, founded by the Baptist missionaries on the Cameroons coast; we only retained Walfish bay and the guano islands on the coast of south-west Africa, though we had prior claims to the whole of that region; and, in short, by about 1890 we had actually facilitated the acquisition by Germany of a colonial empire exceeding 1,000,000 square miles, mainly situated in Africa. As a further proof of our goodwill we had presented her with the little island of Heligoland, which has since proved such a vital point in the coast defences of north-west Germany.

The Germans, however, never took their eyes off North Africa. Fresh attempts to revive the Morocco question occurred in 1910, and in 1911 assumed the usual dramatic form by the dispatch of the *Panther* to Agádir. Here dramatic action was combined with sound practical sense. If there was one point more than another worth making for on the Atlantic coast of Morocco it was the Bay of Agádir, which is the only position on that coast where, with a comparatively moderate expenditure of money, a really good naval harbour might be made. Agádir, moreover, was the outlet for the valuable Sūs country and for some products of the Atlas mountains. And the products of this region, as of much else of Morocco, are likely to be of great value to an industrial and industrious governing power. Morocco produces, I believe, the best qualities of iron for certain purposes, and has mines of lead, antimony, silver, and copper, with gold in addition in the valleys of the Sūs and the Draa. The forests of conifers (thujas, pines, and cedars), of oaks, and especially of that type of tree which really belongs to tropical Africa, the *Argania sideroxylon*, are of considerable value, and their area might be increased very considerably under decent administration. Undoubtedly, the Germans believed that the French would be frightened into yielding them a small, small foothold on the coast of Morocco, and that Great Britain would not be wise enough, would not be bold enough, to resist this concession. Germany would begin here with another Tsing-tau, some fortified place which would require months of siege and great expenditure of life to take from her; and from such a point would, of course, eventually achieve her ambition of dominating North Africa. But Essen in 1911 had not yet produced its marvels, neither German finance nor the German army and navy were strong enough for a world-struggle; and before the resolute attitude of Great Britain Germany drew in her horns, yielded on the subject of Morocco, but accepted instead —*une poire pour la soif*—a considerable enlargement of her Cameroons domain which brought it well within the basin of the Congo.

For in her ambitions as in her military strategy, Germany does not rely only on one line of offence or defence. If she is driven out of her Bzura positions it is found that she has made another strong line of

defence on the Vistula. If she cannot have A she takes B. If she could not obtain from us British New Guinea or the Solomon islands at the time of the Boer war stress, she was content with Samoa. Though Morocco all along, since 1900, has been her coveted prize, the one region she wanted more than any other, she has had her eyes fully open to the wealth of the Congo. Here there were much greater justifications for her ambition, or, if you like to put it so, her greed, which in this respect has been no worse than British greed, or Belgium colonizing zeal, or French land-hunger. The main geographical facts of the Congo basin were laid down by remarkable British pioneers—Livingstone, Cameron, H. M. Stanley, and George Grenfell; but only second to these in achievements were the great personalities of Schweinfurth (who, first of scientific travellers, at any rate, found his way to the Congo basin from the north), of von Wissmann, Dr. Pogge, Boehm, von François, Ludwig Wolff, Dr. Buchner, and other persons of less fame, who revealed to the world most of the southern affluents of the Congo. Indeed, the attractions of Congo geography and of the Congo mystery had been reopened to our contemplation in the second half of the nineteenth century by Dr. Adolf Bastian, by Pechuel Loesche, and those leaders of expeditions (under the nascent German African or Colonial societies) which explored the Loango coast between 1875 and 1883.

In Congoland, therefore, it did seem hard that Germany should have no region under her own flag, when, next to Great Britain, she had done more than any other European nation to place this million of square miles on the map, to investigate its ethnology, and its languages, its fauna and flora.

German rule over East Africa, over the Cameroons, and over South-west Africa had been heavy handed; but none of us who were on the spot, so to speak, could refuse our tribute of admiration to von Wissmann, one of the greatest Germans, one of the most splendid white men that have ever entered Africa. Von Wissmann resolutely put down the bad side of the Arab power in German East Africa, and completely suppressed the slave trade. His feelings on that score were as strong as those of Livingstone, and as disinterested. He not only did this first of all as conqueror and Governor of German East Africa, but subsequently he turned his attention—quite disinterestedly—to what was going on in the northern parts of British Central Africa and the south-east part of the Congo basin. He, or his officers after him, unhesitatingly placed at my disposal, and I believe also at the disposal of the Belgians, such forces as they possessed by land or water for the crushing of Arab revolts and the extirpation of the slave trade. I should not be here addressing you to-night, nor would Sir Alfred Sharpe be listening, had it not been for the unstinted help afforded us by gallant Germans—by generous Germans, I might even say—in our six years' struggle with the Arabs in Nyasaland.

A good deal of vain and silly sympathy was expended by the British on the recalcitrant Hottentots of Namakualand, with whom the Germans

carried on a most exhausting contest for something like twelve years. These Hottentots and Bastards (they were more often half-castes than pure-bred Hottentots) arose from the "Afrikander" clan, which at the opening of the nineteenth century quitted Cape Colony as outlaws, and by means of fire-arms carried devastation and robbery in all directions amongst the peaceful Bantu population of South-west Africa. You have only to read the works of the great South African pioneers down to about 1884 to realize what a nuisance these predatory Hottentots were. They sacked mission stations, they murdered missionaries, and they kept up a perpetual warfare with the far better dispositioned, dark-skinned Damara. When the German Government asked leave of the British Government to intervene in the affairs of South-west-Africa in 1884, it was on the genuine excuse that some intervention must be made to save the laborious German missionaries in that region from extermination at the hands of the Hottentots. The spiritual ancestors of these German missionaries had been in the employ of British missionary societies, and in consequence of Robert Moffat's appeal, had entered this very inhospitable country to tame the savage Hottentot raiders and to establish some kind of working Christianity. They had succeeded to a remarkable degree, extorting admiration from all who visited their stations and saw the peaceful native population growing up around them.

In South-west Africa Germany dealt, I think, too harshly with the Herero (whom we generally call by their Hottentot nickname of Damara). But she did much to extinguish internecine war between tribe and tribe; and, for this reason likewise, when the history of German East Africa is written, far more will lie to the credit of Germany than to her discredit. The same may be said in regard to Togoland, and, I really think, in regard to Cameroons. These facts having sunk into the minds of the few amongst us who are competent to form opinions on African questions, it may be said that from 1910 to the very outbreak of the present war, we viewed with actual favour the chance of a much enlarged German Africa, provided that Germany left the Mediterranean regions alone.

Here she had had another set-back to her ambitions, for concurrently with these dogged attempts to enter Morocco, she had founded, more or less in secret, a so-called Austro-Hungarian Chartered Company for the exploitation of Tripoli. This company's charter would have virtually imposed Austrian—or, to put aside all specious pretence, German—authority over the Tripolitaine between the frontiers of Egypt and those of Tunis. Somehow the conclusion of certain preliminaries and the dispatch of an Austro-Hungarian scientific expedition opened the eyes of Italy, who, ere the Morocco question was really concluded, made her pounce on Tripoli, and did so obviously with no disapproval on the part of the British Government, which had long recognized the hatefulness of Turkish misrule in this region, and the historical justice of allowing Rome once more to rule the former granary of Rome. The Germans, of course, were furious

at this first divergence of Italy from the interests of the Triple Alliance. They could not, however, coerce Italy into withdrawing from the Tripolitaine, nor Turkey into yielding up her interests there with celerity. Consequently, in the further prosecution of the struggle Italy acquired—and will probably never leave—the island of Rhodes, as well as the Dodecanese, which bring her into close contact with the west coast of Asia Minor.

The consequences of the Italian invasion of Tripoli may fitly close this survey of the past political geography of Africa. I invite your attention, therefore, at this stage to the first of my maps, which shows us the political divisions of Africa down to July, 1914. It was obvious that since her disappointment, in North Africa, Germany was feeling particularly chagrined; but so far as I could gauge responsible British opinion at the time, we had no desire whatever to drive Germany into a corner, to leave her with no sufficient field for her colonial and industrial ambitions. It was, therefore, intimated to her that no strenuous British opposition would be offered to negotiations between Germany and Belgium, Germany and France, Germany and Portugal, which would either bring under a German commercial control, or actually under the German flag, much of the Congo basin or of the adjoining regions of Portuguese West Africa. In short, so far as our goodwill went, Germany might have obtained before very long some such an empire over Africa as I venture to depict in my map 2

AFRICA AS IT MIGHT HAVE BEEN IN 1916.

This represents my idea of what might have been the political rearrangement of the African continent if, instead of forcing a war on Europe, the German Empire had pursued to a finish negotiations already tentatively commenced with the Western Powers. France would very probably have been willing to surrender all French Congo (and the right of pre-emption over Belgian Congo) except a coaling station and *pied-à-terre* at the Gaboon, if Germany had been willing to retrocede Metz and French-speaking Lorraine and to extrude Luxembourg from the German Customs Union. The sacrifice of territory by Germany would have amounted barely to 500 square miles. France would also have been willing to give Italy a considerable hinterland in the Tripolitaine in exchange for the city of Ghadames, and Britain have done her share of renunciation in regard to the by no means valueless Libyan desert, in order to open to Italian enterprise a route to the heart of Africa along the slopes of the Tibesti highlands. Belgium might have been willing to sell to Germany the bulk of the Congo basin in exchange for a small portion of French Loango and a tacit or avowed renunciation of any German claims over the Grand Duchy of Luxembourg, which would thenceforth have come within the sphere of Belgian political influence and protection. Great Britain would not have opposed any enlargement of Germany's colonies in Africa, provided her special vested interests in Katanga were recognized and

the Cape-to-Cairo free route assured by a direct connection being granted between Uganda and the north end of Tanganyika. Under such circumstances Portugal might have been induced by financial considerations to sell or to lease Southern Angola to Germany, where, in any case, British concessions were on the point of being made over to German capitalists; and a portion of the "Caprivi" strip in Zambezia would have been exchanged for Walfish Bay. At the same time it might have been possible for Great Britain to consider the transference of the island of Zanzibar to Germany in return for the connection between Uganda and Tanganyika; but provided only that all this rearrangement were accompanied by a definite settlement of the Franco-German quarrel over Lorraine and Alsace, and that all danger of the occupation of Luxembourg were removed. We could only have afforded to transfer the island of Zanzibar provided we were assured as to Germany's future intentions. The surrender of Metz would have been a sufficient safeguard in this respect. France, thus completely set free from the chance of any unprovoked or sudden German aggression on her eastern frontier, could well afford to cede nearly all French Congo to Germany and the French right of pre-emption over the Belgian Congo. While Belgium, on the other hand, reassured as to Luxembourg, which would then tend to gravitate towards the Belgian sphere, might well feel inclined to make considerable additional concessions of Congo territory to the German power. Great Britain, set at rest as to the prospect of a Franco-German conflict, and any German designs on Belgium, would have used all the influence that was fair and friendly with Portugal to secure for Germany all reasonable means of developing the commerce and industries of the Portuguese Congo, and perhaps also of Southern Angola. Indeed, it is an open secret that in this direction existing British concessions were transferred, or were about to be transferred, to Germany when war broke out. Such, for example, as the half-built railway which is to connect Benguela some day with the southern basin of the Congo.

This, therefore, is how Germany stood in regard to Africa in the summer of 1914. Had this war not broken out, 1915 might have been witnessing the evolution of the map of Africa in the form I have shown you, and with the full concurrence of the Powers involved—of France, because she wanted to use some of her spare capital to build that Trans-Saharan railway which will some day be amongst the great dominating features of African political geography; Portugal, because she wanted peace at home and no fomentation of political intrigues by German money, and capital for the development of her West African possessions (from Germany) and her East African possessions (from England); Belgium, because she would have been contented with a reduced, but still valuable, Congo colony, in the knowledge that she was perfectly safe henceforth from any invasion of her eastern frontier, and that a fusion

of interests between herself and the naturally related Grand Duchy of Luxembourg was now under her control. Similarly, though this branch of the question cannot now be considered—German ambitions had been settled with Russia, France, and Britain as regards Asiatic Turkey; and the problems of the Balkan peninsula and European Turkey could quite easily have been arranged by a system of friendly and practical compromises between Austria and the Balkan States. In short, these two allied Powers of Central Europe in 1914 stood well in view of coming enlargements of German over-sea possessions or spheres of influence, till these reached an area of over 2,000,000 square miles, with a very varied population of almost all types of the human race (except the Amerindian), totalling about 75,000,000. And all this she has lost, and I believe lost for all time, through the mad wickedness of those who have directed her supreme government.

Africa as it may be when the War is finished (Map 3).

The result of any peace at all tolerable to the Allies must result in Germany being left with no "colonies" outside Germany from which she can once more renew her intrigues with the non-Caucasian races to fight or to rebel against their Caucasian neighbours or guardians. We assume, therefore, that in one year's, two years' time the French, Belgians and ourselves will be able to lay down with some assurance of permanency the political geography of Africa during the next fifty years. Belgium and Portugal, freed from the menace of German earth-hunger, can consider themselves endowed permanently (with the limitations of the parable of the Ten Talents) with the full extent of the territories allotted to them on the map. There may be trifling adjustments of frontier between themselves and Great Britain or France, but not in any way to their disadvantage. Portugal may allow British Nyasaland to reach the navigable Zambezi as against the acquisition of Tungi bay on the far north (Ruvuma estuary); Belgium may exchange the inconvenient strip of Bangweulu territory and the right bank of the Semliki against better access to Lake Albert and the shores of Lake Kivu, the last named forcibly taken from the Congo State by Germany fifteen years ago. France will regain all that portion of French Congo ceded to Germany in 1911, and in addition much of the south and east of German Cameroons. The north-west of the Cameroons, including the Sanagá river, must be added to British Nigeria.* On the other hand, much of Togoland may go to France, to

* In this direction sentiment may well influence our action. We must not forget that the civilization of the West Cameroons was entirely due to a small but remarkable band of British Baptist missionaries, who with their West Indian colleagues between 1842 and 1885 won over to orderly ways, to fruitful commerce, the Bantu-speaking negroes of this region When Germany somewhat arbitrarily annexed the Cameroons in 1884 she believed the Baptist mission to be a great obstacle in her path of Teutonizing this region. With something that might almost be called brutality, the British Baptist missionaries were expelled, their fine buildings were expropriated,

the adjoining state of Dahomé. The southern two-thirds of German South-west Africa (including Swakopmund north of Walfish bay) is already passing to the Union of South Africa; but the northern third (including the negro territories of Ovamboland and Damaraland) might preferably be governed by the administration of the British South Africa Company, on the same lines as Barotseland. Rhodesia at present has no outlet to the sea. Such an arrangement might, when wealth comes to this region of South Central Africa—as assuredly it will—give to Rhodesia a port on the Atlantic much nearer to England than Beira or Capetown. Lastly, German East Africa will become British East Africa.

You will see that I have been very generous in regard to the British flag, but without forgetting that it is over much of Africa merely the flag of a guardian, and not of the heir; who is still a minor in capacity. I have made a fairly close study of Africa since my first landing on its shores in 1879, and have read, perhaps, as deeply in the imperfect history of Africa as any one else. I emerge from these studies honestly convinced that, with all its faults and imperfections, British rule has brought more true civilization, greater liberty, greater happiness to the African continent than that of any other Power. But there are many amongst us who view the most marked outcome of British rule—the welfare of the indigenous races—with secret disfavour. If we were a logical people, sufficiently well read in history and the lessons of history, each one of us who could afford the modest subscription of a few shillings would be a member of the Aborigines' Protection Society, the most purely philanthropic organization which exists in our land at the present day. We see the effect of the eighty years' work of this society in the peaceful condition of the British Empire in Africa and Asia since the German declaration of war. If Germany has done great good to Africa (as undoubtedly has been the case) since she assumed rule there in the eighties of the last century, she has, nevertheless, for the last ten years steadily prepared for the struggle now forced on us by her intrigues to upset our rule.

We must not conceal from ourselves or from our allies that in the rearrangement of Africa which will follow the general settlement of the war, we shall have to bear in mind most carefully the principle that in taking over increased responsibilities we do so not only to get back some

and they were given the miserable sum of £2000 as compensation, We had, it is true, annexed one of their settlements—Ambas bay—to the British Empire, but in order to be ungrudging in our recognition of Germany's right to a good share of Africa for colonizing experiments, we transferred Ambas bay and the magnificent Cameroons volcano to her in 1887. Whatever disposition of Cameroons territory may take place as the result of amicable discussions between France and Britain, all the western portion of the Cameroons must revert, I might almost say, to us, for it was taken over by us—all but a few square miles on the Cameroons river—in 1884–1885. The trade language of all this region is English. As one of the revenges of history I want to see the British Baptist missionaries once again established in the Cameroons, just as I do not wish to die until mass has been sung in Saint Sophia's Church in Constantinople.

small proportion of the gigantic sums expended by the people of this country in their self-defence, but in order to act faithfully as the trustees of backward peoples unable to minister their own affairs. It is useless to evade the inevitable proposition that we are gradually—in some cases quicker than others—preparing the non-Caucasian peoples of Asia and Africa either for self-government or for participation on equal terms of citizenship in the government of their own lands partially colonized by the white race. The proposition may be a disagreeable one to some people; it may even be proved by a German school of philosophy to be inconsistent with the theory of the Super-man. But long ago the missionaries decided the question for future generations by sowing the Dragon's teeth of Education. If we desired that the non-Caucasian should remain in a more or less serf-like condition, we ought to have inhibited missionaries and the spread of Christian teaching a century ago. We did indeed try to do so in India, but there existed then Danish footholds in Southern Asia; and King Christian VII. of Denmark, who actually believed in Christianity as a sound working religion, gave the requisite permission that brought the Protestant missionaries of England and Denmark into India. With them came the germs of an education now so widespread that it has secured for the natives of India far-reaching concessions as to their political rights. No one can say that subsequently the missionary has proved an enemy to wise and fair government. Personally, I think it is actually prejudicial to the welfare of any European or native-owned territory in Africa that missionaries should not have as free a right to circulate and to settle as commercial travellers and founders of wholesome industries. At no time were such difficulties placed in the way of missionaries in the basin of the Congo as still subsist over the greater part of Northern Nigeria. The result is that our knowledge of the Congo, its peoples, its fauna, its flora, its geography in general, is remarkable and minute as compared to our deep ignorance still about Northern Nigeria.

We have already realized that it does not pay—to put the argument at its lowest level—to administer badly or unfairly in Africa, and the consequence is that the present trouble has found us strengthened on all sides by native loyalty in Africa. This must hearten us to face the grave problem of the Negro and Negroid races, to what extent they should receive—gradually, perhaps, but eventually—recognition of civic and suffrage rights, and a share in the land as proprietors and not merely as tenants. I should not like to drag this Society into a discussion of this thorny question, quite outside its boundaries. I only touch on it to show that the affairs of over 6,000,000 of black people in trans-Zambezian Africa, for example, are amongst the delicate and difficult problems our supreme Imperial and our local and National Governments will have to solve before long. If it is wisely approached, this problem may be solved by degrees. From sheer force of circumstances we must, whether we like it or not, recognize that beyond the southern tropic in the temperate

regions of southernmost Africa, the white man's voice and interests must be predominant, but north of the present limits of the Union we shall, I humbly believe, be committing a grave error in Imperial politics if we too hastily hand over considerable and united negro populations to a white administration relatively uncontrolled from London.

In East Africa we may legitimately give ourselves the satisfaction of at last linking up the route between the Cape and Cairo; an idea, I should like to remind you, conceived (even before it was fostered by Cecil Rhodes) in the far-seeing, poetical mind of Edwin Arnold, who advocated it first in 1876 in the pages of the *Daily Telegraph*. The life-work of Sir John Kirk must be given its coping-stone. But for the sudden German intrusion in 1884–85 Sir John would have succeeded in bringing under the British sceptre, with the full consent of the Arabs as well as of the natives, the whole of East Africa between the Portuguese possessions in the south and Italian Somaliland on the north. Throughout this vast region there is one easily acquired lingua Franca—Swahili. Zanzibar and the Zangian coast for something like 2000 years have been the source of such civilization as has reached these regions, and Zanzibar might once again become, as it was in the palmy days of Sir John Kirk, the virtual capital of East Africa. In fact, just as we have an Empire of India we might some day have an Empire of Zanzibar.

We must not overlook the fact that in what is still German East Africa there is a native population well on the way to numbering 8,000,000; a warlike population in the main, speaking Bantu languages, of the average Bantu physical type, a good deal influenced by Arab civilization, and, fortunately, a good deal under the influence of British and French missionaries. I was surprised to read in the *Times* some months ago a suggestion that—even while the war is going on—we should hand over this territory to the Japanese as a future outlet for their people. To do so would be little short of an outrage on the indigenous negroes, who have always been well inclined to the British, who were forced against their will to become German subjects, and who when once more under the British flag will increase and multiply and be a very important labour force for subjugating Africa in general. British East Africa, I know, contains a few tracts of high and healthy land, as also do Nyasaland and the south-west parts of German East Africa, not only almost without native inhabitants, but thoroughly well suited for white colonization. But in actual area these regions are so small that they do not affect the main fact that the future Empire of Zanzibar—between Somaliland and the British Sudan on the north, and the Portuguese possessions on the south—is a land far more suited for a negro than for a European population. The Japanese entering it would not only find themselves very much in conflict with the local population, but would be just as subject as are Europeans to the germ-diseases as to which the indigenous negro is more or less inured. The

future of Japan undoubtedly lies in Eastern Asia, and there she has quite enough to content herself and her legitimate ambitions for 200 or 300 years to come. The only foreign people who would be in any way welcome to the Empire of Zanzibar are the British Indians already settled in great numbers along the coast. Sir John Kirk once spoke of this region as the America of the Hindu, not implying that the masses of India were to come and take this region from its indigenous populations, but that the two got along admirably together as it was, and that it only needed a better and more secure government for the native of India to colonize much of this region by peaceful penetration and by intermarriage with the indigenous peoples.

To illustrate my theories with regard to the future peopling of Africa I might put before you two maps. The first (No. 4) exhibits Africa and the extent to which it may be colonized of the White Races.

By the term "white" I mean that large proportion of the Caucasian sub-species of Man best represented by the general term "European," but including within its scope comparatively fair-complexioned peoples of North Africa, Asia Minor, Persia, Syria, and Arabia. The map is further intended to show those portions of Africa either already tenanted by white men in preponderating numbers or open to white colonization on account of a temperate climate and a sparsity or absence of indigenous population. The map represents what in my opinion is the utmost extent, for the next hundred years, of the surface of Africa which can really be colonized by Europeans and their Asiatic congeners.

Africa and the Black and Brown Races (Map 5).

By "black" I mean the Negro sub-species—Congo Pigmy, Forest Negro, Sudan Negro, Bantu Negro, Nilotic Negro, and Masai; Bushman and Hottentot. Under the term "brown" I should include several well-marked races with Caucasian physiognomies, but with a distinct "nigrification" caused by ancient or modern mingling with the African or Asiatic Negro: such as the Red Sea Kushites (Beja, Hadendawa, Danákil, etc.); the Gala and Somali; the Tibu-Teda of the Libyan and East Saharan deserts; most of the mixed peoples of Darfur, and the Abyssinian and Nubian borderlands; the Bahima of Uganda and the Batutsi of North Tanganyika; the Fula of West and West Central Africa; the Songhai of the Northern Niger; and the Moors of Senegal. The "yellow" in the map indicates the nigrification, the "Numidian" aspect of Southern Algeria, Morocco, and Tripoli, of the Lower Nile valley and North-East Africa; also the Hindu and Arab residents on the Zanzibar coast and the "Cape Boy" element in Cape Colony. The orange tint in Madagascar corresponds to the more essentially "Malay" Malagasy tribes; and the olive to the negroid Sakalava and their allies.

Besides the questions of race distribution and "native" rights, two

other great problems await for their solution intelligent statesmanship on the part of those powers who between them are to rule Africa for a hundred years or more to come. The first is the suppression of germ-diseases, the second the elimination of distilled alcohol from all parts of Africa, whether imported or of local manufacture. As regards the first of these problems, its solution will be a long and costly task, but it is absolutely necessary to grapple with it in Africa, as in tropical Asia and tropical America. By our activities we have stirred up these regions, and brought races into contact which had hitherto lived in separate compartments. There has always been ready some manifestation of the devil, usually in the shape of an arthropod—an insect or a tick—to transfer the germ-diseases of the one to the veins of the other. Or in the case of the new-comer, germ-diseases have been introduced into his system from some fount of disease in the shape mostly of the big and small mammals of the country. These curious chains of events which lead to so much loss of human life or damage to human property have been admirably worked out in a book by Mr. C. A. Ealand—"Insects and Man"—to which I would refer you if you wish to realize the task which lies before us in Africa as in India and South America. Reluctantly as we may admit it, much of the wild beasts of Africa will have to go, but specimens of them can be preserved for our interest and admiration, either in other parts of the world outside Africa where there is no transmitting agency to convey the trypanosomes from their blood, or even well within Africa itself. But because we may be obliged most reluctantly to evict or even to slay certain mammals, that is no reason why we should allow the insensate destruction of birds for their plumage to continue. On the contrary, we must do everything we can to encourage the multiplication of insect-eating birds, especially types like the guinea-fowl, the white herons, bee-eaters, and glossy starlings, which are the special foes of dangerous insects' attacks. Much can be done in a very short space of time to destroy the tsetse flies by cutting away and burning the coarse herbage and brushwood so necessary to their existence. Valuable forests can remain untouched, and will be all the better for the clearing round the trees. The burning of the grass by the natives need not be discouraged provided that it is conducted in an intelligent manner without damage to forest or to cultivated ground. A much better style of house-building amongst the natives must be stimulated, especially the style long since invented by the more intelligent people of South-East Asia—the house raised on piles, so that the sleeping apartments are well above the surface of the ground, and consequently not accessible to ticks, bugs, fleas, and low-flying mosquitoes and midges. Sanitation also will go far towards the removal of both germ diseases and their transmitting agencies. Mere increase of population also does much to suppress these pests, especially in the case of the tsetse fly, which dislikes the vicinity of human habitations.

In my map (9) of

much of the Sahara desert is left blank, merely from want of definite knowledge as to germ diseases and their transmitting agencies. But we may take it for granted that the principal centres of habitation in the Sahara and Libyan deserts are not free of germ diseases, though as, owing to absence of moisture, there are comparatively few arthropods—especially mosquitoes and ticks—germ diseases are neither so obvious nor so dangerous to the foreigner. In Egypt the chief transmitters of germ diseases are *flies* of the genus *Musca* (the "domestic" fly) and *fleas*. In North Africa, principally Algeria (which in this respect is worse treated than either Morocco or Tunis), trypanosomatic diseases affecting horses, camels, and goats are particularly noticeable. Malaria is much suppressed of late years owing to draining of marshes and numerous other sanitary measures. A dangerous form of malarial fever, obviously communicated by mosquitoes, still haunts the beautiful Jerid region of Southern Tunis, with its abundant springs, its rich vegetation, and general conditions reminiscent of tropical Africa. A similar fever afflicts the large oasis of Tuat—an oasis destined to play a great part in the future development of Africa. Ulcers, boils, and buboes (other than those symptomatic of the plague) are more associated with Muhammadan Africa and Asia than with the pagan or Christian parts of the tropics: why, I cannot say. The only region which is emphatically not Muhammadan, but where they also occur in a marked manner, is in Western Congoland and Angola. "Sleeping sickness" is first mentioned in recorded history in Senegambia. It is believed to have devastated Liberia in the early nineteenth century, and attracted notice in Loango and Northern Angola about 1840. But traditionally it is a well-established disease in Western Congoland. Its deadliest type appears to be due to a distinct trypanosome in south Central Africa conveyed by the ordinary *Glossina morsitans* species of the tsetse genus. This Rhodesian and Nyasaland sleeping sickness is apparently quite a new disease. Although the rapid opening up of Africa has no doubt started several new epidemics of disease by the bringing into close contact infected and uninfected tribes hitherto kept apart, yet one may well believe that Africa, like South America, has long been afflicted with germ diseases, and that they constitute the principal reason why the population of those continents—so favoured by nature with conditions suited to the maintenance of many millions—has nevertheless remained very sparse in volume as compared to Europe—Europe, in which man first began to ask the why and wherefore of his martyrdom, and to turn against Nature with every intention of taking the law into his own hands.

The germ diseases of Africa are scarcely more to be dreaded than those of tropical Asia and America, and can be eliminated in the same way—

by a discriminating yet unrelenting war against insects and ticks—in short, "the next war," when the present insane struggle is brought to a successful conclusion.

In regard to distilled alcohol, we mostly shut our eyes to the evidence before us and refuse—because of the tyranny exercised over us by the alcohol producers—to recognize its extremely damaging effect on Africa. For reasons which have always been mysterious to me, and are the more mysterious now that we have no longer the appeals of German commerce to consider, the coast regions of the Gambia, Sierra Leone, the Gold Coast, and Nigeria are still sacrificed to the interests of the alcohol producers. In the Sudan, I believe, it is still permitted to natives to distil and sell alcohol of a most intoxicating type. The French for some years past have been allowing the *viticulteu·* interests to poison the indigenous population of North Africa, Arab and Berber, with distilled alcohol. In all Portuguese Africa, except the northern part of Moçambique, which is too Muhammadan in religion to consume alcohol, infinite damage is done by the local distillation of rum from sugar. Much of the so-called idleness, much of the degeneracy in physical constitution, the turbulence and other faults attributed to the negroes in Angola and in Portuguese South-East Africa, is due to the rum manufactured and sold there, to the great profit of private individuals and concessionaire companies. Most of the native troubles in Liberia arise from the introduction of poisonous forms of European spirit. So far-reaching is the power of the stored wealth of the alcohol producers throughout the world, that public opinion in our own and in other countries is poisoned at its source in the very press of those lands, and very few politicians are courageous enough to set themselves up in defiance against alcohol. Consequently, we see the progress, the happiness, and the healthfulness of great continents like Africa, wonderful islands like Ceylon, of magnificently wealthy lands like British Guiana, retarded and crippled by this subservience to the distillers.

When the trouble of the war is over the real discovery of Africa will begin. We have only so far set out Africa with tolerable correctness on the map and glanced with an inquiring and scientific eye on its surface in some small portions. These investigations from 1884 onwards revealed or suggested such astonishing sources of wealth to humanity that they have stimulated that colonial movement in regard to Africa which lies at the base of the present war. What has been revealed, however, is probably trifling compared to what remains to be discovered. I venture to predict that a good deal of the area of the Sahara desert will be found to be rich in oil-bearing strata, and some of its mountains and plateaus on the verge of the Sudan wealthy in copper and perhaps in tin; that the mineral wealth of Somaliland, of Abyssinia, of the Nile-Congo water-parting, of Darfur, of Katanga above all, of Eastern Angola, of Liberia, of Rhodesia, Portuguese East Africa, Nyasaland and the northern and central Cameroons will

eventually justify the vague surmises or the actual predictions of prospectors. In regard to this branch of research I should like to call attention to the really valuable reports issued from time to time by the Imperial Institute, because they have justified my predictions in the past. Then there are the sources of vegetable wealth in the wild produce of the forest or in the climate and soil needed for plantations. There is the oil-palm, the produce of which can now be utilized to any extent without much fear of its depreciation in value through over-production. Rubber, coffee, cocoa, sugar, pine-apples, bananas, oranges, even apples, peaches, plums, and grapes are becoming items of importance already in African exports. As regards animal products, something really intelligent in the way of elephant conservation may keep the world sufficiently supplied with ivory. Vast tracts of Africa are already being opened up for cattle-breeding and horse-breeding. Once the French get to work with their trans-Saharan railway or railways, and once there is assured peace in trans-Zambezian Africa, an enormous increase will take place in African exports of mineral, vegetable, and animal produce.

In my map (7) of

THE MINERAL, VEGETABLE, AND ANIMAL VALUES OF AFRICA

I have only attempted to give a general impression of the known wealth of Africa and its location. But I should like to point out that the most recent results of exploring Africa have led to some of its deserts proving more valuable than regions obviously fertile and attractive to the eye. The High veldt and the northern Karoo in South Africa; Namakualand and many parts of the northern Sahara were regarded as hopeless, eternally desolate, and worthless tracts of country a few years ago; which would never pay for opening up. Now they turn out annually millions of pounds' worth of diamonds or copper, of phosphates and other mineral manures, or yield obvious indications of oil-bearing strata below the surface. The desolate thorny Haud of Somaliland, dreary treeless, waterless tracts in East Africa, are either oil-bearing or have valuable deposits of soda or phosphates. Much of the Sahara desert will prove worth railway construction on account of its phosphates, its salt, and its petroleum.

My map (6) of

THE FUTURE GREAT RAILWAYS OF AFRICA

represents with scarcely an addition or exaggeration the existing railways and the published railway projects of Africa in, let us say, July, 1914. Unless Western and Eastern Europe emerge utterly bankrupt from this devastating war, we may permissibly imagine that they will next put their capital, *not* into the making of further armaments to destroy one another, but into the warfare against hostile and grudging Nature. And in this struggle our most potent arm is the railway. Also there is no agent so pacifying as the

railway. If some advisers had been listened to in 1901–3 we should not have wasted about four million sterling in warring against the Mad Mullah in the deserts of British Somaliland, but we should have built a railway through some part of that country. Such an enterprise at once captures the imagination of the savage, or the semi-savage, and at the same time provides wages for restless avaricious warriors. It will be noticed on my map that there may be two alternative routes from the Cape to Cairo: one through Katanga (nearly complete now as far north as Stanley falls), the Bahr-el-ghazal and el-Obeid; and the other through Nyasaland, past the Victoria Nyanza to the lower Sobat and Khartoum. But people in South Africa who want not only variety of route and perhaps an even quicker way of reaching Britain (or, *vice versâ*, those among our grandchildren who wish to proceed to Capetown by rail in preference to the riskier air-ship) are recommended to try the Tangier-Fez-Agades-Kano-Léopoldville line. This will consist of the French Trans-Saharan railway (already completed nearly as far as Igli), and will link up with a great number of coast railways already constructed in West, West-Central, and South-West Africa. "Tangier to Capetown without changing!" What a splendid achievement that will be. Very likely by then we shall have got the Channel railway tunnel in working order, and a steam-ferry will take the London train from Algeciras to Tangier; so that conceivably forty or fifty years from now we may be able to get into our "sleeper" at Victoria and emerge from a delightful unbroken train journey in a glorified Capetown—a city which Nature has destined to be one of the most beautiful in the world; a city which is the only appropriate capital for United South Africa. What a feast for wonderment and education, for history-teaching and ethnology-learning such a journey would provide! After Paris, Seville, and Tangier, to see—as I did not long ago—the snows and cedars of the Atlas, the date-groves of the Northern Sahara, the rocks on which Neolithic man has engraved striking pictures of monstrous buffaloes that he hunted and tamed; and then the grim volcanic mountains and wall-like plateaus of Ahaggar, with their handsome, proud, indigenous Tuareg population; mysterious Agades, repository of some of the secrets of Africa's past civilization, the original home, seemingly, of that unexplained Songhai people. And Kano—then, no doubt, as now, the great and highly interesting metropolis of Hausaland; and the gorilla-haunted forests of inner Cameroons; Léopoldville on Stanley pool (an historic spot in Africa, if ever there was one); again, places on the dividing line between Kasai and Kwanza river systems, where Livingstone limped past in 1854; anon, the picturesque, copper-wealthy deserts of inner South-West Africa—picturesque because of their stately mountain ridges and upreared tablelands; and, finally, the vineyards and orchards of western Cape Colony, and the majestic beauties of Capetown in its inimitable setting.

In this map—whereon I have also marked the principal navigable

waterways, especially where they play into the hands of railway enterprise —in this map my seeming madness is not without method. I have not only copied pretty faithfully the delineation of French, British, and Belgian projects, but I have linked these up and varied my tracing to suit the exploitation of natural riches known or surmised to exist.

Lastly, as an important consideration in government and commerce, it may be well to touch on

The Dominant Languages of Africa (Map 5).

The European languages of the past and present which will have taken a firm hold on Africa and have become valuable means of communication with educated natives are, firstly, *English* (in South, West, and East Africa); *French* (North Africa and Egypt, Senegambia, Congoland, and Madagascar); *Spanish* (North Morocco, Canary Islands); *Portuguese* (Guinea, Cape Verde Islands, São Thomé, Angola, and Mozambique); *Dutch* (in much of South and South-West Africa, and a little Flemish in the Roman Catholic Missions in Congoland); and *Italian* (Tunis, Tripoli, Egypt, and Eritrea); *Arabic*—of the *Maghrabi*, *Egyptian*, *Sudanese*, *Hassanieh* (Senegal), *Yaman*, and *Maskat* dialects—is the most widely used of all "foreign" languages in Africa.* As regards native tongues and *linguæ francæ*: Swahili is perhaps the easiest to learn, the most widespread and the most spreading; Bangala has become the trade language over North Congoland; the Kongo tongue is the universal speech-medium in West Congoland; Hausa is the commercial language over all Eastern Nigeria, and is understood by some one in every village and town between the Shari river on the east and the Ivory Coast on the west. Where Hausa leaves off on the verge of Guinea, its place is taken by dialects of Mandingo (generically known as "Diula"). Mandingo (allied to Vai and Bammana) is the "useful" language of Northern Liberia, of interior Sierra Leone, Senegambia, and the Upper Senegal. Fula is an extremely difficult language to acquire, but a speech which cannot be overlooked, as it is the language of an influential aristocracy of negroids between Senegal and Guinea on the west, and Bornu and Cameroons on the east. Tibu is allied to Kanuri, the language of Bornu. It is spoken round Lake Chad and northward to Fezzan. It is worth learning in the form of Kanuri, the speech of Bornu. Amharic is essential in the Ethiopian Empire, but is quite unknown outside that area. Virtually Arabic will carry one through Abyssinia and much of Somaliland. Lastly, Zulu-Kafir is the dominant language of Negro South Africa; and in the form of "kitchen-Kafir"—a vile dialect and jargon which no self-respecting

* It is right to mention that since 1910 the French authorities in North Africa have pressed on their civil and military officials the study of Imoshagh, Shluh, and other Berber dialects, finding these more useful with the peoples of Morocco and the Western Sahara than Arabic.

administrator ought to encourage—its use extends right into Northern Rhodesia.

The languages I have cited ought to be studied much more than they are, and classes for teaching the useful native languages of Africa ought to be held in great centres of education, especially in London. But the scheme sanctioned in 1909 for teaching them and the principal languages of Asia at some special institute in the metropolis seems to have been delayed in its operations. When it is carried into effect it is highly important that the teaching shall be on the most modern and least academic lines. For instance, instruction in Arabic must refer to the diverse dialects of that language, and not give attention only to classical Arabic.

The PRESIDENT (before the paper): Sir Harry Johnston is a very old friend here. It must be at least thirty years since he first addressed us in this hall, and perhaps he may pardon me if I refer to an incident connected with that Meeting which remains fixed in my mind. Sir Harry Johnston was then young in years, and he was still younger in appearance. We had at the table the veteran M. de Lesseps, and when the lecture was over he turned to me and said, "Mon Dieu quel pays! où même les enfants sont grands voyageurs."

I cannot run through, except in the most summary way, our lecturer's African career. He first visited North Africa as an artist; he then went to South-West Africa, and, subsequently, has moved through almost the whole of Africa in official capacities. He was Vice-Consul in the Cameroons in 1885, Acting Consul in the Niger Coast Protectorate in 1887, Consul for the province of Mozambique in 1888; in 1889 he led an expedition to Lakes Nyasa and Tanganyika, which resulted in the founding of the British Central Africa Protectorate; he was Consul-General and Commissioner in British Central Africa in 1891; Consul-General in the Regency of Tunis in 1897–99; Special Commissioner, Commander-in-Chief, and Consul-General for the Uganda Protectorate from 1899 to 1901. In all these capacities, and wherever he has wandered, Sir Harry Johnston has made the best use of his opportunities. He has studied Africa not only as a geographer, but as a politician; he has studied it economically, racially, linguistically, and the result of all these studies he has put into books which we have most of us read, at any rate, some of them, with very great interest. And last, but certainly not least, Sir Harry Johnston is as good with his pencil as he is with his pen. He is an artist, not one of the so-called artists who make ugly patterns with geometrical figures, but an artist who goes to nature and brings back pictures which remind us of the beauties and glories of the world he has seen, of the mysteries of African forests and the strange birds and animals that inhabit them. I am sure we shall listen to-night to what he has to tell us with the greatest interest, and I will not interpose myself any longer between you and him.

Hon. W. P. SCHREINER (after the paper): When I accepted the very kind invitation to the meeting of the Royal Geographical Society to-night, I had not the remotest idea of being called upon to say anything. I looked forward, therefore, to the very great treat of listening to Sir Harry Johnston. But your commands are, of course, my law on this occasion, and therefore I must accept the position and say a few words, I hope, of appreciation of the most brilliant and fascinating address to which we have listened to-night. I can quite understand that somebody

less gifted might have occupied more time in presenting an address which would have been quite free from objection, but I do not think any one would have been able to present an address which would have charmed us more than Sir Harry Johnston has to-night. He has shown how dull facts can be illumined, and he has stuck to his facts in so far as facts were necessary; but he has certainly shown that he has the poetic fancy and imagination with which, I think, every great geographer should be gifted. To watch the maps passing before one's eye without any prior opportunity of studying them was indeed a liberal pleasure, but somewhat bewildering. I should like, if I could, to recall the magic of that now white sheet, and there are only one or two points on which I would more particularly remark, where one has a certain familiarity. I rubbed my eyes when I saw what the south of Africa was going to be. I said to myself, "What becomes of the Bechuanaland Protectorate? Where is Basutoland? What becomes of Swaziland, the much-tried daughter of the direct government of Great Britain? And then, indeed, what becomes of the Union of South Africa as it is to be?" When I saw such very large Rhodesian letters marked across the northern portion of the future Union, I said to myself, "Truly there is the gift of great imagination! A poetic fancy, no doubt, and a fine one, and one I fear that may not, without some trouble, be realized in actual accomplishment."

We are indeed indebted to Sir Harry Johnston for the broad-mindedness which his paper has exhibited, and I speak with some gratitude to him for venturing to put forward the best, which is worthy of this great nation, the British nation. One thing comes back even in these days, when we have the mind to fight to a finish, not to disregard the lessons of history in the past. There is no doubt Germany has accomplished a great deal in the continent of Africa to which it would be childish to blind one's eyes; yet when one has said that and thanked Sir Harry Johnston for the appreciation he has shown of actual facts, one is obliged to remark the marvel that there, again, the ruling caste, we will put it, of Germany should so have misunderstood humanity as I fear it has. When this war came on, how many predictions did Germany not make with regard to what was going to happen to the British Empire? Those predictions have been, happily, falsified; but they are predictions which proceed from a fundamental misjudgment of humanity, and that same error is, I fear, the reason why, with all that has been accomplished in practical development in Africa, Germany has never yet successfully colonized in Africa at all, and I do not know that she has ever successfully colonized anywhere. That lesson of colonization is one which the greatest empire of all time, and greater still to be, did not learn without a good deal of trouble and travail. Great Britain was not always a sane colonizer herself, and the fact that we to-day are looking wistfully at the spectacle of American neutrality may remind us how we lost other opportunities. Those lessons more than a hundred years ago have been through the nineteenth century, and are still in the twentieth century being, applied; and that is the secret, I won't say of the perpetual character of the British Empire, but of its enduring character and advancing character, and its great future. As yet, whatever might have happened if there had been more places in the sun that did not belong to other people, Germany has not exhibited those characteristics; she does not seem to have learned the lessons necessary for successful colonization. They are only, after all, lessons of true democracy.

Look at South Africa again. If it had not been for the sowing of tares in that field, why I think we might almost safely have gone with Lord Gladstone in saying there was no trouble at all likely to occur in South Africa; but the misunderstanding of humanity to which I have referred led Germany to sow those tares, led the ruling caste in Germany somehow to do these things which we of South Africa

were little aware of. Now, the consequence of that is—some more red map. That is the direct consequence. Yes, I speak as one who would have been prepared to say on better conduct on the part of Germany that, as a great nation, she required the opportunity of learning in German South-West Africa lessons in colonization; that we should stick to our bond of 1890, and allow the spheres of influence to continue after the war. I do not share that opinion now. I take a different view, and I say there is no room for the two systems to march side by side for hundreds of miles in South Africa as they marched for a quarter of a century in the past, and might, but for breach of treaty, have continued to march. I refer to the treaty of 1890, a much more modern treaty than that with Belgium. The events which have happened have demonstrated that there is no room for two such systems as neighbours in that part of the world, and when the solution comes to be made, whether it be that brothers may quarrel a little as to the detailed division of the spoil, I think it is quite true that all the imagination of Sir Harry Johnston will be vindicated in so far as his map was shaded red. I hope that that 320,000 square miles of country may be governed a great deal better than it has been in the past. Germany has taken it as a strategical position, Germany has so developed and used it, but how has she treated that section of the great native population of Africa? I say, without fear of contradiction, that to some extent our nation in South Africa owes the placidity with which we regard the situation to the fact that in every hut throughout South Africa there is but one word amongst the natives with regard to the way that they have been treated in the past by Germany, but one determination that they stand at all risks by the side of the Empire. I am not going to pretend that it is because of the *beaux yeux* of the Union Government that we can, as to the native populations, feel so entirely at ease—behind there lies something that is deeper, and that is the consciousness of the great body, I will say, of African peoples, that where the Empire flag waves there there is justice, and there has prevailed equality of opportunity. And that makes the great safeguard in Africa, and let us hope that that may make also in the future for the avoidance throughout Africa of those troubles which must arise where those first principles are disregarded. They only can be avoided by the pursuance of those principles upon which the Empire is founded, and upon which, I hope, she will prevail. This is an aspect of the problem of this evening which I wished just to touch upon. It has been touched upon, and in that broad spirit which those who have read Sir Harry Johnston's writings must appreciate. If we are to gain true union as civilized people to South Africa, we are to teach lessons of civilization, we are to uplift and raise the people that are there. Those people, after all, are the people of the country, and those people must be provided for, and whatever system it may be we provide in the future, it must be a system which fully, justly, and with equality of opportunity, allows them to rise as high as their own nature renders it possible for them to rise. That principle, I venture to say, is the principle which has not yet been learned by the great power against whom we are conducting this struggle. When we look at what has been done on the battlefields of Europe, we remember that this war is a war of freedom, and in the cause of freedom, and in the issue it is true freedom within the British Empire, which South Africa, I hope, will gain. I wish to thank Sir Harry Johnston very much for the great pleasure and treat which, I am sure, all of us have appreciated and realized. One never either reads what he writes or hears what he says without differing upon certain points, but thanking him for the whole.

Lord BRYCE: Like my distinguished friend, Mr. Schreiner, I did not come here with any expectation of being called upon to say anything. My knowledge of Africa, such as it is, touches but slightly those parts of that continent to which Sir Harry

Johnston has devoted our attention to-night. But I cannot resist the temptation to join in expressing the admiration and pleasure with which we have listened to this lecture. The Royal Geographical Society is famous not only for the excellence, but for the variety of the feast of reason which it sets before those who come to its meetings, and I do not think for many years past there can have been any address more stimulating, more abundant both in fact and in suggestion, than that to which we have had the pleasure of listening to-night. Sir Harry Johnston speaks not only with the profound and intimate knowledge which his travels and long years of residence in Africa has given him, but also with the poetical vision which enables him to see the present in all its variety and the future in all that richness of development which he hopes for in Africa. I think it is partly in the skill with which he has so concisely traced the development of the continent through the past, combining it with that insight into the future he has given us, that the extraordinary and peculiar interest of his presentation of the subject lies. He has given us so much it is hard to know what to comment upon. I feel inclined to ask him questions which it would take the whole of to-night to answer. He has given us in particular a series of dissolving views of Empire in that succession of maps which showed us what was, what was to be, what is, what might have been, and what will be. In these he has given us a profound moral; the moral that when you have got enough, or are just going to get enough, you should be content and not want to have everything. He reminded me in one place, in the ideas he had of solving in Africa the problems of Europe, of the famous dictum of George Canning—he had called a New World into existence to redress the balance of the Old. If Sir Harry Johnston's project, of which I have little doubt he was partly the author, and upon which he certainly smiled, if that project had been carried out, what a different world it would have been—Germany compensated in Africa, and the dangers which were threatening Europe removed from us; good will all round, possibly followed by centuries of peace! Only the dark-skinned subjects of Germany might have fared ill, because what Sir Harry Johnston said is true, she has never known how to manage savage and backward races, inasmuch as she has never tried to enter into their mind and to realize what a part in administration tact and sympathy ought to have. One question I may perhaps ask. Was it an essential part of the scheme for compensating Germany in Africa and the East for the cession of Alsace and Lorraine that she should receive Asia Minor and Mesopotamia? because I noticed upon the map the German colour of yellow was given to that district, and for divers good reasons some of us may be glad that that part at least of the scheme has not been carried out. As it is now, we can easily see that there is plenty of room in Africa to satisfy everybody. Not only so, but it will not be as easy to satisfy everybody in South-Eastern Europe as we trust it may be in Africa. There is one little aspect of the question which is especially interesting for you, Mr. President, and for myself, as members of the Alpine Club. I am very anxious that in the redistribution of territories we should, if possible, get all the highest mountains. We already are fairly well off; we have Kenya and Elgon, and we have the very picturesque, if not equally lofty, mountains of Basutoland, and a good slice of Ruwenzori, which we largely owe to the President, who was one of its first explorers, for he impressed upon the Foreign Office the desirability of our possessing "hill stations" upon those mountains. But we have not got Kilimanjaro, and that, I think, we clearly ought to have, together with any other points whose height exceeds, let us say, 8000 feet. There was one remark made by Sir Harry Johnston which I listened to with particular pleasure; I felt very glad he gave to German travellers the credit which is justly due to them for the way in which they did their often difficult and dangerous work. As we do not forget those philosophers and poets of Germany who belong to all time, so let us not forget the daring explorers.

The gravest permanent problems of Africa are not those of rivalries among European nations. They are the problems of the relations of the whites to the negroes, or to the dark-skinned races generally. We whites cannot expect to form the bulk of the population in any except a comparatively few and small districts of tropical Africa. We must face the fact that the dark-coloured races generally, those whom Sir Harry Johnston referred to as the non-Caucasian races, will, after all, form the vast majority of the population of Africa. I am delighted to think that he does not despair of the future of those dark races. Such limited observations as I have been able to make have led me to believe we are apt to exaggerate the difference between races, or at any rate the capacities of the backward races. We may hope that under sympathetic but prudent treatment, not throwing upon them gifts which they are not fit to receive (as the suffrage was given to them in the Southern States of America, when they were quite unfit for political power), but gradually leading them upwards by education, by interesting them in the works of civilization, by showing sympathy and consideration for them, we may make it possible for them one day to rise to far higher levels than any one has ventured to think of yet, and we may succeed in keeping peace and good feeling between them and ourselves, a condition of things under which alone prosperity and happiness can be obtained. We owe our great thanks to Sir Harry Johnston, not only for the knowledge he has given us to-night, but also for the ideas he has started in our minds and the hopes he has enabled us to form.

Sir Owen Phillips: I came here as a listener this evening, but as you have asked me to speak I should like to express the great pleasure with which I listened to the lecture of Sir Harry Johnston. Africa is a land of problems; there are more difficult problems, I believe, in Africa than in any other portion of the world, and more interesting problems, and Africa, probably, more than any other part of the world, requires the problems to be illuminated by that imagination which Sir Harry Johnston has thrown into the discussion of some of them this evening. I do not to-night intend to discuss these difficult problems, but I was very interested to hear what Sir Harry Johnston said about railways. I am one of those who believe that immense good can be done by building railways, and in this way opening up the whole of Africa to civilization and to progress, both for the good of the natives themselves and for the good of the whole world by making it possible for the white races to move with ease into the very centre of that great continent, which in the old days, but not now, was called the Dark Continent, and I therefore listened with great interest when Sir Harry Johnston told us if our Government had spent a few millions in making a railway in Somaliland, it would have facilitated communication with the interior of Somaliland, and thus made unnecessary that great and expensive expedition into that country. When we look back and see what has been done in Africa by the Germans, even if the Germans, as the result of this war, are turned out of the whole African continent, we shall at least look back with interest on their entry into that continent, and they will always receive, I hope, fair criticism and justice from the fact that they did as much as any other nation in forcing the pace at which railways have been built to open up Africa, and I only hope as one of the results of the war that the progress in opening up Africa to civilization by railways will not be retarded by the vast amount of moneys which is being expended on the present war. I would like to say, in conclusion, with what very great pleasure I have listened to the paper of Sir Harry Johnston, and the extraordinary able speeches of Mr. Schreiner and Lord Bryce.

Mr. H. Wilson Fox: I feel bound, even at this late hour, to comply with your request, though after the speeches we have already heard, there is very little left to be said. I must, however, join in thanking Sir Harry Johnston for an extraordinarily suggestive lecture, which one could discuss for a good many hours

if one were to go into particulars, and which one can regard both as a dream and a practical dream. I feared at first when I saw map No. 2 that the dream was a nightmare, and I think it is quite consistent with Sir Harry Johnston's great artistic gifts that he should have led us on from a nightmare to a beautiful dream, and to a dream which we saw almost realized before us. One began to think that these vast countries were already opened up, and those railways built, and that from every port wealth was pouring into the markets of the world. I hope when that consummation becomes a practical reality it will be in the boats of the lines controlled by Sir Owen Phillips that the bulk of that produce will be carried. Mr. Schreiner, I was sorry to see, was a little doubtful about one point of Sir Harry Johnston's dream. He seemed to think that the Union of South Africa should have spread rather farther north than was shown in that map. I should like to say that I do not think there is any room for jealousy between neighbouring British territories in Africa. It is not necessary to mark out hinterlands when all the territories are in the dominions or under the protectorate of the Crown When these matters come to be considered after the war, the true problem every one must put before their mind is what are the British interests in the immediate development of these territories? In the end Rhodesia and the Union will, without doubt, be merged into one great Dominion. Opinions may differ as to the time when effect will be given to that arrangement. In the mean time, the real British interest is that every section of that British territory shall be developed as well and as rapidly as possible in the interests of the Empire and of the white and native inhabitants of the territory itself. I do not think it is quite realized in this country, as yet, what an important factor in Africa its most valuable native population is, and what enormous wealth arises through that native population. Those of us who have studied this question for many years are realizing more and more every year the importance of stimulating the development and activities of those native races. I think it is a most significant fact, that in Rhodesia, which is an inland territory, with a white population of only about 30,000 people to a native population of roughly 1¾ millions, the imports of British goods into that territory during the present century have been £25,000,000, and that Rhodesia is importing every year £4,000,000 worth of goods —rather more than the whole of the German colonies in Africa import. That is a most significant fact; and when all those great territories are opened up, I feel sure that there will be room for Europeans and natives to develop together, side by side, and that there need be no question of eliminating one race for the benefit of the other. I thank Sir Harry Johnston most heartily for his most interesting and valuable lecture.

Sir Alfred Sharpe: I feel it is quite too late to say anything beyond what has been said already by those speakers who have given us such excellent comments on Sir Harry Johnston's paper. I was for a good number of years in Africa with Sir Harry, and one of the points which I remarked upon in those days was his propensity for colouring the map red. If the Foreign Office had carried out all Sir Harry Johnston had wished, we should have already had the map which we hope to have next year, carried out almost in detail. At any rate, we can see Sir Harry Johnston has lost none of his old propensity. He was quite right then, and he is right now. The lecturer referred to help which the Germans gave us in past times in Nyasaland. I quite agree with him; but after all in Africa, at any rate in those days, we used to think that every white man helped another. It was a case then of the white man against the Arabs, and I think Sir Harry is looking at the matter more as a contrast to doings of the Germans in more recent times. I wish to express my sincere thanks to Sir Harry Johnston for the most interesting and instructive paper he has read to us to-night.

The PRESIDENT: I might ask others to continue this most interesting discussion, but I think, perhaps, at this hour I had better not. I shall therefore wind up the proceedings in the usual form by moving a vote of thanks to Sir Harry Johnston for the address he has given us to-night, which I am quite sure you will all agree with the speakers who have gone before me in estimating as one of the most able and suggestive and compendious that we have ever had given to this Society. There is one point I noticed with pleasure, and that was that Sir Harry Johnston proved very carefully and in detail how false the accusation that we had refused Germany her place in the sun was. He made it perfectly clear that had Germany wished for peace she might have had her full share, and more than her full share, in the Dark Continent.

Another point of importance was that Sir Harry Johnston said about the strategical importance of Morocco as commanding both the access to the Mediterranean and the great route to the Cape. I was specially interested, because I read recently, in the Proceedings of the French Geographical Society, an address made by one of its Vice-Presidents, M. Blondin, in which he anticipates and confirms Sir Harry Johnston's remarks. M. Blondin spoke as follows: "According to an ingenious saying of M. de Voguë, Africa has become a sort of dynamometer on which the European powers may prove their energy. I was in Germany in 1911. In every bookseller's one saw maps of Morocco and pamphlets like Count von Pfeil's *Warum brauchen wir Marokko:* 'Why we want Morocco.' From day to day the idea grew more fixed in the German mind that a victorious war with France might give them North Africa—Algeria and Tunis added to Morocco—and, as a consequence, the mastership of the Mediterranean. There is no doubt that the Germans had also set their eyes on the Belgian Congo, and that they had hoped to unite their colony in the Cameroons with German East Africa. The Portuguese possessions on both coasts were also within their scope. We may venture to believe now that it will not be exactly on this plan that the map of the world will be revised. We can feel confident that the people of Great Britain, who throughout the centuries have given such marvellous examples of their perseverance and tenacity, will know how to put in practice the proud motto of one of their cities—*I Will.*" So far M. Blondin.

In all forecasts of the future we must bear in mind that we are not acting alone, but with allies, and that France, at any rate, has set her teeth and will not willingly submit to a peace which does not protect her from any dread of the recurrence of the nightmare of 1870.

I do not propose to detain you further, but I should like to express my cordial agreement in what Sir Harry Johnston said about the expediency of our endeavouring to form some notion of what ought to be the future of the world after the war. If we abstain from treading on this no doubt difficult ground, others, by no means such experts as we have listened to to-night, will rush in. I may give one instance of such an intruder. I quote from what is considered one of our most serious monthly Reviews. There we are invited to "vindicate the chivalry of our care for Belgium by bringing the isles of the Pacific into the bargain." What a crazy conscience lurks behind this monstrous proposal! One does not hand over to the burglar who has broken into a neighbour's house one's daughters' jewels. That is the light in which Australia and New Zealand would look at this species of barter.

One last word. Great Britain was forced into this war. She did not go into it for any greed of territory, and whatever territory we may have to take will not be taken for greed. We went into it as the protector of Belgium, and the champion of the smaller states. We went into it not alone, but with our Allies and our daughter nations, Canada and the Cape, Australia and New Zealand. When we come to make terms of peace, we ought not to leave Germany in possession of

territories which will be a thorn in their side, as the German territories in Africa have been up to the present day. The first consideration, after the restitution of Belgium, in the minds of the delegates we may send to any great Peace Congress, must be the security of the British Empire. Punishment must follow the crime; that is to say, the punishment must be that which all just punishments ought to be—must prevent the crime ever being repeated.

I will now ask Sir Harry Johnston to accept from all of us, what I am sure you will give him by acclamation, a most hearty vote of thanks for his brilliant paper.

Sir HARRY JOHNSTON: I must not waste more of your time in thanking you for your thanks. In regard to answering three or four pregnant questions which have been put to me, I must refer the questioners to the printed paper, on account of the lateness of the hour. I think they will be answered, as far as I am able to answer them, in my paper when it is printed at full length. I would only say, in conclusion, when Lord Bryce asked me if I really intended to indicate in my maps that a great sphere for exclusive German interests had been laid down prior to August, 1914, in Turkey-in-Asia, I did so on the faith of the agreements entered into not only with Great Britain, but with Russia and France. These agreements were based on the Baghdad railway concession, and we know that that arrangement brought down exclusive German influence to Basra, the very place we now garrison within sight of the Persian gulf. When I refer to the text of these agreements, I mean publications in reputable newspapers of the gist of international understandings, the truth of such announcements being virtually admitted by responsible ministers. If by such understandings, by such concessions, we had killed for ever any cause for discord between Germany and the rest of Europe, such a peace would have been cheaply purchased. It is because Germany has thrust aside two million square miles of colonies and concessional areas as insufficient for her ambitions, that she must be before all things punished for the appalling disasters she has brought on the whole world. I want *this* point to go home to you. We may not be able to carry this war to that complete and triumphant conclusion we originally anticipated. We may not think the attempt to dictate peace in Berlin worth the life-sacrifice it may involve; but we can, at any rate, strip Germany of her power of government outside Germany and Austria-Hungary. Having done that, we can afford to make peace, because we shall have this guarantee of future good behaviour throughout the whole world: that if she gives the Allies any further trouble, she, having no colonies to repair to, can be shut out of the commerce of the Old World by tariffs. I think, considering the degree she has made us, our Allies, and many neutral nations suffer in this unprovoked war, it is not going beyond the limits of Christianity to picture such a means of punishment and control as the complete removal of her governing flag from Africa, Asia, and Oceania.

EUROPEAN INFLUENCE IN THE PACIFIC, 1513–1914.*

By Sir EVERARD IM THURN, K.C.M.G., C.B.

BY "the Pacific" is here meant that great sea, covering more than a third of the globe, which is almost surrounded by the west coast of America, by the east coast of Asia, and of the great islands of New Guinea, Australia, and New Zealand, and by the Antarctic continent from a point south of New Zealand to a point south of Cape Horn.

* Royal Geographical Society, February 22, 1915. Map, p. 856.

Maps of the Pacific ocean, if drawn on Mercator's or some similar projection, so distort the land masses, especially towards the poles, that the enclosure of this sea is not obvious; and on maps showing the world in hemispheres the globe is almost always bisected in such a way that part of the Pacific is shown on each hemisphere. But it is possible to draw that part of the world which lies between the meridians of 120° West and 60° East in such a way as to show the Pacific ocean, approximately truly, as one great, almost enclosed, sea.

I shall try to tell the outline of the story of how men of European race went into that closed ocean, how they have since gradually overspread, and have now parted its coasts and islands among themselves; I shall not be able to confine myself to the pure geography most favoured by this Society, but shall speak rather of the historical geography of the area under consideration.

But, to make the history intelligible, I must begin by setting out some purely geographical facts, not so much as to the coasts, but as to the islands, literally innumerable, which, like the peaks and upper edges of ranges of a submerged land, rise above the sea-level, in groups, in lines, or singly, from the Australian and south-east Asiatic coast, on either side of the equatorial line, and extend two-thirds across to America. For these islands, though mostly too small, too rugged, or too little above the sea-level, to afford much opportunity for human life and activity, have been, and are, of great historical importance, because in the early days they were the main attraction of Europeans to the Pacific, and because in our days the great European Powers, having first divided the coastal regions, have been and are engaged in the partition of the islands, the "stepping-stones" from coast to coast.

Of other, but much less numerous, islands which are set close round the coasts of the Pacific I shall have little occasion to speak.

Almost all the islands of this great belt—it is convenient to call them the South Sea islands—whether they are large, as New Caledonia, or small, as Pitcairn, and whether they are "high islands" or "low islands," have this in common, that they are volcanic rock-masses round the sea edge of which more or less coral has grown—forming, at first, a fringing reef.

In some cases the rock-core has sunk, lower and lower, and meanwhile the coral at the outer, or living, edge of the fringing reef has grown straight upward, tending always to keep its upper surface just below the level of the sea; and in this way a water-channel has gradually been formed between the central rock mass and the outer rim of coral. Sometimes the rock mass has continued to sink further until even its top is below sea-level, but the coral-rim has continued to grow till it appears, in Charles Darwin's words, as a so-called *atoll*, one of "these extraordinary rings of land which rise out of the depths of the ocean." *

* 'Voyages of H.M.S. *Adventure* and *Beagle*,' vol. 3, p. 539. (London: 1839.)

Other changes have from time to time and in very various ways altered the islands thus formed; sometimes, especially, a certain amount of drift matter has been piled by winds and currents on to the rocky ledge, so raising it just above sea-level; and on this plant-seeds have been caught, especially coconuts, which in time have crowned the whole rock with palms, which, like a garland, encircle the central lagoon of such an atoll. Later, wind and sea, working together, have either thinned the once dense palm grove, till each individual trunk, with its great head of leafage, stands distinctly out against the sky, or have even broken, at several points, through the once continuous line of greenery, splitting it into a line of dot-like islets, between which, at times, the sea breaks into the hitherto closed lagoon. The atoll as a whole is no longer visible from passing ships, and only a number of much smaller islands, apparently disconnected, is seen.

An atoll, like a "high island," often covers a large area, *e.g.* to take one almost at random, Rahiroa (or Rangiroa) atoll—the Vliegen Eylandt of Le Maire and Schouten in 1616—consists of a very narrow palm-covered rim of coral, enclosing a lagoon 42 miles long by from 10 to 14 miles wide. Such an atoll, considerable as is its size, affords very little land surface for men's work and the production of men's wealth.

Rahiroa is only one, though the largest, of the 78 islands of the Tuamotu or Low Archipelago, extended across more than 15 degrees of longitude, all but two of which, Makatea and Tikei, are simple atolls, *i.e.* lagoon islands; and even the two exceptions, both of small size, were probably once atolls, or parts of atolls, which have since been upheaved. The total area of productive land, on this particular group, putting coconuts out of consideration, is infinitesimal.

Quite near these "low islands," however, is the double group of the Society islands, so-called by Captain Cook after our Royal Society. These are practically all typical high volcanic islands, of very different and much more usable character. Of this group is Tahiti, which really consists of two volcanic masses close together and joined by a narrow isthmus. The total length of this island is about 33 miles, and its highest point rises to 7321 feet. Though much of this is very mountainous, a considerable and very fertile area is available for cultivation. There are other similar, though smaller, islands in the group. In the Society islands, and Tahiti in particular, is now the European (French) centre from which the atolls are worked, and without which the Low Archipelago would be of little value to white men.

Of the people who occupied these islands before and during the intrusion of Europeans, there is little time to tell. For my immediate purpose it matters not whence and when these South Sea islanders originally came; but it is important to note that they were all so-called "savages"—which does not mean that they were naturally ferocious and without culture.

Few English words are so misleading as this word "savage," which is really a form of the old French word "silvage," to which our word *sylvan* (of the woods) is akin. It implies not *ferocity* but *wildness, uncontrollableness*. The pair of phrases "wild rose" and "garden rose" help to explain the point; and still more helpful is the name "*gas sylvestre*," by which the Belgian discoverer of carbonic acid gas distinguished that volatile substance—just because of the difficulty he experienced in controlling it. The savage is essentially uncontrolled by any of the ideas which have civilized his earlier visitors from the western world.

Again, no savages are without "culture"; and, in the South Sea islands, some were of very high culture, of a self-developed kind. The self-culture of the savage had moved forward on purely egoistic lines; and the savages had grown in culture without hitting upon the idea of "duty to one's neighbour," which, however badly it may be observed, is the foundation of civilization, as opposed to savagery.

The point I want here to make, once for all, is that the difference in mental attitude between the South Sea savage and the civilized European, good or bad, who intruded in those seas was so enormous that the two kinds of men never understood each other, had absolutely no common basis for intercourse, and that the occasional apparent ferocity and the eventual yielding of so much of his rights by the savage to the civilized man, and the taking of these rights by the civilized man with so little pricking of conscience, should not be judged without clearer understanding of the problem than has hitherto prevailed.

Early in the sixteenth century—only four hundred years ago—nothing was known in Europe of the Pacific ocean. The Portuguese, with their Dutch rivals in their wake, had crept eastward round the world, and had reached "the Spice islands," only just short of the Pacific area; and the Spaniards, travelling westward, had reached the east coast of America. What lay between the Portuguese-Dutch and the Spanish outposts no man knew.

The story of the unveiling of the Pacific began on September 25, 1513, when from the peak in Darien Balboa first caught sight of what he called the Great South sea, and took formal possession of it, and all which appertained to it, for his master, the King of Spain. Seven years later, in 1520, another Spaniard, Magellan, found and sailed through a waterway into the South sea—or, as he called it, the Pacific ocean—and then crossed to the extreme western edge of that sea, where he found "the Isles of Lazarus," the Philippines, and there lost his life in a fight with the natives. Magellan had thus gone westward round the world all but to the point, the Moluccas, which had by that time been reached by the Dutch from the east.

Balboa's and Magellan's adventures were but incidents in the founding by Spain of the great empire which, during the three subsequent centuries,

it held on the Pacific coast of America and, across the ocean, in the Philippines.

Following more or less in the track of Magellan, Mendana in 1567 discovered the Solomon islands, and Quiros in 1606 discovered the northernmost of the New Hebridean islands, which he thought to be part of the supposed "great southern continent," or, as he called it, Tierra Austrialia del Esperitu Santo—since called "Santo" for short. Certainly sometimes, perhaps many times, others of these Spanish voyagers sighted some of the many islands more or less in the track from Mexico or Peru to the Philippines; but, probably partly because they saw little or no value in these islands, and partly because they preferred to leave no traces for others to follow, they never voluntarily settled in any such islands, and even said as little as possible about them.

Yet there can be little doubt that not a few members of such expeditions got adrift in one way or another from their ships, and became, unwillingly enough, the lost explorers of the Pacific, as Mr. Basil Thomson has called them, of whose subsequent fate little can even be guessed, though such of us as in recent times have cruised through the Pacific often assume that some European trait of feature or manner observed in some native of a still little visited island is due to descent from some of these long since lost Europeans.

While Spanish influence was thus making itself felt on the American coast of the Pacific, in the Philippines and, though much less definitely, on the way between, other Europeans were endeavouring at least to look into this ocean which the Spaniards pretended to keep for themselves.

The Dutch East India Company, early in the seventeenth century, was established as far east as Java, and held from the States of the Netherlands a monopoly of Dutch trade with all countries between the Straits of Magellan and the Cape of Good Hope. But other Dutchmen, thinking this too wide a privilege, sent Le Maire and Schouten to find a way into the South seas by any passage which they could find further south of Magellan's strait—it being argued that this would not infringe the "Company" rights.

Le Maire and Schouten sailed in 1615, passed Magellan's strait, and further south discovered and passed through that which has since been called after Le Maire, between Tierra del Fuego and the land which these Dutchmen, mistaking it for the great southern continent, called Statenland, in honour of the Netherland States.

The Hollanders crossed the Pacific, nearly, but not quite, on the Spaniards' track, and eventually reached Batavia, where they were seized for infringement of the Dutch Company's monopoly.

As a trading voyage that of Le Maire and Schouten was a failure. But they were the first discoverers of many islands, and were almost the first Europeans to have any considerable dealings with the South Sea islanders.

In 1642 the Dutch East Company sent Tasman from Batavia to explore

the still entirely unknown south-west Pacific. During this expedition much of the south coast of New Holland was discovered—thus first showing that the Australian land-mass did not extend to the South Pole. Tasman also discovered and named Van Diemen's Land, which he thought to be part of North Holland, discovered also New Zealand, where his people had a first meeting with the natives of the South Pacific, a meeting which, probably owing to a misunderstanding, ended disastrously. He then passed on to the islands which he named Amsterdam, Middelburg, and Rotterdam, which are what we call the Friendly or Tongan islands, and had much dealing—fortunately not disastrous—with the natives there, and got back to Batavia. His discoveries in this and a subsequent journey made known quite a new part of the Pacific; but his voyages were not effectively followed up, and the Dutch never established themselves on the Pacific.

Meanwhile the Spaniards had greatly strengthened their position on the American shore and in the Philippine islands, and their ships periodically crossed the Pacific between these two points. It was the attraction of these treasure ships which led the first Englishman, Francis Drake, between 1578–80, to enter the Pacific. He entered by Magellan's strait, and after having been driven so far south that he probably saw "the Horn," then passed up the coast, taking every opportunity of singeing the King of Spain's beard, till he reached a point, probably on the Gulf of California, where he claimed for the English queen a country which he called New Albion, and then struck westward across the Pacific, and so home by way of the Cape of Good Hope.

Sir Francis Drake's example of attacking the Spaniards along the Pacific coast of America was followed by innumerable adventurous sailors of fortune, some French, others Dutch, but mostly English, who, during their voyages, doubtless dropped many more "lost explorers of the Pacific," to the confusion of the purity of South Sea island descent. These buccaneers and other adventurers were the first European visitors to many an island —unless in some cases they had been preceded by the Spaniards, who, as has been noted, were shy of telling about their discoveries.

One very remarkable group of islands, first heard of as the resort of these buccaneers—when they needed to careen and refit their ships, or to divide their spoil, or merely to have a downright good time—was the Galapagos, which have recently again become of great interest.

The Galapagos group, so called because of the giant tortoises which abounded there, consists of high volcanic islands, with an aggregate area estimated at 2400 square miles, lying actually on the equator, quite apart from the main South Sea group, off the American shore, and only some 600 miles from the isthmus of Darien. It is uncertain when and by whom these islands were first discovered, but they are named on a map by Ortelius of about 1570, and the name seems to show that the discoverers were Spaniards. These islands were ideal havens of undisturbed

and unobserved rest. So many a buccaneer found, and so, on more than one subsequent occasion, storm-tossed, battle-wearied sailormen have found.

The Peace of Ryswick, between England and Spain, nominally at least put an end to the activities of the buccaneers in 1697; but one of these filibusters of the Galapagos, William Dampier, whose notoriety as a buccaneer—though he seems never to have played a leading part among those folk—was counterbalanced by his good repute as a hydrographer, was officially employed, and for a time did good work, on the Australian and New Guinea coasts in the scientific voyages of exploration, which began to take the place of mere voyages of adventure.

Anson's famous voyage round the world in 1740–44, during which he effectively attacked the Spaniards along the Pacific coast, is of interest to the student of the spread of European influences in the Pacific area, if only for the incident of the wreck, soon after the squadron entered the South Seas, of the storeship *Wager*, on an island off the coast of Chile, somewhere off Cape de Tres Montes. Some of the survivors from this wreck, among whom was Midshipman, afterwards Admiral, Byrón, eventually got back to England, partly on foot, partly in improvised boats, and in this way saw far more of the out-of-the-way parts of Spanish America of that date than any other Englishman ever did; and several of them, Byron, Gunner John Bulkeley, and Carpenter John Cummins, Lieut. Campbell, and Midshipman Isaac Morris, published narratives—"affecting narratives of the dangers and distresses which befell" them. Other sailormen have left elaborate accounts of the ports and towns at which they called in Spanish America, but it is unlikely that any but these survivors of the *Wager* have recorded as vivid glimpses of the condition at that period of the Chilian back-country.

We now come to that splendid series of voyages to the Pacific, originated and controlled by two of the great European Powers, which began to lay the real foundations of European influence in the Pacific as it exists to-day. First in turn of these was Commodore John Byron's voyage with the *Dolphin* and the *Tamar* (1764–6); then the English voyages of Captain Samuel Wallis, in the *Dolphin*, and Captain Philip Cartaret, in the *Swallow* (1766–9), and the almost simultaneous French voyage of Bougainville, in the frigate *La Boudeuse* (also 1766–9); and then Captain Cook's voyages in 1768 to his death in 1778—or perhaps till the ships got back to England in 1780.

It is my good fortune to be able to reproduce on the screen to-night an important series of the sketches—I believe these have never been published—which Captain Samuel Wallis, sailor-like, made of many of the islands which he discovered, or thought he was the first to discover, chiefly in "Low Islands" or Tuamotus.

After entering the Pacific through the Straits of Magellan, the *Swallow*,

Captain Cartaret, which was a slow sailer, was finally left to follow a course of its own, and Captain Wallis sailed westward in the *Dolphin*. This was on April 12, 1767. No land was sighted till June 6, when "a low island"—*i.e.* an atoll—was seen at about 5 or 6 leagues distance. That afternoon Second-Lieut. Furneaux—the senior officers and many of the crew being ill with scurvy—was sent ashore, the boats being armed; and two canoes were seen to put off and paddle hastily to a second island which was in sight. The *Dolphin's* boats returned at 7 p.m., bringing a few coconuts and a quantity of scurvy grass, also some fish-hooks made of pearl-shell and some of the shells. Furneaux reported that no inhabitants had been seen, but that he had visited three huts, or rather sheds, neatly thatched with coconut and palm leaves, supported upon posts, and open all round, . . . also several canoes building, but had found no fresh water nor any fruit but coconuts. No anchorage had been found for the ship, and the landing on the island had been difficult because the surf was so high.

The *Dolphin* stood off and on all night; and early the next morning, which was Whitsunday, the boats were again sent out to find anchorage for the ship, but in vain. A boat passage was seen on the weather side of the island, but the surf was too high to warrant any attempt to get the boats through. Neither had it been possible to land on any part of the island, the surf running still higher than on the previous day.

Wallis gave up all hope of landing on this island, but having named it *Whitsun island*,* he stood away for the other island, which was in sight. Of this second island Wallis took possession "in the name of King George the Third, and gave it the name of *Queen Charlotte's island*, in honour of Her Majesty." It is Nukutavake island of our charts; it is of coral formation, but remarkable for having no lagoon.

The *Dolphin* men had at first some slight intercourse with the natives of this island, and without coming into collision with them; but the natives soon got out their canoes and paddled away, leaving the white men to collect water, scurvy-grass, and coconuts for themselves. It is pleasant to be able to add that before leaving Wallis left some small presents for the natives, "as an atonement for the disturbance we had given them."

On June 10 another island was seen. Of this Wallis says, "The east and west ends are joined to each other by a reef of rocks, over which the sea breaks into a lagoon, in the middle of the island, which therefore had the appearance of two islands, and seemed to be about 6 miles long and 4 broad. . . . As the shore was everywhere rocky, as there was no anchorage, and as we had no prospect of obtaining any refreshment here, I set sail at 6 o'clock in the evening from this island, to which I gave the name of *Egmont island*, in honour of the Earl of Egmont, who was then First Lord

* Pinaki.

of the Admiralty." Wallis says that the island "seemed full of trees," but that they saw not a single coconut on the island. It is the Vairaatea of our charts; and is the Cocotiers of Maurelle, who saw it in 1781.

On the 11th another island was seen and named *Gloucester island*, in honour of H.R.H. the Duke.* Again on the 13th another atoll was seen, and, in honour of His Majesty's third son, was called *Prince William Henry's island*. The native name is Nengonengo. Here Wallis made no stay, hoping to the westward to find higher land, where the ship might come to an anchor, and refreshments be procured.

As a matter of fact, from Prince William Henry's island the nearest land, though it was a long way off, to the west was the nearest of what are now called the Society islands, all considerable and high volcanic islands.

Accordingly, having lost sight of Prince William Henry island on June 13, they did not sight land again till the 17th, when they came up to an island which "greatly resembled the Mewstone in Plymouth sound, but it seemed to be much larger." It was Maitea of the charts. After quite friendly intercourse with the natives of this island, which Wallis named Osnaburgh, "in honour of Prince Frederick who is bishop of that see," the *Dolphin* again went westward, it having been reported that "there were islands of larger extent not far distant, where refreshments in great plenty might be procured, and . . . less difficult of access."

The next day they discovered very high land in the W.S.W., and at 7 p.m. "brought to for the night or till the fog cleared off." At 2 a.m., it being very clear, we made sail again, and at daylight saw the land five leagues off. At 8 a.m. fog again closed in on the *Dolphin*, then close under the land, "and when it cleared away," Wallis says, "we were much surprised to find ourselves surrounded by some hundreds of canoes," with about 800 natives in these canoes. This is how Wallis first discovered, as now seems to be accepted, the island which was soon to become and long to remain, for Europeans at least, the centre of interest in the Pacific island world. Captain Wallis himself seems to have named it *King George's island*, and the anchorage to which the *Dolphin* came, *Port Royal*, but the island is that which soon became known throughout the world as Otaheite or Tahiti.

At King George's island Captain Wallis stayed thirty-eight days, to refresh his men, and to enjoy friendly intercourse with the natives, probably the most highly cultured, after their own fashion of culture, in the Pacific, occupying as they do one of the finest islands in those seas.

Having made sail from Tahiti (on July 27, 1768), Wallis discovered another similar but smaller island, which he named *Duke of York's island* [Moorea or Eimeo]; and the next day, yet another, which he called the Right Honourable *Sir Charles Saunder's island—i.e.* Tabuai Manu, still in the Tahitaian sub-group.

* Paraoa of charts.

Thence, altering his course slightly to the north-west, he came, on July 30, to an atoll which he called *Lord How's island*—the Mopeha or Mopelia of the charts.

From July 30 the *Dolphin* ran westward across an open sea, till, on August 13, two islands, close together but far from any others, though usually held to belong to the Friendly island or Tongan group, were sighted. Of these Wallis thought he was the discoverer, and he named them Boscawen island and the Honourable Augustus Keppel's island. They are respectively the Cocos island and the Verrader's island, which Le Maire and Schouten visited in May, 1616; and they are the Tapahi and Niuatobutabu of the Admiralty charts.

The *Dolphin* still going westward, land was again approached on August 16, and the officers of the *Dolphin* named this *Wallis island*, in honour of their captain, by which name it has since generally been best known, though latterly the name *Uea* or *Uvea*, which may be a native name, seems to have come into favour with the chart makers.

On May 13, 1768, the English Scilly islands were sighted; on the 19th Captain Wallis "landed (from the *Dolphin*) at Hastings in Sussex; and at four the next morning the ship anchored safely in the Downs, it being just 637 days since her weighing anchor in Plymouth Sound."

Even before Wallis and Cartaret, and the French expedition under Bougainville, got back to Europe from their respective voyages of investigation, Captain James Cook began that series of voyages into the Pacific during which, between 1768 and his death, in the Sandwich islands, in 1779, he not only, and much more systematically than any who had passed that way before him, explored the Pacific, everywhere except along that part of the Spanish coast which had long been under Spanish influence, but, by his extraordinarily careful surveys and observations, by his success in establishing friendly relations with the islanders, by his victory over the scurvy which had baffled all previous voyagers, and, not least, by his remarkable personal influence in training others to carry on his work after his own death, he surely laid the foundations on which British influence in the Pacific has since been built.

Cook did not live to see his countrymen actually established in any part of the Pacific. But it is to his gathering of facts, and to the subsequent use of these facts by men whom he influenced and taught, that we owe that small settlement of New South Wales—the yeast which eventually spread not only through Australia, Tasmania, and New Zealand, but thence through most, and these the most important, of the islands which serve as stepping-stones across the South Seas; and it is to other of Captain Cook's men—especially to Captain George Vancouver—that we owe the rights which eventually led to the British settlements on the Pacific coast of North America.

The earliest British settlement in the Pacific—the first European

settlement except that of the Spaniards on the American shores—was formally established at Sydney in New South Wales on January 26, 1788, at the suggestion of James Matra, one of Captain Cook's midshipmen, and with the warm approval and support of Sir Joseph Banks, who, as botanist, had sailed with Cook on the first voyage. Botany Bay, as the settlement was long called, was to be a convict station; that is to say, it was to be developed chiefly by the manual labour of persons who, under the drastic English laws of that time, were condemned to transportation from home; and it was fully intended that the persons so transported should be afforded every opportunity, in a new climate and under new surroundings, of becoming respectable and free citizens in the new land.

Theoretically it was a wise and even humane system for developing, and preparing for future voluntary immigrants, a new land in which there was practically no available labour supply. Doubtless the system was occasionally harshly carried out. But in the long run it worked well—how exceedingly well there is no occasion here to tell, and it seems hardly conceivable that by the application in the early stages of any other system could so excellent a result have been attained.

The ships which brought settlers and stores to "Port Jackson," where the undeveloped land produced little or no food and nothing for export, usually proceeded, say, from Port Jackson to Canton for tea, thence to Calcutta, where they exchanged the tea for Indian produce, and so back to England. During the Pacific part of this voyage, they passed by and discovered many islands, and sometimes even from them picked up a little island produce—sandalwood, tortoise shell, and similar things. Moreover, the Port Jackson people, besides striving to increase the products of their own lands, strove also to get in what they could from the adjoining seas and its islands, not only sandalwood and tortoise shell, but also whale-oil, sealskins, and peltry.

Again, the declaration of the Independence of the United States of America, in 1776, had had the effect, among others, of excluding the trade of the New Englanders, who were all born and bred seafarers, from many of the older known seas, so that long before the end of the eighteenth century, they passed more and more frequently, and further and further, into the Pacific, whaling, sealing, fur-getting from the Pacific coast of North America, incidentally crossing and re-crossing the Pacific, discovering and naming its islands and islets, visiting Canton, Manila, and eventually Port Jackson.

Before the end of the eighteenth century the natives of the Pacific coasts and islands, who before the visits of Captain Cook had never, or hardly ever, seen a white man or his ships, saw them no longer rarely. About the same time white men other than sailors reached the Pacific islands. Moved by the tales told in England of South Sea folk, the London Missionary Society was founded in 1795, for the express purpose of converting these heathen; and in 1796 the Society despatched the good ship

Duff, Captain Wilson, with a passenger list of thirty-nine missionaries, of whom four were ordained ministers. Without doubting the pluck and devotion with which, it may be assumed, this party set out for the South Seas, one wonders whether there ever has been a stranger assault, with spiritual weapons only, on primitive men.

The *Duff's* passengers were landed, some in Tahiti, some in the Friendly islands, and one at least in the Marquesas. It is unnecessary here to go further into the history of this adventure than to say that the missionaries left in the Friendly islands effected little and did not long remain there, but that those who were landed at Tahiti were apparently the originators of good work done in those parts by the London Missionary Society. The rest of the story of the several missionary efforts for the civilization of the natives of the Pacific belongs to the next century.

Mention may here just be made of Laperouse, who, leaving Europe in 1785, after cruising extensively in the Pacific, called at Botany Bay in January, 1788, at the very time when the British flag was hoisted. He called partly to refit his ships and partly, very fortunately, to leave his journal there for transmission to Europe; and then, on March 15, he sailed away and disappeared from human ken, though very many years after, 1826, traces of his wrecked ships were found at Vanikoro of the Solomon island group.

By the end of the eighteenth century the Russians, who had long been creeping eastward, partly by land and partly by short coasting voyages along the north of Siberia, had, almost secretly, reached the extreme north of the Pacific; Bering, a Dane, but in Russian service, by his explorations in 1728–9, and again in 1741, had discovered the strait, since called after him, which divides the north-eastern extremity of Asia from north-western America, and subsequently Russian fur-traders had passed, somewhat tentatively, across this strait into Alaska and thence down the American coast, at least as far as Vancouver Island. Captain Cook, in 1778, found such Russian fur-traders camped but not settled; and Captain Vancouver's mission to these parts in 1791-5 was partly to investigate the doings of these Russians on coasts which were claimed, somewhat vaguely, both by England and by Spain.

Passing to the nineteenth century, it may here be recorded, that during its first forty years or so, the sending of elaborately organized scientific expeditions to cruise through the Pacific, without much obvious purpose or result, other than the increase of knowledge, was continued by at least two European Governments. The most important English voyage of this period was that of Mathew Flinders, who as a pupil of Captain Bligh was another of Cook's men—but in the second generation, which, in that it was a practical and resultful completion of the examination of the coasts and adjoining seas of the great land which he was the first to call Australia, was of a different class. But the French Expedition under

Nicolas Baudin, almost contemporaneous with that of Flinders—indeed, the two came in contact more than once—was probably never intended for other than scientific purposes, though the fact that it resulted in the placing on Freycinet's map of the name Terre Napoléon as part of Nova Hollandia has suggested that Baudin's instructions had political as well as scientific intention. The two French Government expeditions, in 1826–9 and in 1837–40, both under Dumont D'Urville, were even more certainly purely for purposes of investigation.

Three of a series of Russian expeditions to the Pacific during this period may here be mentioned. Adam John Von Krusenstern, who had served in the English navy and had studied English methods of trade in the East Indies and in China, sailed in 1803, in command of the men-of-war *Nedeska* and *Neva*, the first Russian ships to circumnavigate the world, and—at his own suggestion—paid particular attention, in passing through the Pacific, to the possibility of direct shipment in Russian vessels of furs from the languishing settlements in Alaska to the Chinese, East Indian and further markets—instead of by land from Okhotsk. This particular scheme seems to have had little or no result; but his voyages, and subsequent voyages under Krusenstern's pupils, Otto von Kotzebue and Bellingshausen, which directly resulted from his, put at his disposal the material which before he died he utilized in the publication of the magnificent atlas, with accompanying memoirs, of the geography of the Pacific as far as then known.

Bellingshausen's voyage, in 1819–21, the *full* account of which, unfortunately, has never been translated from the Russian language and published, is remarkable in several ways. His investigation of the Antarctic regions of the Pacific was for long surpassed in merit only by that of his predecessor, Captain Cook. He discovered many of the islands in the Tuamotu archipelago—and gave to these rather crack-jaw Russian names, some of which survive, to the puzzlement of those who nowadays pass that way. But his greatest merit is his kindly and considerate treatment of the South Sea islanders with whom he met—under personal instructions, as he himself says, from the Czar.

These French and Russian voyages, though they have added considerably to our knowledge, cannot be said to have had much, if any, permanent effect in the partition of the Pacific.

In 1812–14 there happened in the Pacific an incident which, in the circumstances of the present moment, is worth recalling. In 1799, in connection with the English-French-American war of that period, the New England Colonies, long a nest of bold sea-fishers and daring merchant sailors, had most keenly taken up the patriotic task of contributing to the little navy which was all that the new republic of the United States then had to contest the naval supremacy of Great Britain. The men of Salem, the North Atlantic port from which had sailed a large proportion of

the whaling and trading ships which were even then at work in the Pacific, had built, manned, and contributed the armed frigate *Essex*.

When, in 1812, war was renewed between America and ourselves, over questions of American maritime rights, the *Essex*, Captain David Porter in command, in October, left "the Capes of Delaware" to cruise, with the two or three other ships which then constituted almost the entire United States fleet, against the English.

Porter, though not unsuccessful in the Atlantic, soon grew tired of fighting at considerable disadvantage in those seas, and, taking advantage of his separation, accidental or not, from the senior ships of his squadron, boldly decided to pass round the Horn into the Pacific, to attack the English whaling and trading ships, many of which were armed and provided with letters of marque, on the coasts of Chili and Peru—then both in process of throwing off their allegiance to Spain, so that it was doubtful whether their sympathies at any moment were with England or the new Republic of America.

Porter was most extraordinarily successful in this unexpected raid. The *Essex* captured practically all British ships then working off that coast and in the adjoining favourite whaling grounds about the Galapagos islands.

Porter almost always approached the enemy ships, and even neutral ships from which he wished to glean news of the enemy, under the disguisé of the British flag. Though far from home and from any port which he could certainly count on as neutral, he never sank the captured ships, but either used them as tenders to the *Essex* or sent them, as American prizes, to run the gauntlet through the enemy's fleet from south to north of the Atlantic. Some of his prisoners he accepted as volunteers in his own rapidly growing fleet; some, when there was opportunity, he put ashore in inhabited places whence they could easily get away; and some he detained as prisoners, treating them well. He took from the captured vessels ample stores of all sort for his ships and men throughout the long cruise; and he even paid his men, at least partly, from the treasure taken.

When needing to refresh and refit, Porter used the Galapagos islands —much as the buccaneers had done of old, and as, it may be guessed, warships of another nation have even lately done. Also, at one period, he made a long stay in the Marquesas islands, partly to refit; and while in these islands Porter entered into friendly relations, though in somewhat masterful fashion, with the natives whom he met on first landing; and, when other natives who occupied the more remote parts of the island refused to give him food and obedience, he waged war on these, and compelled them to come in.

Porter's account both of the natural conditions which he found in the uninhabited Galapagos islands, and of the natives of the Marquesas, who were extraordinarily far on in savage culture, are both well deserving of reproduction, but are too long to be here given.

Having claimed certain of the Marquesas islands, or, as he called these, the Washington islands, for the Republic, and leaving some of his men to hold a fort which he had erected there, Porter in the *Essex* returned down the Peruvian and Chilian coast, grumbling that there were no more British ships to capture, till, on January 12, 1814, he anchored in the harbour of Valparaiso.

Into the same neutral harbour, on February 8, sailed H.B.M. ships *Phœbe* and *Cherub*, which had been sent to deal with the *Essex*. Then followed as strange a naval blockade as has perhaps ever happened, till on March 28, after a great fight, in which the *Essex*, shattered almost to pieces, 179 of her 255 men being "killed," "wounded," and "missing," perforce surrendered.

The *Essex's* men who had been left in the Marquesas were soon expelled; and thus ended this strange adventure in the Pacific.

Between 1800 and 1840, though no European government was established in the islands, a great many individuals, chiefly English, American, and French, got, in one way or another, into many, perhaps most, of these islands. These were of two very different classes. The earlier of the two were the so-called "beachcombers," *i.e.* those whom the combing wave threw on to the island beaches, mostly derelict sailors and escaped prisoners from "Botany Bay" and Norfolk island, who found refuge in the more remote islands of the western half of the Pacific, where the natives were least advanced in culture; and these were followed by the missionaries, who resorted more to the eastern islands, where the natives were of much higher culture.

It would take too long here to tell the story of the relations between the beachcombers and their native hosts, between the missionaries and the natives, between the missionaries and the beachcombers (when the two eventually came in contact), and, a very bitter irony of fate, even between the missionaries themselves, according as they were of one set or another. The result, inevitable in the absence of any central authority, was that, by 1840, the wise man might have been justified in saying of the beautiful islands in the South Seas, that every prospect pleases and only man is vile.

Incidentally, the difference in this contact between "civilized" and "savage" men in the eastern and western isles may be noted. In the eastern islands the missionary intruders, speaking generally, strove gradually to induce their more cultured hosts to join in building up a new social order in quaint imitation of European models; they would have been more successful but for the disputes between the several different bodies of missionaries which entered the field. In the western islands, on the other hand, the beachcombers, reaching the islands before the missionaries, and being far from anxious for the introduction of social order, broke down even the "club-law" which had before prevailed over the

backward natives, and so brought about a state of utter lawlessness and disorder which made it much more difficult for the missionaries, when they did come, to gain any footing.

The first definite step taken by a European Power to end this disorder by assuming control in any of the islands was in 1842–3, when the French Government, to settle the local disputes between the Protestant and Roman Catholic missions, took possession, separately but almost simultaneously, of the Society islands, including Tahiti, of the Tuamotu group, the Marquesas, and other islands in the Eastern Pacific. With a few exceptions, of which Tahiti is the most important, these are atolls, producing little of consequence except coconuts.

With an exception presently to be named, French acquisitions in the Pacific were for many years effected on a policy of supporting French missionaries, rather than of protecting the natives; whereas, rightly or wrongly, British policy was to acquire only what has seemed absolutely necessary for the protection of the natives, and only in very urgent cases anything for the advantage, commercial or strategic, of the European intruders, and even then only when it might be taken without injury to the native occupants. By anticipation, it may be convenient here to add that a third European Power, which after the date of which I am now speaking made acquisitions in the Pacific, Germany, seems to have done this without reference either to the interests of the natives or to the commercial value of the places taken, but for strategic reasons.

The establishment of French authority in the Eastern Pacific, in 1842–3, and the more frequent visits to the western area of men-of-war of various nationalities, British, French, or American, not only for scientific exploration, but to "show their flags" and to keep some sort of order in the now cosmopolitan islands, rendered the lives of the scattered Europeans somewhat safer than before—and, it is fair to add, partly in consequence of the control which the missionaries had gained over the natives in some of the islands, the beachcomber now gradually gave place to the trader and the settler.

By trader is here meant the man who, unlike the beachcomber, instead of passing time, idle and entirely supported by the natives, occupied himself in collecting from the natives what produce they had—tortoise shell, *beche de mer*, coconuts—paying for these things with European goods, and exporting what he collected by the trading ships which began to call more regularly.

By the settler is meant the man who, probably having been a trader, contrived to get possession, by fair means or otherwise, of more or less "native land," which he cultivated with the assistance of such natives as he could, by persuasion or other influence, get to work for him.

Among the traders and settlers who gradually gathered in the No-man's islands of the Pacific were not a few individual Germans, who were first

brought together under the influence of the once great Hamburg firm of Goddefroi, which later gave place to the so-called "Deutsche Handels und Plantagen Gesellschaft der Südsee Inseln," which for a time controlled much of the trade and claimed a very large proportion of the alienated native land in many of the islands which had not then been appropriated by any European Power.

In 1853 France—this time in the Western Pacific—unexpectedly took possession of the magnificent island of New Caledonia, the largest in the Pacific, excepting New Guinea. New Caledonia had been first discovered and named by Captain Cook, in September, 1774; but, though subsequently carefully inspected, more than once, by French and other naval captains, though it had been a regular resort of whalers and sandal-wood traders, and though a mission had been established there in 1843, no attempt to acquire and use it had been made till, in 1853, the French took it, for a convict station. Possibly it was hoped to do in New Caledonia what had been so splendidly done in New South Wales. As a matter of fact, though as grimly effective a penal settlement as the world has ever seen was established at Noumea—its use for oversea prisoners has been abandoned only within the last ten years—and though the harbour and roads of Noumea itself were splendidly engineered by convict labour, the opportunity for thus making a great colony was missed. The most noteworthy consequence of the French acquisition of New Caledonia, as regards the spread of European influence, was that from that island many French subjects who for one reason or another preferred to live outside the pale of the law passed up into the New Hebrides, which were then, and long continued, outside the purview of European authorities.

It was not till 1874–5, despite many temptations dangled before her, that Great Britain annexed, or rather accepted the cession of, any islands in the Pacific.

In 1859 the Fiji islands, which, taking all circumstances into consideration, offered the best prospects for development by Europeans, had been offered by the native chiefs, but had, after inquiry, been refused by H.B.M. Government on the ground that it was not clear that the offer was spontaneous on the part of the natives. Soon after, the American Civil War having raised the price of cotton, it had been found that cotton of excellent quality could be profitably grown in Fiji, till then without any important staple product, and over-full of contending factions of natives and Europeans, chiefly Australians and New Zealanders, but with many Germans and Americans. Cotton growing attracted men and capital from Australia and New Zealand, and for a few years the cotton industry in Fiji flourished, but then, the price of the product falling in the home markets, the bad time came again, and disorder greater than before prevailed.

The British Government, despite much pressure from Australia and

New Zealand, both of which were naturally much more nearly concerned in the matter, was still reluctant to annex these islands, chiefly because unwilling to do what might be against the real interests of the natives, and because unwilling to undertake the control of native affairs in places so far from England. A few more years of ever-increasing disorder in Fiji followed; and then, as the only way of relieving an impossible situation, a renewed offer from the more important Fijian chiefs to cede the islands was accepted, Fiji becoming a British Crown colony in 1875.

The new colony, in order to safeguard the rights of its natives, was from the first and has since been administered from headquarters in Downing Street, and therefore on a footing entirely different from that of the adjoining colonies, as they then were, of Australia and New Zealand, which, even in 1875, enjoyed a large measure of the self-government since attained in such full measure. In any study of British rule in the Pacific it is necessary to bear in mind this out-planting of a little bit of the home country in a remote area where otherwise a system of government founded on alliance rather than dependence prevails.

Moreover, a few years after the annexation of Fiji, in order as far as possible to embody British control over British subjects in the Pacific islands other than Fiji, and in order to afford due protection to the natives within the same area, the office of High Commissioner of the Western Pacific was created (in 1877), with limited jurisdiction over British subjects (extended in 1893 to foreigners) in "all islands in the Western Pacific not being within the limits of the colonies of Fiji, Queensland, New South Wales, or New Zealand, and not being within the jurisdiction of any civilized Power, together with full jurisdiction over British possessions and protectorates—except over a very few islands which, with illogical reasonableness, have been assigned to New Zealand."

Since the office was instituted a large number of islands, extending over a very wide area, have thus passed, for one reason or another, under the jurisdiction of the High Commissioner. The Gilbert [Kingsmill] and Ellice islands were declared a British protectorate, in 1892, for the sake of the natives, both those remaining in the islands and those who went abroad as indentured labourers; many of the Solomon islands were added in the following year, originally for a similar reason, but largely, thanks to the good work of the first British Resident, Mr. C. M. Woodford, F.R.G.S., have proved commercially valuable. Among many other quite small but very important additions to the British possessions in the Pacific may here be mentioned: Fanning island, or rather atoll, which, long before under British influence, was annexed in 1888 as a repeating station for the Pacific cable connecting Canada and Australia.

Thus the High Commissioner of the Western Pacific and the Governor of Fiji—the two offices are absolutely distinct though held by the same person—has, in one capacity or the other, authority over a very large number of islands, of all sizes and sorts scattered over a wide area,

extending from not far off Australia to Ducie islet, two-thirds of the way to America; over a British Crown Colony, of great extent but somewhat lacking in cohesion, which lies isolated between the great Dominions of Australia and Canada.

The next important move in the partition of the Pacific was made by an entirely new player, and in a part of the area, New Guinea, till then unappropriated by any Power; for though the Dutch had long before claimed the western part of New Guinea, the eastern part, bordering on the Pacific, was vacant.

The German Empire, when still very young—it was born only in 1871—wanted a colonial policy, and before long thought it saw a chance of establishing a great dependency in and about New Guinea, the greater part of which was then a veritable no-man's-land, into parts of which a few missionaries—very good ones—and a considerable number of squatters, Australians, Germans, and others, had penetrated, without authority, and at the risk of their lives, among natives who had grown more and more suspicious in face of the encroachments of the white intruders.

In 1884, and the few following years, Germany declared a Protectorate over a large part of the east of New Guinea—calling this Kaiser Wilhelm's Land; over New Britain and New Ireland, which it renamed respectively Neu Pommern and Neu Mecklenburg, calling the two together the Bismarck Archipelago; and over the Marshall islands. It also claimed as within its sphere of influence several of the larger Solomon islands; and at the same time it purported to take in many less considerable scattered islands as adjuncts to these compact German holdings in the North-West Pacific.

Development was at first entrusted to a chartered company; but in or about 1899 the Imperial Government assumed direct control, consolidating the whole under one central government, the headquarters of which, as had been those of the company, was at Herbertshöhe, in the north-east of New Britain. Thereafter, less effort seems to have been spent on trade development, and more on converting the Bismarck Archipelago into a strong naval base.

Australia, which had long tried by every means in its power to induce Great Britain to consent to the annexation of all but the Dutch part of New Guinea, was naturally moved to fresh effort at the first sign of Germany's intention to raise its flag in any part of the great island, so close to the nortl Australian shore; with the result that on November 6, 1874, the same year in which the German flag was hoisted in another part of the island, a British protectorate was sanctioned over the south-eastern part of the island; but, in accordance with the old British policy of retaining in its own hands control over coloured-skinned natives, British New Guinea was for some years administered from home, though partly at the cost of Australia. It was not till 1901 that, again with illogical reasonableness, full charge was handed over to Australia, imposing

on the Commonwealth, I think for the first time, the care of natives other than its own aborigines. In 1906, Australian New Guinea was renamed Papua.

In 1897–8 Germany acquired, there is no need to say how, Kiau-Chau on the Chinese coast; and by working this as a naval station in connection with that other in the Bismarck Archipelago greatly strengthened her general position in the Pacific. Also—though this was a comparatively unimportant sweeping up of crumbs—in October, 1899, she bought from Spain several groups of scattered islets which chanced to lie in the new German Pacific; the Carolines and, except Guam which had been ceded in 1898 to the United States, the Marianne, or Ladrone islands, which had been Spanish, or at least more under Spanish than any other European influence, since times not long after Magellan.

Little has hitherto been said of any part taken by the United States in the partition of the Pacific islands. The very frequent presence of the New England whaling and trading ships in the early part of the century has been mentioned; and it is certain that many Americans got ashore from these ships and squatted in islands which were still no-man's-land. Captain David Porter's claim of some of the Marquesas islands for his country had no result. The very important visit of the United States Exploring Expedition, in 1838–42, under Commodore Charles Wilkes, produced, it is true, a very valuable set of hydrographical surveys, but these were as much for the advantage of the world in general as for America.

America's first share in the partition was when, in 1867–68, she bought Alaska from Russia, and thus gained footing in the extreme north-east of the Pacific. Next, in 1898, America, at the close of her war with Spain, took over the Philippine islands (said to be over 300 in number) and Guam, the largest of the Marianne islands. Guam has a good harbour, and is doubtless a good naval station on the way to the Philippines. At the same time America annexed the Hawaiian islands, the Sandwich islands of Captain Cook, and the scene of Cook's death. These islands, isolated in the north-central Pacific, rivalled the Fijis in opportunity for development. Historically, too, they are of great interest, having almost throughout the last century been the scene of experiments, nominally by the natives themselves, but with much assistance from European settlers, missionaries, and laymen, and from naval officers, in imitation statecraft, first monarchical, then constitutional-monarchical, and finally republican, with an American citizen as President. Four years later, local affairs being still very unsettled, the islands were annexed by the United States. They afford another convenient naval station on the way between America and the Philippines; and they have since been so admirably developed by their new owners as to justify, if justification were necessary, their annexation.

The story now comes to the convention of Samoa, in 1899–1900, between

Great Britain, Germany, and America. The Samoan islands in the Central Pacific had, from the time when Europeans first squatted there, been in special degree cosmopolitan. The islands and its natives were very attractive to Europeans, Britishers and Americans and Germans, but—as was the case in Fiji before cession—the white men could never agree among themselves, nor refrain from distracting the natives now this way and now that. The Commissioners met in Samoa to settle, once for all, it was intended, which of the three Powers concerned, Great Britain, Germany, and the United States, should prevail in these islands; and the opportunity was to be taken to settle several other Pacific questions, as between Great Britain and Germany.

It has always seemed to me that, taking all the circumstances into consideration, the Commissioners' decision was equitable. Germany got the Samoan islands, which were more commercially valuable, but without any good harbour; America, besides a few quite unimportant islets, got the island of Tutuila with the fine harbour of Pangopango as a naval station in the South Pacific; and Great Britain, though she got nothing in Samoa, secured exclusive control, by German renunciation of such claims as had before been made, over the Tongan group, including the splendid natural harbour of Vavao, and she also secured recognition of exclusive rights to all but two (Bougainville and Buka) of the Solomon islands.

Before leaving the subject of the Samoan convention it may be pointed out that by a line, drawn by that convention, which will now be found on most maps, the German possessions in the North-West Pacific, as these *were* at their highest point, are clearly marked off—at this their southern line. It will be noted, *inter alia*, that this line passes between two of the smallest but, because of their phosphate deposits, most valuable of the inhabited islets, Ocean island or Banaba, and Pleasant island or Nauru.

After the Samoan convention, the only considerable South Sea islands still to be taken definitely within the sphere of influence of one or other of the European powers were the New Hebrides. A few British subjects, from Australia, and a few French subjects, from New Caledonia, had long before scattered themselves as pioneer settlers over the islands of this group, and a few missionaries, chiefly British, but some French Roman Catholics, had at great risk to themselves gained some ascendancy over the natives in certain of the islands. But the islands were still outside the pale of any civilized law. Indeed, in 1878, the British and French Governments, who were alone concerned, mutually agreed not to occupy the islands, with the natural result that disorders increased. In 1887, Australia protesting against this state of affairs, a joint commission of British and French naval officers was appointed to protect the lives and property of British and French subjects, and to maintain what order they could by means of very occasional visits by men-of-war, and in 1902 British and French Residents were appointed.

None of these steps, however, had any great effect; and in 1906 a *condominium* was established by a joint Anglo-French convention, with, I am afraid, no greater success.

This brings the story of the partition of the Pacific practically to August 4 last. It happens that I was at that time in Australia; and even now can hardly think calmly of the outburst—and I know it was the same in New Zealand—of grim delight at that sudden and unexpected coming of the day which gave Australians and New Zealanders such opportunity not only to prove their tremendous loyalty to the Mother-country, but also to wipe out, as they so promptly and so thoroughly did, every trace of that invader of the Pacific ocean whose comparatively recent intrusion they had from the first resented.

I may not prophesy as to what will or should happen after the war. But I will, in conclusion, record several hopes of mine own, as of one who has lived, worked, and thought, to the best of my ability, while actually among the islands of the Pacific. I hope that the opportunity for readjustment which apparently must shortly occur—I need hardly say that I assume that the expulsion of Germany, as a ruling power, from the Pacific is final—will be taken, especially in two ways: (1) By the friendliest arrangement with our French allies for the assignment of the New Hebrides to one or other of the now joint powers; and (2), this is perhaps even more important, for the settlement of the problem, difficult, but, I am sure, not insoluble, as to the best method of control by the United Empire of all its tropical Pacific islands, with due regard to the interests of Australia and New Zealand, of Canada, of those Europeans who, under Crown colony rule, have invested their capital and their labour in any of the islands, and, certainly not least, in the interests of the coloured natives of those islands and of the coloured British subjects who have been, or may be, introduced into our tropical British possessions, as absolutely essential assistants in the development of these island stepping-stones between Canada and Australasia.

The PRESIDENT (before the paper): To-night, in pursuance of a promise which I made at our last meeting, we are going to put before you a paper dealing with the discovery of the Pacific and the historical development of its islands during the last three hundred years. I need not repeat what I said at our last meeting as to political frontiers. I feel sure it is quite unnecessary to insist on the fact that it is our duty as a national Society to put forward the considerations, to set out the physical and social conditions, which ought to influence the determination of political frontiers in the World of the future. It is our function to put before the public, and through the public before those statesmen who govern public affairs, the opinions of the experts whom we number among our Fellows. It is, I know, often alleged that the local expert is apt to magnify unduly the importance of the sphere of his own activity. That is no doubt true. It is the part of the man who sits in Downing Street to weigh intelligently the facts put before him and to base his action upon the considered result. It is matter of common knowledge that, once upon a time, the action of

Downing Street was too often to ignore the local facts, and to postpone any action until it had become difficult, if not impossible. But those days are, we trust, past. Nowadays mechanical inventions have shortened distances, have brought the centre into closer contact with its limbs; there is a unity in the variety of our Empire which did not exist fifty or even fifteen years ago.

The lecture we are going to hear to-night is delivered by one who has the highest qualifications for his task. Sir Everard im Thurn has been a Fellow of this Society for over thirty years. We knew him first when he was officially employed in British Guiana, when he interested us with a fascinating account of the ascent of that reputedly inaccessible mountain, Roraima, on the top of which he found a virgin forest. This mountain has a singular parallel in Europe, the Mont Inaccessible, in Dauphinè, which was first ascended by the chamberlain of the King of France in the year 1462, one of the earliest mountaineering feats upon record. Sir Everard has had a long and varied official career; he served first in the Colonial Office, then in Ceylon, and more recently he has held high office as Governor of Fiji and High Commissioner of the Western Pacific. He has lectured to us previously on the eastern part of the Pacific. He is going to lecture to-night on the whole Pacific. It is a large subject, and I will not hinder him from starting upon it at the earliest possible moment.

Sir William Macgregor (after the paper): We have listened to a very instructive lecture, a lecture which has given us much insight into all the different great questions connected with the Pacific, a *résumé* which could have been given only by one who is an expert, and you all know our lecturer is a thorough expert on Pacific questions. You have heard all about the different kinds of islands found in the Pacific, with one exception. There is one kind of island in the Pacific, perhaps a more interesting one than any we have had described in detail by the lecturer, but of that I have no time to speak to-night. Then you have heard all about the people. The thing that struck me when I came to have some knowledge of the Pacific was how very unimportant commercially each of the little islands was, dotted as they are over all that immense space: intrinsically each island is really of very little value. The lecturer has shown you, however, the strategic importance of many of those islands. Having been connected with the Pacific since 1875, I can assure you, as we gradually took possession of those islands we looked more to the strategic importance than we did to the commercial. At the end of this lecture you will find that the lecturer has pointed out that strategy was, perhaps, what most influenced Germany in coming to the Pacific. She learned that, as she has learned much else, from ourselves. You have had your attention called to the "culture" of the people. There are very few inhabited islands there on which I have not some personal acquaintances, for during a half-score years I, as chief medical officer of the colony of Fiji, examined almost every man, woman, and child that came to that country as field labourers, and I can assure you they possess all the culture that the lecturer has put before you. The contrast between the ideal education of a Pacific island chief of two or three generations ago and of a young chief of to-day is very remarkable, and in no place would it be better illustrated than it would be, say, in the education of King Cakobau. I think it is in the book of the Rev. Mr. Waterhouse, of the Methodist mission in Fiji, that we find a description of the early training of Cakobau. When he was about six or seven years old, he had a little club put into his tiny hand, and he was given a little boy to kill, and the lesson for the day was to beat out the child's brains; and yet that King died, as far as one could judge, as good and sincere a Christian as any here to-day, a cultural change due to the Methodist mission, though, as stated by the lecturer, the evangelization of the Pacific was initiated by the great London Missionary Society. If time permitted,

I could tell you a great deal of what has been done by that Society and other missionary societies in the Pacific. It would be a long story, but if the history is ever fully written, believe me, it will be one of the most interesting tales that has ever been read. There is much else of historical interest to relate. For example, the history of how the Germans came to occupy the north-eastern part of New Guinea is of very special interest to us. The particulars of this transaction were all reported a good few years ago, I think in the *Deutsche Rundschau*. If you will read an account of it as given from the German point of view, you will not blame the Germans for being there. There is also another exceedingly interesting point which our lecturer has not touched upon—how the French came to occupy New Caledonia. As to the changes about to take place shortly in the Pacific, I agree with the lecturer, and I sincerely hope one of the first will be the abolishing of the present system of condominiums. I am sure many of you will remember what Prince Bismarck said about condominiums: he said how they were unable to manage it in Schleswig-Holstein. We had also an unpleasant experience of it in Egypt. It has not succeeded in the New Hebrides. I have no doubt that the condominium there will be got rid of. There are many other things in this paper I should like to speak on, but this time does not permit.

Dr. B. Glanvill Corney: I speak with great diffidence in the presence of Sir William Macgregor, who was my first chief in the Pacific, and of Sir Everard im Thurn, my last chief, but I should like to give my tribute to the boldness of the lecturer in attempting to compass a subject of such vast width. I noticed that the title of the paper is not the "influence" of Europeans, but the "influences" of Europeans in the Pacific, and that is a subject which has many sides; and, as Sir William Macgregor said, time does not permit of entering anything like fully into them. I noticed, however, what I might call an audible smile at one moment in some portion of the audience when reference was made to the misapprehension by natives of the inter-relationship between property and person, commonly described by our early navigators as propensity to theft. Among the earliest in modern times was M. de Bougainville; and his medical officer, Philibert de Commerson, was an exception to those who claimed that the Pacific islanders were given to theft. Dr. Commerson wrote a letter to a distinguished man of science, which is printed in the *Mercure de France* for 1769, in which he describes Tahiti and the Tahitians in the most glowing of terms. He excuses the natives from all the faults that most of the other navigators have ascribed to them, and declares that their so-called propensity to theft was merely misapprehension due to the fact that all their own chattels and implements were made from natural objects, either vegetable or animal, that grew without care or cost to anybody, the animal objects being chiefly from the fish kingdom; and that, therefore, they had no owners until they acquired them by being fashioned by hand. The term "savage" might, perhaps, be better expressed by the word "untutored." There were many other points to which I should have liked to allude, but we had such a liberal display of slides that there was no light to make notes, and I have forgotten most of the points. I should like, however, to draw attention to the rarity and interest of those sketches in Indian ink by Captain Sam Wallis, who was buried at the Cornish village of Sheviock, not far from Plymouth. They came into Sir Everard im Thurn's hands recently, I think almost by an accident, and I should recommend every one who is interested in them to go into the other room and look at the original sketches. They are not described in printed books; they came quite as a surprise.

The President: After the full evening we have had I am sure the kindest thing I can do is not to detain you more than a few moments, and to dismiss you to look at the originals of the interesting sketches we have seen reproduced in the

lantern. At the same time, there is a duty I have to perform, and that is to offer your thanks to Sir Everard im Thurn for the interesting account, founded on his own knowledge and experience, of this wide region, the Pacific, which he has given us to-night. I noticed (having had the proofs of the paper before me), that Sir Everard was led by his interests as a pure geographer to spend more time on the earlier part of his lecture than was proportionate, and the consequence has been that the elaborate and interesting historical sketch at the end was given in a somewhat mutilated form. You will, however, be able to read it and appreciate it much better when it is printed in the pages of the *Geographical Journal*. I beg to propose a vote of thanks to Sir Everard im Thurn.

Mr. Basil Thomson sends the following communication :—

"The comprehensive and masterly account of the political history of the Pacific to which we have just listened brings us to the present day. I should have liked to hear Sir Everard's views upon the future, but either he was too wary to be inveigled into prophecy, or too conscientious to indulge in unscientific speculation. I am not trammelled by such scruples. The question of how the savage and the civilized are ultimately to shake down together, and what sort of population will inhabit these fascinating islands two hundred years hence, is to me a problem of absorbing interest, even though we can never live to see its solution. On one point there can be no doubt at all. The islands of the South-Western Pacific—especially those that lie nearest to Australia and New Zealand—will be developed as gardens of tropical produce for the supply of those great colonies. Almost certainly Asiatic labourers will be found necessary, and you will then have, what is already the case in Fiji, a small community of Europeans, a larger community of Asiatics, as labourers and shopkeepers, and a substratum of natives. There has now been time enough to see how far these diverse elements will intermingle. The native remains at the bottom of the scale, as a landowner, indolent and improvident, but neither vicious nor incompetent. The East Indian, thrifty and commercial, has gradually absorbed all the retail trade of the islands; the European does the directing and governing. Except to a very small extent the three races do not intermarry, for between the Indian and the Melanesian there seems to be mutual repulsion, but in the rare cases when they do, the half-caste progeny, particularly that of the European and Polynesian, are physically a fine race, though prone to scrofulous disease. Probably the races will never amalgamate, but the natives, decreasing in number, but benefiting by improved education and comparative wealth, will meet the other races on nearly equal terms. There is, as far as I have been able to discover, no mental inferiority in the Polynesian and Melanesian. The inferiority is in lack of purpose rather than in lack of intelligence. The Melanesian is said to think and act like an intelligent child, but already he is beginning to put away childish things. Very gradually he is acquiring new wants and is beginning to save money in order to satisfy them. We have no right to blame him for his indolence. It is the natural bent of all men to be idle. When men of the old world in his scale of development tried to imagine Paradise, they made it a garden which yielded fruit without cultivation; their conception of a fitting punishment for disobedience, was the decree that man should earn his bread by the sweat of his brow. The Melanesian is a landowning peasant—a class which does not in other countries put his labour on hire. Probably in all parts of the Pacific, the natives are decreasing. The adoption of alien customs and the introduction of new diseases will still further reduce them until they reach a point of resistance, at which a native population seems to rally and become immune. From this point it shows a tendency to increase. If the Government pursues its present policy of encouraging leases of native land and dividing the rent among the native owners, the surviving

natives will pass from the status of landowning peasants into that of landlords with rich companies as tenants. Such prosperity may be their salvation or their ruin. They may become absorbed in commercial competition as one or two Tongans and Fijians have already done, or they may take to drink and debauchery as so many have done already. It cannot leave them as they are."

THE GEOGRAPHICAL ASSOCIATION ANNUAL MEETING.

THE Geographical Association prospers steadily, and during Dr. Keltie's presidency the number of members has been raised to 1144. The Annual Report, which was submitted to a meeting held in London in January, contains an account of the activities of the Association, and is published in the spring number of the *Geographical Teacher*.

At this meeting Mr. Hilaire Belloc was appointed successor to Dr. Keltie, and gave an address on the "Materialistic Interpretations of Geographical Influences in History." In this he warned geographers against a very common habit of interpreting history purely in terms of geographical influences, more particularly when they postulated a succession from the animate to the inanimate, and from the less conscious to the more conscious. As examples of the fallacy of this method, he cited the current statement about Britain owing everything to being in the centre of the Land Hemisphere, and Rome to its being in the centre of the Mediterranean. There were certain elements observable in human history which were not amenable to materialistic interpretations. First, there was *religion*. As an example he cited the spread of Mohammedanism from the centre of two miserable groups of mud huts in Medina and Mecca, in almost the nastiest part of the habitable world. The second he called, for lack of a better term, *accident*; for instance, the path taken by cows ultimately being that followed by a street in a great city. Then accident and religion were combined, and as an example of this he chose Carthage, a very inferior port compared with Bizerta, which could have been joined to the open sea by a few slaves digging for some weeks. The third element was the *deliberate choice* of one brain, which used to be more important when the central government was more powerful. Constantinople was an example of this. For hundreds of years Byzantium had all the material advantages which Constantinople had afterwards. But Byzantium was not Constantinople, and during nearly thirty centuries there were not six hundred consecutive years in which it had been the key of commerce or strategy. Delhi as the capital of India was another example. The fourth non-materialistic element was the *conflict of wills*, which accounted for an enormous amount of historical geography, for much fortification which was not always determined by purely material reasons; for instance, Metz. The fifth, the most important, perhaps, of all, was the element of *continuity*, of which there were hundreds of examples, such as London. London lay up a river full of shoals, and with an estuary with congested and abominable communications and artificial docks; everything which should make it decay. But it has not decayed. Why? The reason was something in the quality of the merchants of the City of London, something in the continuity of the tradition which had been established. Paris rose to importance with the decay of the great Roman roads; the water-carriage to Paris made it great. But people went to Paris because it was there, not because of its water carriage. Liverpool was an excellent port

when ships drew 11 to 12 feet, and having got inside the expanse of the Mersey, they were free from storms. They turned up a little creek, and discharged at a little quay in a little country town. Liverpool to-day was a purely artificial thing; its channel had to be continually dredged. The Mersey was crowded, and the ships docked in an artificial manner, in docks which had been dug with human labour. You had a vast city there through the effect of continuity.

Mr. P. M. Roxby, Lecturer in Geography, University of Liverpool, lectured on "Some Aspects of the Geography of China," and showed a number of lantern slides. The lecturer said that of all the countries which he had visited as Albert Kahn Fellow, China had the most deeply interested him and impressed his imagination. This was partly due to the character of the Chinese as a people. He described some Chinese qualities which had particularly impressed him. One of the most striking of these was their extraordinary physical vigour and climatic adaptability. Vigour was almost equally characteristic of the Southern and Northern Chinese. Their great industrial qualities were conspicuous over all the Far Eastern Tropics. The marvellous economic development of the Straits Settlements and Federated Malay States was due as much to the industry of the Chinese as to the administrative genius of the British. There could be no doubt that were they admitted to the great sub-tropical province of Northern Australia, an immense development comparable to that of British Malaya would take place. The exclusion of the Yellow Race might or might not be justified, but that it was holding back the development of a valuable part of the Earth's surface was hardly disputable. When to the great staying-power of the Chinese was added a knowledge of European science and technology—rapidly spreading in China—they would become an even greater economic force than they were at present. Among other noteworthy qualities of the Chinese, Mr. Roxby instanced and illustrated their almost unvarying cheerfulness, often shown under the most depressing circumstances, their response to reason, and their trustworthiness.

Mr. Roxby gave several reasons for believing that the case against the partition of China was overwhelmingly strong. On quite general grounds it was surely desirable that the ancient, distinct, and very real civiliza ion of Eastern Asia, as embodied in separate sovereign states, should be perpetuated. But on more specific grounds the importance of preserving the integrity of China should be maintained. The lecturer defended the thesis that the Chinese as a whole were essentially a homogeneous people. But if partition was to be avoided, it could only be by a transform ition of extreme difficulty. It is essential to distinguish between the strength of China regarded as a civilization, with its centre in the organization of the family, and its weakness regarded as a nation. The sense of nationality was only just coming to the Chinese. The greatest item in the task of reconstruction before the creators of a new China was to transform a loosely organized confederacy of families of the clan type into a unified nation-state of the European type. It involved the development of a new system of administration, a new political and legal machinery, a new system of taxation, and the unification of the currency. It must also be remembered that the economic transformation of China, its conversion into perhaps the greatest industrial state in the world, would inevitably involve the development of new social relationships which were not covered by the Confucian Code, hitherto the chief element of Chinese society. If Confucianism were to disappear and nothing else to take its place, there might

indeed be terrible anarchy in China. These were some of the herculean task of reconstituting Chinese civilization.

Now in China there was no natural class of leaders, such as Japan had in the daimios and samurai. China in many ways was an exceedingly democratic country, and her leaders had to be drawn from the people themselves. The student class would have to provide the agents of reform. The autocratic form of government might be maintained, but Yuan Shih K'ai and his successors would have to rely upon the young men who were now being introduced to Western ideas and methods. For this reason the education of "Young China" was a matter of world-wide interest and importance. Its significance was, unfortunately, not at all realized in this country.

A discussion on "The Place of Map Tests in Examinations" was opened by Dr. J. F. Unstead. He considered five classes of such map tests. The first, where everything had to be drawn by the pupil, he considered undesirable. The second, where outline maps with coasts and latitudes and longitudes were given, and on which the rivers and towns, etc., had to be drawn, was better. The third kind, the outline map with coasts, rivers, etc., on which the candidate was asked to fill in the distribution of certain phenomena, he considered very desirable. The fourth type was a map which was filled in, and the candidates were asked to comment upon it as to explain certain things on it—this very admirable type was, unfortunately, rarely used. Finally, a sketch-map illustrating an answer might be asked for, in which the candidate was left to put in what he liked as long as he illustrated the answer. This also he considered good.

Rev. W. J. Barton, Headmaster of Epsom College, considered that the map was all-important in junior classes, but that when you came to seniors the question was more open to debate. Map tests might disappear in the senior examination. This point of view was called in question by many speakers, most of whom seemed to agree with Dr. Unstead, and all urged the necessity for giving maps which require description and explanation rather than outlines for filling in details.

There was also an important discussion on "The Value of Surveying in teaching Geography," in which Mr. Ernest Young, of the County School, Harrow, pointed out why he had insisted on surveying being made an important subject in his school. Methods adopted at this school were sketched by Mr. Richardson and Miss Moll. Most speakers agreed that if surveying could be thoroughly taught it was an excellent school subject, but there was some difference of opinion as to whether the mathematics or the geography master should teach it. The speakers agreed with Mr. Young that surveying was not geography, and that as far as possible no part of the time of geography masters should be diverted from his geographical work, for which he had too little time, by an attempt to teach surveying in hours allocated to geography.

REVIEWS.

EUROPE.

The Home Counties.

'Geological Excursions round London.' By G. M. Davies. London: Murby & Co. 1914. Pp. 156. 3*s.* 6*d. net.*

This little book should prove a useful guide to the geology of the London area. Many of the best sections are described, and the directions for finding

them are given in sufficient detail to satisfy even those who are unfamiliar with the localities. The general treatment is designedly geological, but occasional anthropological and geographical notes add some human interest to the story of the Croydon Bourne, of the wind and water gaps of the North Downs, and to the descriptions of the views from the Addington Hills, Worms Heath, and Leith Hill. Excursions XVI.–XVIII. are almost purely geographical and will be useful to students of the English scarplands. It is interesting to note that a section at Upminster shows the most southerly exposure of boulder clay now visible in England. The book is illustrated by photographs, sketch-maps, sections, and a geological map of the south-east of England.

J. D. F.

ASIA.

The Last Indian Census.

'The Census of India.' Vols. 1 and 2. By E. A. Gait, C.S.I., C.I.E. Calcutta: Superintendent of Government Printing. 5 *Rs.* or 7*s.* 6*d.*

The International Geographical Congress has devoted its attention on more than one occasion to the desirability of extending the census, in however simple a form, to tracts where the conditions do not allow of a detailed enumeration. The authorities in British possessions abroad have not lagged behind in this respect, and in the case of the outlying tracts of India their efforts at each succeeding census have resulted in the omission, in 1911, of none but a few mountain regions on the frontiers. The Indian census would stand out from other operations of this sort by reason of the magnitude of the numbers involved apart from other considerations, but, in the light thrown upon the figures by the admirable comment and analysis contained in this Report, it will be seen that the unique characteristic of the population of India is not its numbers so much as the variety of race, creed, language, and other social traits which it comprises, together with the marked differences in the physical conditions in which its life is passed. This is not the place, however, for touching upon the statistical aspects of Mr. Gait's review, which have received cordial recognition from experts here and in other countries. But those to whom the exposition of this almost overwhelming array of figures does not appeal will find ample compensation in the perusal of the first eighty or ninety pages of the Report, which deal with geographical features having a close and influential bearing upon the main factors of life in India.

The astonishing range of the variety to which reference has just been made is indicated briefly but clearly in these introductory pages. Geologically, for instance, India includes the most modern and some of the most ancient formations, with samples of most of those intervening between those periods. The soil varies, of course, accordingly. The great extremes of heat and cold in the north may be contrasted with the equable but intensely hot temperature which prevails in the peninsula. Over large tracts the annual rainfall is no more than 5 inches, whilst elsewhere it averages 300 inches or more. Nearly three-fourths of the inhabitants live by agriculture or pasture. The distribution of the population on the land, therefore, is in direct relation to the sum total of the physical conditions upon which those means of subsistence depend, that is, upon the configuration of the tract, its soil, and its water-supply. While, therefore, the administrative purposes which the census has to fulfil necessitate the grouping of the statistics by the artificial divisions of provinces and states, the natural divisions of the country have been judiciously

co-ordinated with these when the density of the population is being considered. In determining these groups, the main factor which Mr. Gait, in consultation with the meteorological authorities, has taken into consideration, is the annual rainfall. He is careful to point out, however, that an abundant fall is not by any means an infallible indication of the ability of a tract to support a dense rural population, since it may be counteracted to a greater or less extent by the conformation of the country, the nature of the soil, or political or social circumstances, not to mention the ill-distributed or irregular character of the rainfall itself. The water-supply, again, in an area annually being extended, is no longer dependent upon the rain, and the striking instance is here given of a region in the Panjab, which supported a nomad population of about seven to the mile in 1891, when a large canal system was introduced, and which, in 1911, returned a population averaging 272 per square mile and still on the increase. Here the rainfall is only 13 inches. To take a case in the contrary direction, Lower Burma, with a rainfall of nearly 120 inches, and with large alluvial tracts, falls considerably below the average Indian density, on account of the comparatively recent introduction of settled government and security of property. Taking into account all the disturbing factors, the only general conclusion at which it is safe to arrive is—that in India proper the density of population tends to be greatest where rice is most grown. Mr. Gait draws an interesting comparison between East and West on a text furnished by a German economist to the effect that in his country, and apparently in England also, agriculture alone is unable to support more than 250 persons per square mile. In India, where two-thirds of the people are agricultural, the above proportion is well exceeded in the case of 55 per cent. of the population, and in several regions a large and purely rural population is massed in the ratio of 1000 and over to the mile. It is worth noting, in conclusion, that whilst practically all the net increase of population in India in the last decennium took place amongst densities of less than 450 per mile, and most of it where there were less than 150, there are instances in the most thickly peopled tracts where the growth was greater in the more dense areas than in the rest. Mr. Gait has had the supervision of Indian census operations on three occasions, and the volumes under review bear unimpeachable testimony to his experience, knowledge, and interest in his gigantic task.

J. A. B.

The Philippine Islands.

'The Philippines, Past and Present.' 2 vols. By Dean C. Worcester. London: Mills & Boons, Ltd. 1914. *Illustrations.* 30*s. net.*

The author has been so intimately connected with the subject-matter of these two volumes, both in the capacity of an official and as a resident for the entire space of eighteen years, that a better authority could hardly have been found. His former book, 'The Philippines and their Peoples,' published some sixteen years ago, embodied the results of a naturalist's tour through the islands. The present two volumes read more like a blue-book, describing the long negotiations and relations between the American authorities and the insurgents. There are various points and details into which the general heads ramify, which are handled, as it seems to us, at almost excessive length. For instance, "Was independence promised?" is a question which at an earlier stage may have aroused attention and inquiry, but which in this, a book of the present day, seems to be refuted with superabundant detail and unnecessarily long quotations from official documents and commission reports.

"Insurgent rule" fills more than one chapter, and the particulars of the tortures inflicted by the insurgents on the unfortunate priests and others who fell into their clutches, form a truly gruesome series of episodes. The gradual improvement brought about by the Americans forms a welcome relief to the preceding tale of horrors and misgovernment, though of course it would not be quite fair to omit to mention that here and there, in departments such as those of education, civil government, the administration of justice, the Philippine constabulary, and public order, the new order of things did succeed former attempts on the part of the Spanish to supply the requisite organization, inadequate though these attempts undoubtedly were. The spirit in which the American commissioners and their collaborators have approached the great task of reform may be caught from the following little incident, in which Mr. Taft, afterwards President, was expressing his satisfaction with and admiration of the work done by General Hughes, this officer having displayed an accurate knowledge of a variety of facts which one could hardly have expected an army officer to be familiar with. Mr. Taft said, "General, how do you do it? You have always been a busy man devoted to your profession. How have you managed to accumulate such a remarkable fund of information?" The general smiled his rare smile, and replied, "Governor, I will tell you. I always try to go to bed at night knowing a little more than I did when I got up in the morning." This, opines the author, is a wise plan to follow.

AFRICA.

The Western Borders of Uganda.

'On the Congo Frontier: Exploration and Sport.' By Major E. M. Jack, R.E. 44 *Illustrations and a Map.* London: T. Fisher Unwin. 1914. 10*s.* 6*d. net.*

The western and south-western frontiers of the Uganda Protectorate run through one of the most fascinating regions of Africa. It includes Ruwenzori and its glaciers, and the volcanic range of Mfumbiro (where rise the most distant headstreams of the Nile); Lakes Albert, Edward, and Kivu; the most easterly part of the great Congo forest; healthy uplands seemingly well suited for settlement by Europeans; districts in which elephants, buffaloes, lions, and other big game abound, and barren uninhabited tracts.

It is this wonderful region which Major Jack describes. As member or head of boundary commissions he helped to map the frontier during 1907–8 and 1910–11. The author does not set out technical details, but gives an admirable account of the aspect of the land and the races which dwell therein, together with incidents of travel and sport. The pains and pleasures experienced by the traveller who for the first time escapes from the toils of civilization are graphically portrayed, and Major Jack has the rare gift of describing mountain, plain and lake in a few short sentences which leave a vivid impression on the mind. The opening chapters cover the journey from Mombasa to Lake Edward, whence the author journeyed around Ruwenzori and through the Semliki valley to Lake Albert. Thereafter he was engaged in the survey of that part of the 30th meridian which passes through Uganda—and when Major Jack has to use scientific terms he is good enough to give explanations suited to the lack of knowledge of the layman, who, for example, after reading this book will have no excuse for not knowing what "measuring a base" means.

The second part of the book deals with the Anglo-German frontier, the Mfumbiro mountains, and Lake Kivu. Much of this district was scarcely known previous to the work of the boundary commissions. No part of Lake Kivu is

in British territory, but the British secured from Belgium the right to establish a trading station on the northern shores of the lake, and thither Major Jack went to report on the possible site for such a station and the prospects of trade. To the Mfumbiro mountains the author obviously lost his heart, and little wonder, if weird beauty be the attraction. He claims for them the honour of being the *Lunæ Montes*, whence, according to ancient and mediæval geographers, the Nile issued—and he makes out a fair case. One of the most interesting of his chapters describes Ruanda and its cattle-owning inhabitants, the Batusi, who are of the same stock as the Bahima. Scattered throughout the book are illuminating comments on the mentality of the African, good stories of lion and elephant shooting, and shrewd observations on the activities of missionaries and officials.

Besides a serviceable map, there are many fine photographs and some clever pencil drawings by the author.

F. R. C.

'Morocco.' By Pierre Loti. (London: Werner Laurie. 1914. Pp. xv., 335. *Illustrations.* 7*s.* 6*d. net.*) Pierre Loti's 'Morocco,' the latest of his batch of Oriental travel books, is thin and superficial compared with his 'India' and his 'Egypt.' The title is a little misleading, as practically the whole of the book is taken up with an account of his experiences as an honorary member of the French Mission to Sultan Mulai Hassan at Fez in 1889. The journey is described with all the author's charm of style and literary distinction, and the description of incidents on the journey and the social life of the Moorish capital makes pleasant reading. Considering the shortness of his stay in Morocco—a few weeks only—it says much for the author's sympathetic intuition and trained observation that he gives such a vivid impression of the atmosphere of this fascinating country. We get graphic pictures of the social life of Fez; the author, through his knowledge of Arabic and familiarity with Oriental modes of life, being far better equipped than nine out of ten travellers in Moghreb-el-Aksa. The illustrations, mostly in half-tone and photogravure, are well reproduced.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia.

'Federal Handbook on Australia.' Prepared for the Meeting of the British Association. Edited by G. H. Knibbs, C.M.G. Published by the Commonwealth Government, 1914. Pp. xxi. and 598. *Illustrations and Maps.*

This is the largest of the many handbooks provided for members of the British Association at last year's meeting, for in addition to this one each of the States prepared a separate handbook, and members were overwhelmed with literature wherever they went. In this respect, like in all others, Australia left nothing to be desired in her arrangements for the members of the Association. The present volume is divided into fourteen chapters dealing with various aspects of Australia, and certainly forms the most valuable volume on Australia as a whole that has ever been published. Prof. E. Scott writes on the history of Australia, and Prof. Baldwin Spencer on the aboriginals. The physical geography is treated by Mr. Griffith Taylor, and the geology by Prof. T. W. E. David. Mr. H. A. Hunt deals with the climate, Mr. Maiden with the vegetation, and Prof. W. A. Haswell with the animal life. Other chapters are on astronomy

and geodesy (by Mr. P. Baracchi), mining (by Messrs. E. F. Pitman and A. G. Maitland), agriculture, manufactures, educational policy, and political systems. All the ground is covered by experts, and many data are given which are not readily accessible. Only one or two of the papers contain references to other literature, but to demand a bibliography of Australia, even of modest dimensions, would be asking too much in a handbook. The volume is profusely illustrated, and contains many maps and diagrams. It is much to be hoped that the Commonwealth Government have printed an edition large enough to enable them to put on sale this standard reference work on Australia.

R. N. R. B.

'The Old Whaling Days.' By R. McNab. (Christchurch, etc.: Whitcombe & Tombs. 1913. Pp. xiv. and 508. 12*s.* 6*d.*) This volume deals with the history of New Zealand from 1830 to 1840. It partially overlaps the author's previous work, 'Murihuku,' which terminated with the year 1835, but since that appeared he has had access to fresh sources of information. Moreover, in 1829 "sealing had died away to very small proportions," and bay whaling from 1830 practically took its place. The present volume provides a record of that industry and of the historical incidents directly or indirectly connected with it; the Dominion and students of imperial history owe gratitude to the author for thus rescuing from oblivion these early records of the activities of white men in New Zealand. The close of the period introduces interests wider than those of the whalers. Appendices supply transcriptions of the logs and records of individual vessels and traders, among whose names that of Enderby holds an honourable place in the minds of geographers.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Early Man in Europe.

'The Antiquity of Man in Europe: being the Munro Lectures, 1913.' By Prof. James Geikie. Edinburgh: Oliver & Boyd. 1914. 10*s.* 6*d.* *net.*

Prof. Geikie's book, published in the early summer of last year, really represents our knowledge of the ancient history of man in Europe down to the beginning of the year 1913. He just makes mention of the remarkable Piltdown discovery, but at the time of his reference much less was known about Eoanthropos and its probable geological horizon that was subsequently discovered and set forth by Dr. Smith-Woodward, Mr. Charles Dawson, Mr. Lewis Abbott, and others. Consequently, Prof. Geikie lays most stress as regards ancientry of human remains on the Mauer jaw from the neighbourhood of Heidelberg. This man of Heidelberg, I believe, is classified by Dr. Keith as akin to the Neanderthal species. If so, it would point to that species having originated at a comparatively early stage of man's development. But for the fact that the molars are hypsodont, and consequently much specialized as compared to those of modern man or of Eoanthropos, one would be inclined to attach great importance to the very simian features that distinguish the remainder of this lower jaw.

Prof. Geikie, though his work wants bringing up to date in a few places—so rapidly does our knowledge increase of the antiquity of man in Europe and elsewhere—has nevertheless produced a most interesting and valuable summary of the geological conditions of Europe during the Pleistocene and the opening of the recent or Human period. The present age is not to be called Human because it marks the origin of Man, for that origin must now be put back at

least as far as the Pliocene—at a guess, a million or more years ago—but because it was after the Pleistocene had closed that Man began really to dominate this planet; that he succeeded in colonizing all portions of the Earth's surface except Antarctica and a few remote Oceanic islands; that he was exterminating many species of mammals as a hunter, and beginning to preserve and develop and create others by domestication; that he was chopping down forests with his stone axes, starting bush-fires, damming streams, and otherwise interfering with the surface conditions of the planet which has now almost become his property (save for occasional reminders like the Italian earthquakes).

Prof. Geikie is cautious in his estimates of time, and rightly so. It is well-nigh impossible for geology in its survey of the past to be dogmatic on the question of a few thousand years more or less; or, when one recedes beyond the Secondaries, of a few million. He is also, perhaps, rightly sceptical over the extravagant theories founded on the eoliths. These rudely shaped flints were very probably man's implements in the Pliocene, especially where they are found in association with other evidences of human or quasi-human existence. But when it is asserted that there are Oligocene and Miocene evidences of the existence of an anthropoid, intelligent enough to adapt fragments of stone to his use, one is obliged to suspend one's judgment until much greater evidence can be arrayed in favour of such a theory. That the human genus or even the human family should have come into existence as far back as the later stages of the great Eocene period, is hardly credible. We know that there were small anthropoid apes developing out of the Colobus type of monkey in Upper Egypt in the Oligocene, and that there were anthropoid apes of a rather generalized type in Europe in the succeeding Miocene; or at least the scanty evidence in existence points to such probabilities. But no find of skull, bones, or teeth has yet been made which indicates the existence of any being which could be brought within the Hominid family until the upper horizons of the Pliocene. On the other hand, as Prof. Geikie shows, the Pleistocene period, with its recurrent glacial ages, may have lasted for a million years behind the 40,000 or 50,000 that have elapsed since the last ice-age afflicted Europe. And the Pliocene was in all probability of longer duration than the Pleistocene. Prof. Geikie shows how glacial conditions began to arise in the Arctic regions well within the limits of the Pliocene, how there were icebergs floating in the northern seas when the vegetation of Arctic Europe was still a rich one suggestive of that of the southern United States of to-day. He would also seem to convey the idea that the coming and going of the ice and the recurrence of genial and almost sub-tropical climates a good deal depended on fluctuations in level of the land-surface which either brought northwards the warm-sea currents like the Gulf Stream, or drew down around the coasts of Europe the glacial waters of the Arctic circle. Yet when all is propounded on the lesser problem of the recurrent Ice Ages and intervening recoveries of temperature, no explanation is offered as to why there was permanent ice and snow round the North Pole.

Prof. Geikie does not carry us much further than we have been hitherto led by Dr. Keith in regard to the identification in modern classification of the succeeding types of Man which inhabited Europe during the Pleistocene and the beginning of the recent period. Neither does he seem to have realized the fact that Neanderthal man was a distinct species of comparatively recent specialization, and not the ancestor of modern man, who is more likely descended from Eoanthropos, perhaps conjointly with the Neanderthal type. But this

may be because his lectures were delivered before Dr. Keith's remarkable theory (based on the structure of Neanderthaloid teeth) was published. These reticences do not detract from the soundness of Prof. Geikie's positive information on the geology of the Pleistocene, the duration, the effect, and the extent of the ice-ages and of the remarkable genial intervals between these episodes in the long martyrdom of man. H. H. JOHNSTON.

BEGINNINGS OF THE BRITISH EMPIRE.

'Maritime Enterprise, 1485–1558.' By James A. Williamson. Oxford: Clarendon Press. 1913. *Sketch-maps and Illustrations.* 14*s. net.*

Portugal and Spain opened the way for the expansion of Europe into other continents. England came later into the field. We associate the beginnings of the British Empire and the rise of British naval power with the reign of Elizabeth; but the foundations for the achievements of her reign were laid in her father's. In this, as in other spheres, Henry VIII. left the mark of his strong mind and will on English history. The transition from a feudal England, hankering after continental expansion, to the insular mercantile England, seeking its future on the seas, was begun in his time and his father's. Henry VII. had dreams of emulating Spain and Portugal; under Henry VIII. much was done; the merchant class rose to importance in the State; a navy was developed strong enough to protect England's shores from invasion and to give security to English trade; English explorers, as distinguished from Italians in English service, began their discoveries of "islands far away"; the first attacks on Spanish power by sea were made, and the way thus prepared for the rise of a maritime state. Mr. Williamson's account of all this, although he does not claim a large measure of originality, makes an interesting and valuable book. Commencing with the reign of Henry VII., he narrates on the parallel lines of trade and discovery the growth of our maritime enterprise down to the accession of Elizabeth. This brings within his scope as regards discovery, which is the stronger side of his work, the voyages of the Cabots—the evidence concerning which, and particularly the part played by Sebastian Cabot, he elucidates with great care—the early English voyages to Brazil, the first voyage to the Guinea coast, and the breaking of the Portuguese monopoly there, and the attempt of Willoughby and Chancellor to find a north-east passage to the East, in which Willoughby perished, while Chancellor made his way from the White sea to Moscow, and brought back an invitation to trade with Russia. On the commercial side the story is brought down to the fall of the Hanse, of which Mr. Williamson gives a valuable account. It is interesting at such a moment as this to observe the motives which lay behind these early efforts at expansion. A natural desire to see the New World which was being unveiled played a part. The hope to find a new market for English cloth, and the fascination of the East, towards which the English sought a northern route both east and west, were more important, and perhaps strongest of all was an emulation, both national and royal, of the doings of Spain and Portugal. Mr. Williamson quotes an interesting passage from a play written about 1517, which expresses very well this side of the new imperialism.

Mr. Williamson's book is well and clearly written. It is illustrated with some interesting contemporary maps and pictures. He says very little of the authorities, but his footnotes show extensive acquaintance with the original materials. The work forms a useful introductory chapter to the history of the British Empire. E. A. B.

THE MONTHLY RECORD.

THE SOCIETY.

The Awards for 1915.—The Society's awards for 1915 were decided at the last meeting of the Council, and will be presented at the Anniversary Meeting on May 17. The Founder's Medal has been awarded to Sir Douglas Mawson, for his conduct of the Australian Antarctic Expedition of 1911–14, which has achieved highly important results in several departments of science. The Patron's Medal has been awarded to Dr. Filippo de Filippi, for his great expedition to the Karakoram and Eastern Turkestan in 1913–14, one of the most completely equipped expeditions that ever entered the Himalayas. As will be seen in the reports which have appeared from time to time in the *Geographical Journal*, important results have been achieved in geography, geodesy, geophysics, geology, meteorology, and other departments of science. The Victoria Research Medal has been conferred upon Dr. Hugh Robert Mill, who for many years has done a great deal on behalf of geographical research, in raising the standard of geography in this country by his numerous publications, and by the various researches he has undertaken on behalf of the Society. The other awards have been decided as follows: The Murchison Award to Captain J. K. Davis, who commanded the S.Y. *Aurora* during the time of the Australian Antarctic Expedition, when he proved to be a seaman and commander of exceptional merit; the Back Grant to Mr. C. W. Hobley, C.M.G., for his valuable contributions to the geology and ethnology of British East Africa; the Cuthbert Peek Grant to Mr. A. Grant Ogilvie, for the good work he has already done in geographical investigation and research; and the Gill Memorial to Colonel Hon. C. G. Bruce, M.V.O., who for twenty years has been exploring the Himalayas, and has probably a more extended knowledge of them than any one else.

Honorary Corresponding Members.—At the last meeting of the Council the following two gentlemen were elected Honorary Corresponding Members of the Society: Colonel Don Benjamin Garcia Aparicio, Director of the Argentine Military Geographical Institute; and M. Charles Rabot, editor of *La Géographie*, organ of the Paris Geographical Society, and well known as a glaciologist.

Dr. Sven Hedin.—At the meeting of the Society on March 22, the President made the following statement: "Before proceeding to the ordinary business of the evening, I have to make an unusual, and I think I may say unprecedented, announcement to the Society. We have felt compelled to remove a name from the list of our Honorary Corresponding Members. I shall make no further comments, but read the resolution that has been passed to-day by the Council, having before them the book by Dr. Sven Hedin 'From the Western Front,' which has been published in Sweden, and which is, I regret to say, about to be published in this

country. The resolution is as follows: 'The Council, having become aware that Dr. Sven Hedin, a subject of a neutral state, has identified himself with the King's enemies by his actions and published statements, orders that his name be removed from the list of Honorary Corresponding Members of the Society.' The Council believe that the feeling of the majority of the Fellows of the Society will be with them in taking this step."

The Secretaryship.—As already announced, Dr. Keltie will on March 31 retire from the Secretaryship of the Society which he has held for twenty-three years. He is succeeded both in the posts of secretary and editor by Mr. Arthur R. Hinks, F.R.S. It has been arranged, however, that Dr. Keltie shall remain on the Society's staff as Joint Editor until midsummer, 1917. In any case the retention for a period of Dr. Keltie's unique experience of the affairs of the Society and its relations with geographers throughout the world would have been greatly to the benefit both of his successor and the Society. In the stress of present circumstances, while so much of the time and energy of the officers and staff of the Society, and of Mr. Hinks in particular, are given up to work entrusted to them by the War Office, the Council feel that they are peculiarly fortunate in being able to retain Dr. Keltie's presence and services. D. W. F.

EUROPE.

The Rivers of Sweden.—An instructive sketch of the main features of the fresh-water system of Sweden is given by Dr. Axel Wallén, of the Swedish Hydrographical Office, in a pamphlet issued in connection with the Baltic exhibition at Malmö (Stockholm: P. A. Norstedt, 1914). Dividing the river-basins in the first place into categories of size, he points out that the fourteen with an area exceeding 10,000 kilometres account for 69 per cent. of the area of Sweden. These include the streams of the high mountain region of the north and those draining the great lakes of central Sweden. While the basin of Lake Wener and its effluent almost reaches 50,000 kilometres, the greater number lie between 25,000 and 30,000. The secondary basins, including (among others) those lying within the forest region of northern Sweden and the lowlands further south, fall considerably behind the last of the first group. The Swedish water-system, with its great number of lakes, presents, as a whole, the youthful character due to the transformations of the ice-age, and the undeveloped longitudinal profile of the rivers is associated with an abundance of falls and rapids. The differences in their discharge and fluctuations of level are influenced largely (apart from the amount and distribution of precipitation) by the greater or less degree of the water-storage in lakes or as snow. From the point of view of their hydrological *régime*, the rivers may be divided into groups, corresponding broadly with physical provinces. The melting of the snow being the most important factor influencing the fluctuations of volume, the mountain streams of the north are specially marked by the pronounced series of high stages in spring and early summer, with low water in winter. The difference between exceptional high and low stages is enormous, the maximum discharge being sometimes as much as eighty times the minimum. The forest and coast streams of northern Sweden show much less pronounced variations and a generally smaller discharge. Low water again occurs in winter, but there is an almost equally low stage in summer, due to the more pronounced evaporation. The lowland streams of central Sweden show a

more southern type of fluctuation, with nearly equal high stages in summer and winter, the maximum being reached about April. The discharge is less than in the preceding group, and the range varies greatly with local conditions. The rivers of the Småland upland have the character of the forest streams, modified by the southerly latitude. There is a pronounced low stage in summer and a less marked one in winter, the level being highest in spring. The mean discharge is decidedly greater than in the preceding group. In the extreme south (Schonen), the rivers have a high stage in winter and a low one in summer. Lastly, the great lakes and their effluents form a separate category, with but slight mean yearly variation, and comparatively small discharge owing to the strong evaporation.

ASIA.

Hydrology of the Red River, Tongking.—An elaborate study of the floods of the Red river and the means to be adopted for the lessening of their harmful effects appeared last year in the *Bulletin Economique*, issued under the auspices of the Government of French Indo China. The writer, M. A. Normandin, is chief of the Public Works Department of Indo-China, and although some of his views have since been contested in the same Bulletin, he has done good service in bringing together a useful collection of data on the subject. The great floods of the Red river occur principally in July and August, and are the result of the monsoon rains, supplemented in certain cases by the effect of typhoons. From a study of observed floods and the rate of propagation from above downwards, the writer finds that, as between the main upper course of the river and its principal tributaries, that upper course and the Black river exercise a preponderating and nearly equal effect on the rise of the lower river at Hanoi, while the action of the Clear river is well-nigh insignificant. The equality in the first case is matched by an approximate equality in the catchment areas of the two streams, whereas the slight influence of the Clear river cannot be attributed solely to the smaller area of its basin. As regards the discharge of the Red river, M. Normandin calculates that a level of 11 metres at the gauge at Hanoi would correspond to a discharge of 16,000 cubic metres per second. But he estimates that, if the level were not lowered at Hanoi by the overflow or breaching of the existing dykes higher up, a level exceeding 13 metres at the gauge would be attained during the highest floods, which would give a discharge of over 23,000 cubic metres. This is considerably greater than was estimated by the commission which studied the subject in 1895. In order suitably to compare the principal high floods recorded, it is necessary to make allowance for the loss of water by the breaching of dykes, where this has occurred. By so doing, M. Normandin arrives at the conclusion that the importance of the floods has in no way increased during the past thirty years, as some have maintained, and holds that deforestation has had no important action on the floods. (This is a point on which a divergent opinion has since been expressed.) As regards measures to be adopted to extenuate their ill effects, he examines in turn those which have been recommended from time to time, and concludes that, while it is useless to attempt to withstand the effects of abnormally high floods, something may be effected in the case of more ordinary ones by the use of overflows, by the rectification of the major bed of the river, and by the consolidation of the dykes up to a certain height, without attempting to raise them so as to control exceptional floods.

AFRICA.

Geography in South Africa.—Mr. James Hutcheon sends us a short account of the present position of geography in South Africa, principally in reference to education. Hitherto the study has had to contend against difficulties, evidently of

much the same character as it encountered in this country at the time of the early efforts to raise its status in the educational curriculum, but a movement has lately been set on foot to bring about a better state of things, and the endeavours of those who have advocated a more extensive and rational study of the subject in the schools and colleges of South Africa have already met with some encouragement. The old objection that the subject does not "pay" is being to some extent removed. During the past year the question has been keenly discussed in educational circles, and no fewer than three syllabuses for advanced examinations in geography have been arranged. Courses of instruction for teachers have been provided both by the Provincial and Union Education Departments. Hitherto geography has been taught during only the first two out of the five years' secondary course, but a new departure has been made by the inclusion of the subject as one that may be taken in 1915 by candidates in the junior certificate examination, at the end of their third year. It is also hoped that before long the Matriculation examination at the outset of the B.A. degree course will likewise include geography. For teachers, the Education Department has established vacation courses in the subject, comprising series of lectures illustrated by practical exercises. It also takes a prominent place in the Union Teachers' First Class Certificate Examination, open to graduates desirous of becoming teachers of special subjects. The course extends over eighteen months, and besides passing an examination, the candidates must give evidence of their ability to teach the subject in secondary schools. In 1916, the first examination for the B.A. degree in geography is to take place, and candidates must have gone through the first year's course in geology, and have subsequently studied geography for two years. Much importance is naturally attached to a knowledge of South Africa, though the lack of text-books written from the local point of view has put difficulties in the teacher's way; but the want is now being supplied. The Education Department in Cape Town possesses an up-to-date library of geographical publications, as well as a comprehensive collection of lantern slides. A fine wall map has been prepared, and the question of providing detailed contour maps of the whole country is receiving attention. The foundations of the subject are thus being laid slowly and surely in the secondary schools, and it is mentioned as a promising sign that a geographical tour lasting a fortnight, and extending over 300 miles, was attended last summer by fifteen students of the High School of the South African College, Cape Town. To further a better knowledge of the home country, a movement has been set on foot for the collection of geographical data of all kinds, with a view to the preparation of regional monographs. For this end a number of gentlemen are forming themselves into the nucleus of a geographical society, and a comprehensive schedule has been drawn up as a guide to the inquiries to be made in the several districts. It embraces all departments of the subject, economic as well as physical. The general interest in the whole movement which has evidently been aroused augurs well for its success.

AMERICA.

Hydrographic Work in Canada, 1913-14.—The Annual Report of the Department of Naval Service for 1913-14 has been received. As usual, it contains reports on the Survey of Tides and Currents and on the Hydrographical Survey branch, summarizing the work accomplished during the year. As regards currents, the most important observations were those in the northern passes of British Columbia, notably at Seymour narrows, carried out in the interests of the large coast traffic of that region and also of the international traffic to Alaska. Valuable results were obtained in reference to the tides in Hudson bay and strait. From a series of observations at Ashe inlet in the latter, it was found that the tide in

Hudson strait is similar to that in the Bay of Fundy, and that as the tidal differences between Ashe inlet and St. John, N.B., are remarkably constant, a satisfactory means is available for computing the tide in the strait. Progress was also made towards the provision of tide tables for Nelson and Churchill in Hudson bay by establishing the relation between the tide at those places and at western European ports. Thus the tide at Churchill can be calculated direct from that at Harwich, to which it is remarkably similar, with a constant difference. Of the hydrographic work, that carried out in Hudson bay by a party under Mr. F. Anderson is of interest. This work was done in the new survey steamer *Acadia*, built at Newcastle-on-Tyne, which arrived just in time to be used for the purpose. She was specially strengthened for use in ice, and proved quite successful, though, even so, some plates were seriously indented, showing that merchant vessels will incur risks in navigating the bay and straits unless strengthened. Little ice was met with in the straits on the outward voyage, but closely packed winter ice was encountered, well on in August, 60 miles off Port Nelson; and on the return voyage heavy ice caused serious trouble on October 22, badly damaging a merchant ship. In view of such dangers from ice, it is held to be important to establish depôts of provisions and fuel on the inhospitable shores of the straits. As a result of the surveys carried out, there is now a chart embracing an area of some 45 miles off the entrance to Port Nelson. Other parties were at work during the year on the Pacific coast, in Lakes Superior and Ontario, on the Lower St. Lawrence, and in James bay; a large amount of sounding has been done, and various plans made. In James bay observations were made of the break-up of the ice in Moose and Rupert rivers; that in the former case was marked by a big flood.

AUSTRALASIA AND PACIFIC ISLANDS.

The Southern Ocean.—We have been favoured with a copy of correspondence which has passed between the Governor-General of the Australian Commonwealth, the British Colonial Office and Admiralty, and the Governor-General of the Union of South Africa, with reference to the naming of the ocean which encircles the globe in southern latitudes. The question was raised by the first-named, the Commonwealth Government having pointed out the confusion hitherto existing with regard to the name to be applied to the ocean adjacent to the southern shores of Australia, and urged the desirability of uniformity in the matter. It was referred to the Admiralty, which, after examining the usage adopted in the past by early discoverers, etc., as well as by geographers, recommended the name "Southern ocean" as suitable to be applied to "the ocean bounded on the north by the line joining the southern portions of South America, Africa, Australia, and New Zealand, and on the south by the Antarctic continent." As forming part of this expanse of water, the seas to the south of Australia and New Zealand would thus bear the name suggested. This proposal has since been formally adopted by the Commonwealth and Union Governments. It may be recalled that this very question was raised nearly thirty years ago by Mr. Mackinder, at the Bath meeting of the British Association in 1888 (cf. *Proceedings R.G.S.*, vol. **10**, p. 732), and that the same designation was then proposed for the expanse in question, the importance of which Mr. Mackinder emphasized by speaking of this ring of waters as the "mother of oceans." It is well to remember, however, that any attempt to draw hard and fast lines of partition between the great oceans is hardly scientific, and was deprecated by Mr. Mackinder at the time. Such a division must be recognized as more or less conventional, and ill suited to the requirements of the student of geomorphology, who must take account not merely of the existing distribution of sea and land, but of the general form of the ocean-floor. The limits must be

elastic, variable according to the point of view momentarily adopted. Thus, in studying the Pacific as a physical unit, it would of course be absurd to stop short at a conventional line joining New Zealand to Cape Horn. Regarded, again, as the "mother of oceans," the great southern expanse can have no hard and fast limits to the north, but merges insensibly with the other oceans, which become little more than limbs or outcurves of the parent mass.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Transport of Débris by Running Water.—While investigations of the matter transported in *suspension* by running water are relatively simple, and have been frequently carried out, much less has been done, by reason of the inaccessibility of the channel-bed, to throw light on the transport of *débris* along it. A series of laboratory experiments carried out by Mr. G. K. Gilbert (described in Profess. Paper 86 of the U.S. Geological Survey) marks a distinct step in advance in this study, though it is recognized by their author that the resulting laboratory formulas are not immediately available for the discussion of river problems, being both empiric and complex. The results of the experiments are given in full detail, but the general principles elucidated are summarized at the outset in an abstract. The special object was to determine how the quantity of load is related to the stream's slope and discharge and to the degree of comminution of the *débris*, and in the course of the work these three conditions were separately varied, and the resulting variations of load observed and measured. The sand and gravel used were sorted by sieves into grades of uniform size, and in each experiment a specific load was fed to a stream of specific width and discharge, and measurement made of the slope to which the stream adjusted its bed so as to enable the current to transport the load. S being taken to represent the stream's actual slope, and σ the slope at which it begins to have a capacity for load (called the "competent" slope), that capacity varies as $(S - \sigma)^n$, the value of n depending on conditions. In the experiments its values ranged from 0·93 to 2·37, being greater as the discharge decreases or the *débris* is coarser. Similarly, there is a "competent" discharge (κ) for each combinaton of width, slope, and grade of *débris*, and if the actual discharge is called Q, the stream's capacity varies as $(Q - \kappa)^o$; the observed values of o ranging from 0·81 to 1·24, being greater as the slopes are smaller or the *débris* is coarser. Under like conditions o is less than n, capacity being less sensitive to changes of discharge than to changes of slope. Again, for each combination of width, slope, and discharge there is a limiting fineness of *débris* (ϕ) below which no transportation takes place. In the formula $(F - \phi)^p$, giving the stream's capacity, p was found to vary from 0·50 to 0·62, the values being greater as slopes and discharges are smaller. Capacity is less sensitive to changes in fineness of *débris* than to changes in discharge or slope. As regards form of bed, there is a particular ratio of depth to width, ρ, corresponding to a maximum capacity, and the value of ρ was found to range from 0·5 to 0·04, being greater as slope, discharge, and fineness are less. To make a comparison between capacity and mean velocity (attempts to measure *bed* velocity failed) it was necessary to consider in turn the slope, discharge, and depth as constant, and to work out an exponent of variation in each case. The values have a wide range, being greater as slope, discharge, and fineness are less. If composed of particles of a single size, *débris* is moved less freely than if the particles are of many sizes. In the latter case the larger particles are rolled, some slide, while the multitude make short skips or leaps, this last process grading into suspension. When the bed-load is small, the bed is moulded into ridges comparable to dunes, which travel down-stream after the analogy of moving æolian dunes. As the load increases the bed becomes smooth, but this smooth phase is succeeded by

another rhythmic phase, in which the ridges (now called "anti-dunes") travel upstream. The load carried is a tax on the stream's energy in various ways, thus reducing its capacity; but apart from this, the load is determined by the supply and fineness of the *débris*.

New Cruise of the "Carnegie."—It was announced during February that the *Carnegie*, the special vessel built for the Carnegie Institution of Washington for magnetic research, was expected to sail about March 1 for a cruise of two or three years in the southern hemisphere. Proceeding through the Panama canal, the *Carnegie* will at once go south to 50° S. lat. or more. An English scientist, Mr. E. Kidson, who has been attached to the magnetic laboratory of the Carnegie Institution, will take part in the voyage, and another, Dr. W. F. G. Swan, will accompany the party as far as Panama.

Argentine Meteorological Station at the South Orkneys.—We understand that a new party of meteorologists for this station sailed from Buenos Aires towards the end of January to relieve those stationed there during the past year. The head of the new staff is Mr. Hartwig Basche-Wiig, and the second in charge Mr. Antonio Stuxberg. The value of the work accomplished by the station is fully appreciated by meteorologists, and it is to be hoped that the Argentine Government will continue to support this useful undertaking, so that as long a series of observations as possible may be secured without a break.

HISTORICAL GEOGRAPHY.

The Cartographical work of Giovanni Oliva.—Considerable obscurity has enveloped the cartographical output of the several members of the family of Olives or Oliva, originally natives of Majorca, but afterwards settled in Italy, who laboured at their calling during the sixteenth and first half of the seventeenth century.* But many examples of their work have been brought to light within recent years, and a fair acquaintance with the main facts of their activity has thus been built up. The latest specimen to be unearthed is an elaborate and ornate nautical chart by Joan or Giovanni Oliva, described by Prof. S. Grande in the *Rivista Geografica Italiana* for October, 1914. The inscription states that it was made by "Joan Riczo alias Oliva figlio de mastro dominico in napole año 1588." This inscription brings the map into close association with the chart, preserved in the British Museum (Addit. MS. 9811), the author of which describes himself in almost identical terms as "Joanne Riczo alias Oliva figlio de mastro dominico in Napole a dí 7 de 9bre año 1587," though the similarity of description is not fully brought out by Prof. Grande, who quotes the name as erroneously given by previous writers, though with a caution in respect of its correctness: "Diego Giovanni Oliva," or "Riego alias Oliva." † Various other maps have come down to us as the work of Giovanni Oliva (without mention of the name Riczo, probably derived from his mother), either alone or in association with his brother Francesco; and some writers have doubted whether there were not two Giovannis, but this seems extremely unlikely. From the inscription on a chart by the father, Dominico (1568), it appears that he was in turn son of Jaume Olives of Majorca, himself author of various maps (preserved in the British Museum and elsewhere). The newly discovered map, which

* Oliva appears to be merely an Italianized form of Olives. Productions of Bartolomeo Olives, the first to settle as a cartographer in Italy, are dated from 1532 to 1588, while those of younger representatives of the family reach as late as, or later than, 1659.

† The author of the British Museum chart is also given erroneously by Enrile (Bol. S. G. Italiana, 1905, p. 66), as Ioanne Oliva Ricco.

is on parchment and well preserved, embraces the basin of the Mediterranean and the lands surrounding it. In spite of its fine appearance, its scientific value is not high, for it belongs to a period in which cartography had to a certain extent degenerated into a means of supplying an ornate furniture for the walls of dilettanti. Thus even Italy is shown in outlines far from correct. Little attention is paid to the orography or hydrography of the lands included, but on the other hand the nomenclature is particularly rich, especially for Italy, and the writer concludes his study with a list of all the names entered round the coasts of the peninsula and islands.

GENERAL.

Geographical Society and Board for Colorado.—At the instance of the Governor of Colorado, a meeting of representative citizens took place in October last with a view to taking steps to regularize the geographical nomenclature of the state, various associations and other institutions in the latter being represented. There was a general consensus of opinion in favour of action in the direction indicated, and the result was the formation of "The Colorado Geographic Society," of which the government will be vested in an advisory committee of about thirty; this in turn selecting a group of five, to be known as the "Colorado Geographic Board," and to constitute the working arm of the society. The aim of the board will be to secure a nomenclature that will be appropriate, and that will reflect the romance and adventure of historical and pioneer days in Colorado. No general revision of names will, however, be attempted at present, but attention will be devoted to specific questions calling for settlement—such as the nomenclature of map sheets about to be published by the U.S. Geological Survey, which would otherwise be arranged at Washington—and the collection and systematizing historical data for future use. The first president of the society and chairman of the board is Mr. J. C. Rogers, president of the Colorado Mountain Club.

OBITUARY.

Prof. James Geikie, LL.D., D.C.L., F.R.S.

British geology has lost one of its most honoured representatives in Prof. James Geikie, whose death occurred on March 1, in his seventy-sixth year. Much of his work was from its nature of special interest to geographers no less than to geologists, and some at least of his many publications are indispensable to students of both sciences. He was a consistent and warm supporter of the Royal Scottish Geographical Society from its foundation, was honorary editor of its magazine throughout almost its whole existence, and President of the Society from 1904 to 1910. A son of James Stuart Geikie, of Edinburgh, and younger brother of Sir Archibald Geikie, the deceased professor was born in 1839, and after completing his education at Edinburgh University entered the Geological Survey of Scotland in 1861, receiving promotion to the post of District Surveyor in 1869. His attention was early directed to the more recent of the geological formations represented in the British Isles, and his study of these had its outcome in 1874 in the publication of his classical work, 'The Great Ice Age,' which subsequently passed through two other editions. Like all that came from his pen, it was marked by great thoroughness and by the care with which all his conclusions were based on a solid foundation of

observation. His visit to Gibraltar in 1876 as assistant to his friend Sir Andrew Ramsay, when sent by the Colonial Office to report on the water supply of that British outpost, enabled him to extend his study of the recent geology of Europe, and the results of this and further investigations were put forward in his 'Prehistoric Europe,' published in 1881. In 1882 he succeeded his brother, Sir Archibald, as Murchison Professor of Geology in Edinburgh University. As a student of the latest phases of the geological record his attention was necessarily attracted to questions bearing on the appearance of Man on the globe—a subject treated of in several of his books, including the latest of all, reviewed in the present number (p. 333, *supra*). His range of interests was wide, and others of his writings were concerned rather with the more general and physical side of his subject. Among these his 'Earth Sculpture' (first published in 1898), 'Structural and Field Geology' (1905 and 1908), and 'Mountains: their Origin, Growth, and Decay,' have a special interest for the physical geographer.

Frank Thomas Bullen.

The well-known lecturer, and writer of stirring sea stories, Mr. Frank T. Bullen, who died towards the end of February, was a Fellow of this Society from 1898 until a couple of years ago. A son of Mr. F. R. Bullen, of Crewkerne, Dorset, he led a roving and adventurous life from quite an early age, and many of the most thrilling episodes in his books were the records of his own experiences After various adventures on shore he went to sea in 1869, and for some years roughed it in various capacities in the merchant service, suffering great hardships, as vividly described in 'The Log of a Sea Waif' and other books. From 1883 till 1899 he was a junior clerk in the Meteorological Office. He was keenly interested in bettering the condition and raising the moral tone of our merchant seamen, and many of his books were of a semi-religious character. In his latter years he was known as a successful lecturer and a writer of miscellaneous stories and articles in additionto his books. He had lived for some years at Melbourne, near Cambridge.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Eighth Meeting, February 22, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Presentation of the Cullum Gold Medal to the Secretary.

The President: Before we come to the ordinary business of the evening, we have a very pleasing ceremony to witness. The American Geographical Society of New York have been good enough to recognize the great services that have been rendered to Geography by our Secretary, Dr Keltie, during his long term of office here by according him the Cullum Gold Medal, which I believe is very rarely accorded except to most distinguished geographers. In addition to that, His Excellency the American Ambassador has been good enough to come here to-night at the request of the Geographical Society of New York to present that medal to Dr. Keltie. I will ask His Excellency to do so.

H.E. The American Ambassador addressing Dr. Keltie: I have laid upon me by the American Geographical Society of New York the very agreeable and

honourable duty of presenting to you, sir, their Cullum Gold Medal for conspicuous service to geographical science. It is presented to you in recognition of your long and eminent labours as the Secretary of the Royal Geographical Society, as editor of the Society's *Journal*, and as a writer on geographical subjects—whose writings have very greatly enlarged the knowledge and widened the vision of a whole generation of readers. The *Journal*, under your leadership, has developed and broadened with the development of the Society under your faithful labours as Secretary. I need not say that this medal comes also with the greeting of the American Society to this Society; and, while it is awarded to you personally, it brings with it the compliments of the American Society to the Royal Geographical Society.

It is the more agreeable duty to me to deliver this medal this evening because it happens to be the evening of the anniversary of the birth of Washington, which gives to the Americans a patriotic interest to the day; and we have now entered the beginning of another century of peace between our two peoples. I have great pleasure in making this presentation in the name of the American Geographical Society of New York.

Dr. Scott Keltie: Your Excellency, I beg you to convey to the Council of the American Geographical Society my deep appreciation of the honour they have done me in awarding me the Cullum Gold Medal, an honour enhanced, I venture to think, by its being presented through the Ambassador of a great nation, the spirit of whose culture, notwithstanding the infusion of many other racial types, is essentially Anglo-Saxon. I am sensible of the value of the honour. It is not awarded every year, and among the seven previous recipients are such distinguished names as those of Scott, Nansen, Peary, Amundsen, and Shackleton. I ought to feel proud at being allotted a place in such distinguished company. Moreover, I cannot but be gratified that so competent a body as the Council of the leading Geographical Society of the New World should adopt this method of expressing their conviction that during the last thirty years my efforts to promote the objects of this great Society, and to improve the position of geography in England, have achieved a certain measure of success.

Sir William Macgregor: May I be allowed to say a word or two in respect of the ceremony so gracefully performed at the commencement of this evening. It was a very great pleasure to me, and I am quite sure it would be a very great pleasure to every one here, to see such an honour conferred on our old friend Dr. Scott Keltie. I am sure all the ladies here know very well how a gem is set off by the setting. Dr. Scott Keltie has had a real gem conferred upon him to-night, and its setting consists of the graceful way in which it was presented by H.E. the Ambassador of the United States.

Elections.—*Miss Norah Battye; Lieut.-Colonel Boris Roustam Bek; William Benstead; Miss Kathleen M. Crosse; Miss Mary L. Jobe; John E. Moss; Mrs. A. I. Brooke Robinson; Julien Rothery; E. G. Sahlin.*

The paper read was:—

"European Influence in the Pacific." By Sir Everard F. im Thurn, K.C.M.G., C.B.

Ninth Meeting, February 24, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

The paper read was:—

"Africa after the War." By Sir Harry H. Johnston, G.C.M.G., K.C.B.

Tenth Meeting, March 8, 1915.—DOUGLAS W. FRESHFIELD, Esq., President, in the Chair.

ELECTIONS.—*Henry Clare Cardew; Mrs. William Gordon; William Harvie; Lieut. Francis P. Nosworthy; Sir Frederick George Painter; Henry Joseph Ryan; Major Edward Aldborough Tandy, R.E.*

The paper read was :—

"Our Fisheries and their Geography." By Prof. Stanley Gardiner, F.R.S.

Afternoon Meeting, Thursday, March 4, 1915.—Dr. J. W. EVANS in the Chair.

The paper read was :—

"Suess's Classification of the Eurasian Mountains." By Prof. J. W. Gregory, F.R.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science (s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Denmark—Hydrography. *G. Ts.* **22** (1914): 225–284. **Jacobsen.**

Hydrografiske Undersøgelser i danske Farvande. Af J. P. Jacobsen. *Sketch-maps and Diagrams.*

Denmark—Mean sea-level. **Madsen and Petersen.**

De Danske Kysters Middelvandstande og disses reduktion til "Stille." Polhøjdevariationens Indflydelse. Udgivet af V. H. O. Madsen, bearbejdet af N. M. Petersen. (Den Danske Gradmaaling. Ny Række. Hefte Nr. 13.) Copenhagen, 1914. Size 11 × 9, pp. 118. *Diagrams.*

Europe—Food-supply. *J.G.* **13** (1914): 97–101. **Finch.**
War and the Food Supply in Europe. By V. C. Finch. *Maps.*
The maps show the distribution of wheat, rye (these two nearly complementary to each other), potatoes, swine, and cattle.

Europe—Political. **Gibbons.**
The new map of Europe, 1911–1914. A study of contemporary European national movements and wars. By Dr. Herbert Adams Gibbons. London: Duckworth & Co., 1914. Size 8 × 5, pp. xiv. and 382. *Price 6s. net. Presented.*

France—Lille and Nancy. *La G., B.S.G. (Paris)* **30** (1914): 103–122. **Blanchard.**
Deux grandes villes françaises: Lille et Nancy. By Raoul Blanchard.

Germany. *La G., B.S.G. (Paris)* **30** (1914): 89–102. **Blondel.**
L'Allemagne, ses ressources et ses ambitions. By Georges Blondel.

Iceland—Physical geography and botany. **Thoroddsen.**
The Botany of Iceland. Edited by L. Kolderup Rosenvinge and Eug. Warming. Part I. 2. An account of the Physical Geography of Iceland with special reference to the Plant Life. By Th. Thoroddsen. Copenhagen: J. Frimodt (London: John Wheldon & Co.), 1914. Size 10 × 7, pp. 191–343. *Maps and Illustrations.*

Italy—Adige. *Archivio l'Alto Adige* **9** (1914): 372–384. **Toni.**
L'Alto Adige nelle antiche carte. By Ettore de Toni.

Italy—Tuscany—Morphology. *Riv. G. Italiana* **21** (1914): 534–538. **Gasperi.**
Sulle forme d'erosione nelle Crete Senesi. By G. B. de Gasperi. *Illustrations.*

Italy—Weather service. **Eredia.**
L'Organizzazione del servizio dei presagi del tempo in Italia. By Filippo Eredia. (Estratto dalla *Rivista Meteorico-Agraria*, Anno XXXV., n. 29.) Rome, 1914. Size 10½ × 7, pp. 50.

Mediterranean—Meteorology. **Marini.**
Carte di Pressione e di Venti per il Bacino Mediterraneo. By L. Marini. (Estratto dagli *Annali Idrografici*, vol. 9°, Anno 1913–1914.) Genoa, 1914. Size 12 × 8½, pp. 50. *Maps.*

Northern Europe—Hydrography. **Witting.**
Öfversigt Finska Vetenskaps-Societetens Förhandlingar **56**, 1913–1914 (1914): No. 3, pp. 10.
Hydrografisk-Biologiska Hafsundersökningarna under år 1913. Redogörelse afgifven af Rolf Witting. [Also in Finnish.]

Norway—Christiania fjord. **Øyen.**
Förhandlingar Videnskapsselskapet Kristiania, 1913 (1914): No. 9, pp. 1–9.
Terraces and littoral phenomena in Rauer. By P. A. Øyen. *Illustrations.*

Norway—Geology. **Goldschmidt.**
Skrifter Videnskapsselsk. Kristiania, Mat.-Naturvid. Kl. **2**, 1913 (1914): No. 9, pp. 27.
Das Devongebiet am Röragen bei Röros. Von V. M. Goldschmidt. Mit einem paläobotanischen Beitrag: Die Pflanzenreste der Röragen-Ablagerung, von A. G. Nathorst. *Maps, Illustrations, and Diagrams.*

Norway—Glaciation. **Hansen.**
Skrifter Videnskapsselsk. Kristiania, Mat.-Naturvid. Kl. **1**, 1913 (1914): No. 2, pp. 155.
Fra istiderne. Sørlandet. Av Andr. M. Hansen. *Maps.*

Norway—Glaciers. **Øyen.**
Förhandlingar Videnskapsselsk. Kristiania, 1913 (1914): No. 3, pp. 1–14; No. 4, pp. 1–14.
Variationer ved norske bræer 1910–1911; Ditto, 1911–12. Af P. A. Øyen.

Russia. **Wood.**
The tourist's Russia. By Ruth Kedzie Wood. New York: Dodd, Mead & Co., 1912. Size 7½ × 5, pp. 254. *Map and Illustrations. Price 5s. 6d. net. Presented.*

Russia. *National G. Mag.* **26** (1914): 423–520. **Grosvenor.**
Young Russia, the Land of unlimited possibilities. By Gilbert H. Grosvenor. *Photographs.*

Russia—Finland—Hydrology. **Witting.**

Jahrbuch 1913, enthaltend Hydrographische Beobachtungen in den Finland umgebenden Meeren. Herausgegeben von Dr. Rolf Witting. (Societas Scientiarum Fennica. Finlandische Hydrographisch-Biologische Untersuchungen, No. 13.) Helsingfors, 1914. Size 13 × 10, pp. 134. *Maps.*

Russia—Finland—Hydrology. **Witting.**

Öfversigt Finska Vetenskaps-Societetens Förhandlingar **56** (1914): No. 12, pp. 26.

Om vattenståndsiakttagelserna vid särskilda kustorter, af Rolf Witting. *Illustrations.*

Russia—Geography and History. *Popular Sc. Monthly* **86** (1915): 5–24. **Lingelbach.**

Geography in Russian History. By William E. Lingelbach.

Russia—Historical. **Michell and others.**

The Chronicle of Novgorod, 1016–1471. Translated from the Russian by Robert Michell and Dr. Nevill Forbes, with an Introduction by Dr. C. Raymond Beazley, and an account of the text by A. A. Shakhmatov. Camden third series, vol. 25. London: The Camden Society, 1914. Size 9 × 7, pp. xliv. and 237. *Presented.*

Russia—Urals. *Mém. S. Physique Genève* **38** (1914): 69–168. **Duparc and Tikanowitch.**

Recherches géologiques et pétrographiques sur l'Oural du Nord, le bassin des rivières Wagran et Kakwa. Par Louis Duparc et Marguerite Tikanowitch. *Illustrations.*

Spain—Picos de Europa. *B.R.S.G.* (*Madrid*) **11** (1914): 321–324. **Inclán.**

Los Picos de Europa y de Tres Aguas: su hidrografía. By Pío Suárez Inclán. *Map.*

Sweden—Stockholm. *Ymer*, 1914: 271–276. **Elander.**

Innebörden af Stockholms läge vid tiden för stadens uppkomst. Af Rudolf Elander.

On the importance of the site of Stockholm.

Switzerland—Lötschberg. **Stebler.**

Sonnige Halden am Lötschberg. Von F. G. Stebler. (Monografien aus den Schweizeralpen.) (Beilage zum Jahrbuch des S.A.C., Band 49, 1913.) [Zürich: Achmann and Scheller, (1913).] Size 10 × 7, pp. viii. and 118. *Illustrations and Sketch-map.*

Switzerland—Place-names. **Sprecher.**

Jb. Schweizer Alpenclub **49**, 1913 (1914): 170–196.

Ueber Ortsnamen des Taminagebietes. Von F. W. Sprecher. *Illustrations.*

Switzerland—Zürich. *Jb. Schweizer Alpenclub* **49**, 1913 (1914): 197–213. **Heim.**

Der Uto. Von Alb. Heim. *Illustrations.*

On the physical history of the ridge west of the Lake of Zürich.

United Kingdom—Derbyshire—Derwent. **Sandeman.**

Min. of Proc. I. Civil Engineers **194** (1914): 20–152.

Measurement of the flow of the river Derwent, Derbyshire. By Edward Sandeman. *Sketch-maps and Diagrams.*

United Kingdom—Fisheries. *Nature* **94** (1915): 709–710. ———

The Sea Fisheries and the War. By J. J. *Diagram.*

United Kingdom—Geodesy. **Close.**

Notes on the Geodesy of the British Isles. By Colonel C. F. Close. (Ordnance Survey. Professional Papers, New Series, No. 3.) London, 1914. Size 12 × 10, pp. 31. *Price* 1*s.* 6*d.* *Maps.*

United Kingdom—Scotland—Caithness. **Crampton and others.**

The Geology of Caithness. (Sheets 110 and 116, with parts of 109, 115, and 117.) By C. B. Crampton and R. G. Carruthers; with contributions by John Horne, B. N. Peach, John S. Flett, and E. M. Anderson. (Memoirs of the Geological Survey, Scotland.) Edinburgh, 1914. Size 9½ × 6, pp. viii. and 194. *Maps and Illustrations.*

United Kingdom—Scotland—Geology. **Horne, Hinxman, and others.**

The Geology of the Country round Beauly and Inverness: including a part of the Black Isle. (Explanation of Sheet 83.) By J. Horne and L. W. Hinxman. With contributions by B. N. Peach and E. H. Cunningham Craig, and

Petrographical Notes by J. S. Flett. (Memoirs of the Geological Survey, Scotland.) Edinburgh, 1914. Size 9½ × 6, pp. 108. *Illustrations.*

United Kingdom—Scotland—Loch Creran. **Bailey.**
Quart. J. Geological S. **70** (1914): 321–327.
The Ballachulish fold near the head of Loch Creran (Argyllshire). By Edward Battersby Bailey. *Maps.*

United Kingdom—Scotland—Rainfall. *J. Scottish Met. S.* **16** (1914): 312–319. **Watt.**
The Annual Rainfall of Scotland and the limits within which it fluctuates. By A. Watt.

United Kingdom—Scotland—Water-supply. **Reid.**
Min. of Proc. I. Civil Engineers **194** (1914): 3–19.
The yield of various catchment areas in Scotland. By William Carstairs Reid. *Sketch-maps.*

Western Europe—Water-supply. **[Strahan.]**
Notes on Sources of Temporary Water Supply in the South of England and Neighbouring Parts of the Continent. (Geological Survey and Museum.) London, 1914. Size 9½ × 6, pp. 13. *Diagrams. Price 2d.*

ASIA.

Arabia—Yemen. **Bury.**
Arabia infelix, or the Turks in Yamen. By G. Wyman Bury. London: Macmillan & Co., 1915. Size 9 × 5½, pp. x. and 214. *Sketch-maps and Illustrations. Price 7s. 6d. net. Presented.*

India—Indigo. *J.R.S. Arts* **63** (1915): 117–129. **Perkin.**
The Indian Indigo Industry. By F. Mollwo Perkin.

Japan—Geomorphology. *Ann. Ass. American Geographers* **3** (1913): 43–61. **Cushing.**
Coastal plains and Block mountains in Japan. By Sumner W. Cushing. *Sections.*

Persian gulf—Koweit. ———
Persian Gulf. Report for the Year 1913–14 on the Trade of Koweit. (Dipl. and Consular Reports. Annual Series No. 5405.) London, 1914. Size 9½ × 6, pp. 20. *Price 2d. Sketch-map.*

Russia—Siberia—Yenesei. **Haviland.**
A summer on the Yenesei (1914). By Maud D. Haviland. London: E. Arnold, 1915. Size 9 × 6, pp. xii. and 328. *Illustrations. Price 10s. 6d. net. Presented.*

Turkey—Asia Minor—Cappadocia. **Jerphanion.**
La G., B.S.G. (Paris) **30** (1914): 1–10.
La région d'Urgub (Cappadoce). Par G. de Jerphanion. *Illustrations.*

AFRICA.

Abyssinia—Climate. *B.R.S.G. (Rome)* V., **3** (1914): 845–884. **Eredia and De Castro.**
Sulla climatologia dell' Etiopia. By Filippo Eredia and Lincoln de Castro. *Diagrams and Illustrations. Also separate copy.*

Algerian Sahara. *B.S.G. d'Alger, etc.* **18** (1913): 601–633. **Martin.**
Reconnaissance de la région sud et ouest de l'Erg Ighidi. Rapport du Capitaine Martin.

Egypt—Historical. *Palestine Explor. Fund, Quart. Statement* (1915): 22–29. **Trumper.**
The Route of the Exodus: from Pithon to Marah. By Victor L. Trumper. *Sketch-map.*
The writer endeavours to trace the route by the aid of recent research and personal knowledge of the ground.

French West Africa—Senegal. *La G., B.S.G. (Paris)* **29** (1914): 397–400. **Renaud.**
Amélioration de l'embouchure du Senegal. Par J. Renaud.

Morocco. *B.S.G. d'Alger, etc.* **18** (1913): 678–695. **Lapin.**
Impressions du bled marocain. Par — Lapin.

Nigeria—Hausa language **Parsons.**
A Hausa phrase book with medical and scientific vocabularies. By Allan C. Parsons. London: H. Milford, 1915. Size 7 × 5, pp. 164. *Price 7s. 6d. net. Presented.*

Portuguese East Africa—Climate. *S. African J. Sc.* **10** (1914): 284–344. **Teixeira.**
Alguns elementos para o estudo do clima de Lourenço Marques. Por Augusto de Almeida Teixeira. *Diagrams.*

Red Sea—Historical. *Cairo Sc. J.* **8** (1914): 173–175. **Crossland.**
De Castro's Red Sea Log. By Cyril Crossland.
Notes on this well-known Portuguese "Roteiro" of the sixteenth century, which has lately been translated, but not yet published, by Mr. R. S. Whiteway. The Portuguese text was printed by Carvalho in 1833, other logs by the same hand following in 1843 and 1882.

Tunis. *G. Ts.* **22** (1914): 234–246, 261–275. **Olufsen.**
Tunisiske Landskaber og deres Økonomi under det franske Herredømme. Af Ole Olufsen. *Illustrations.*

NORTH AMERICA.

Canada. **Mitchell.**
In Western Canada before the war. A study of communities. By E. B. Mitchell. London: J. Murray, 1915. Size 7½ × 5, pp. xii. and 206. *Sketch-map. Price* 5*s. net. Presented.*

Canada—Rockies. *Appalachia* **13** (1914): 114–131. **Fay.**
The Canadian Rockies to Date. By Charles E. Fay. *Illustrations.*

Lake Superior region. *B. American G.S.* **46** (1914): 881–916. **Miller.**
Some Geographic Influences of the Lake Superior Iron Ores. By George J. Miller. *Sketch-maps and Diagrams.*

Mexico—Historical. **Maniau and Carreño.**
Compendio de la Historia de la Real Hacienda de Nueva España, escrito en el año de 1794, por D. Joaquim Maniau. Con notas y comentarios de Alberto M. Carreño. (Sociedad Mexicana de Geografiá y Estadística.) Mexico, 1914. Size 9 × 6½, pp. 148.

Pacific Coast. **Fraser.**
Seven years on the Pacific Coast. By Mrs. Hugh Fraser and Hugh C. Fraser. London: T. Werner Laurie, [1915]. Size 9 × 6, pp. xii. and 392. *Illustrations. Price* 12*s.* 6*d. net. Presented.*

United States—California and Colorado. *Appalachia* **13** (1914): 103–114. **Bent.**
A Visit to the Higher Mountains of California and Colorado. By Allen H. Bent. *Illustrations.*

United States—Cities. *B. American G.S.* **47** (1915): 19–37. **Jefferson.**
How American Cities Grow. By Mark Jefferson. *Map and Diagrams.*

United States—Cotton. **[Harris.]**
Cotton Production, 1913. Department of Commerce. Bureau of the Census. Bulletin 125. Washington, 1914. Size 11½ × 9, pp. 10. *Maps.*

United States—Immigrants. *National G. Mag.* **26** (1914): 265–271. ———
The Foreign Born in the United States. *Diagrams.*

United States—Indiana—Loess. *Science* **41** (1915): 104–108. **Shaw.**
On the Origin of the Loess of South-western Indiana. By Eugene Wesley Shaw.

United States—Maine—Mount Desert island. **Dorr, Forbush, and Fernald.**
National G. Mag. **26** (1914): 75–89.
The Unique Island of Mount Desert. By George B. Dorr, Ernest H. Forbush, and M. L. Fernald. *Illustrations.*
A considerable area on this island, which possesses striking scenery and forms an important resting point for bird migrants, has been secured for the public by an association formed for the purpose.

United States—Ohio—Lake Craigton. *American J. Sc.* **38** (1914): 432–436. **Leverett.**
Observations on Craigton Lake. By Frank Leverett. *Sketch-map.*
Discusses the relations of the lake to features due to the ancient ice.

United States—Western—Climate. *B. American G.S.* **47** (1915): 1–19. **Reed.**
Climatic Provinces of the Western United States. By William Gardner Reed. *Map and Diagrams.*

United States—Wisconsin. **Whitbeck.**

Ann. Ass. Amer. Geographers 3 (1913): 62–87.

Economic aspects of the glaciation of Wisconsin. By R. H. Whitbeck. *Sketch-maps and Diagrams.*

CENTRAL AND SOUTH AMERICA.

Brazil—Bahia. *Rev. J.G. e Historico Bahia* 9 (1914): 25–31. **Souza.**

Em torno da Carta Geographica da Bahia. By Bernardino de Souza.

Project for the preparation of a large-scale map of the state.

La Plata river—Hydrology. **Carlésimo**

B. Obras Públicas de la República Argentina 9 (1914): 29–91.

Dirección General de Obras Hidráulicas. Canalización del Río de La Plata a su desembocadura. By J. Carlésimo. *Diagrams.*

Will be noticed in the Monthly Record.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Mountains and Vegetation. **Cambage.**

J. and P.R.S. New South Wales 48 (1914): 267–280.

Mountains of Eastern Australia and their effect on the Native Vegetation. By R. H. Cambage. *Map.*

Australia—New South Wales—Cooma. **Browne.**

J. and P.R.S. New South Wales 48 (1914): 172–222.

The Geology of the Cooma District, N.S.W., Part I. By W. R. Browne. *Map and Illustrations.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Dew-ponds. **Martin.**

Dew-ponds. History, observation and experiment. By Edward A. Martin. London: T. Werner Laurie, [1915]. Size 7½ × 5, pp. 208. *Illustrations. Price 6s. net. Presented.*

Geomorphology—Denudation. *Science* 40 (1914): 933–934. **Keyes.**

Rate of Continental Denudation. By Charles Keyes.

See Monthly Record, March. The writer's contentions are criticised in a subsequent number of *Science.*

Rivers. *Ann. Ass. American Geographers* 3 (1913): 3–28. **Davis.**

Meandering valleys and underfit rivers. By W. M. Davis. *Diagrams.*

Zoogeography. *Ann. Ass. American Geographers* 3 (1913): 29–42. **Shelford.**

The significance of evaporation in animal geography. By V. E. Shelford.

BIOGRAPHY.

Forest. **Forest.**

A Walloon family in America. Lockwood de Forest and his forbears, 1500–1848. By Mrs. Robert W. de Forest. Together with: A voyage to Guiana, being the Journal of Jesse de Forest and his Colonists, 1623–1625. 2 vols. Boston: H. Mifflin Comp., 1914. Size 10 × 6½, pp. (vol. 1) xx. and 314; (vol. 2) x. and 400. *Portraits, Sketch-maps, and Illustrations. Presented.*

A separate copy of the 'Voyage to Guiana" has also been received.

Macarthur. **Onslow.**

Some early records of the Macarthurs of Camden. Edited by Sibella Macarthur Onslow. Sydney: Angus & Robertson, 1914. Size 9 × 6, pp. vi. and 496. *Facsimiles and Illustrations. Presented by Earl Curzon of Kedleston.*

John Macarthur of Camden, N.S.W., introduced the merino sheep into Australia and founded the Australian wool trade.

Pigneau. *La G., B.S.G. (Paris)* 30 (1914): 68–77. **Maitre.**

Pierre Pigneau, évêque d'Adran, initiateur de la politique française en Indochine. Son œuvre, d'après les archives françaises et annamites, par Cl. E. Maitre.

Pigneau was born in 1741. A museum was last year inaugurated in his honour at Origny en Thiérache, in the house in which he was born (same journal, pp. 57–67).

Soto. **Malone.**

Hernando De Soto. By Walter Malone. London: G. P. Putnam's Sons, 1914. Size 8½ × 5½, pp. xx. and 632. *Price 12s. 6d. net. Presented.*

De Soto's career is here set forth in verse.

GENERAL.

Education—Text-book. **Franklin and others.**

The Atlas geographies. Junior geography. The British Empire beyond the seas. By Thomas Franklin, E. D. Griffiths, and Ernest R. Shearmur. Edinburgh, etc.: W. & A. K. Johnston, [1915]. Size 10 × 7, pp. viii. and 50. *Maps. Price 10d. net. Presented.*

Education—Text-book. **Golding.**

An introduction to General Geography. By Alec A. Golding. Cambridge: University Press, 1915. Size 8½ × 5½, pp. x. and 222. *Sketch-maps, Sections, and Diagrams. Price 4s. Presented.*

Geography—Field work. *J.G.* **12** (1914): 345–350. **Tower.**

The Question of Field Work in Geography. By Walter S. Tower.

Travel. **Roxby.**

Albert Kahn Travelling Fellowships. Report to the Trustees. By P. M. Roxby. London: University of London Press, 1914. Size 8½ × 5½, pp. ii. and 74.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles—England and Wales. **Lloyd.**

Outline Geological Map of England and Wales. Scale 1: 1,900,800 or 1 inch to 30 stat. miles. Size 15 by 12 inches. Issued by John Lloyd, 15, Chepstow Place, London, W. *Presented by John Lloyd, Esq.*

A sketch-map coloured geologically with a corresponding outline in black and white.

British Isles—London. **E. Stanford, Ltd.**

A map showing proposed Railways, Tramways, and other schemes affecting London in connection with Bills where Plans have been deposited in Parliament, Session 1914–15. Scale 1; 63,360 or 1 inch to 1 stat. mile. Size 20 by 19 inches. London: Edward Stanford, Ltd., 1915.

Europe. **Belloc.**

Land and Water Map of the War. Drawn under the direction of Hilaire Belloc. Scale 1: 3,168,000 or 1 inch to 50 stat. miles. Size 30 by 39 inches. London: "Land and Water," [1915]. *Price, mounted on linen, with explanatory article by Hilaire Belloc, 2s. 6d. net.*

This is hardly a topographical map, but more of the character of a diagram, boldly drawn to emphasize special features having an important bearing in connection with present military operations; and as such it has considerable merit. The part of Europe included extends from the north of Scotland and southern Norway and Sweden to Greece and the Dardanelles, and from the Bay of Biscay to Odessa; but only the actual theatres of war have been dealt with in any detail. The countries at war are marked off by a broad black line, and further distinguished by a white background, while the neutral countries are tinted grey. The three important features, from a military point of view, which have received special attention are communications, natural obstacles, and fortresses. As regards communications, the principal roads and railways are shown, the former in red and the latter in green. Rivers are in blue, where they are likely to serve as obstacles they are marked by a broad line, and where they cease to be obstacles by a thin blue line. Where mountain ranges are obstacles they are shown by two tints of brown, with clear white lines to indicate passes Marshes of any considerable extent, and canals, are shown by the ordinary symbols. Fortified zones and fortresses are in red. Industrial areas are indicated by diagonal lines.

The map is specially intended as a companion to the articles on the war which are appearing in *Land and Water;* and Mr. Hilaire Belloc has written an introduction to it, which also contains an index to the names of places on the map.

Europe. **Lloyd.**

Sketch-map of the Seat of War, 1914. Western area. By John Lloyd. Scale 1: 2,851,200 or 1 inch to 45 stat. miles. Size 11 by 15 inches.—Geological map of the Seat of War, 1914. Western area. By John Lloyd. Scale 1: 2,851,200 or

1 inch to 45 stat. miles. Size 11 by 15 inches.—Sketch-map of the Seat of War. Eastern area. By John Lloyd. Scale 1:6,082,560 or 1 inch to 96 stat. miles. Size 15 by 12 inches. London, 1914. *Presented by John Lloyd, Esq.*

A portfolio containing the following maps: (1) a geologically coloured sketch-map of a large part of western Europe, extending from the Baltic sea to Switzerland, and from the eastern part of England to Prague; with another in outline of the same area on the same scale in black, showing only the outlines of geological formations, and instructions for colouring according to the coloured copy. (2) A sketch-map of the same part of Europe included in the former map in black and white, without the geological outlines, but with most important place-names boldly printed, and mountain ranges roughly indicated in hachures. (3) A similar kind of outline sketch-map of the eastern theatre of war, extending from the Baltic to the Mediterranean, and from Italy to the Crimea.

ASIA.

Asia. **E. Stanford, Ltd.**

Stanford's War Maps, No. 10. [The Frontier Regions of Russia, Turkey, and Persia.] Scale 1:1,000,000 or 1 inch to 15·78 stat. miles. Size 20 by 28 inches. London: Edward Stanford, Ltd., 1915. *Price* 2*s.* 6*d.*

This map extends from lat. 38° 50′ to 42° 15′ N., and from long. 38° 30′ to 46° 40′ E. It thus includes the frontier region of Russia, Turkey, and Persia between the Black sea and Lake Urmia, with Mount Ararat and Lake Van, which is now frequently referred to in the Press in connection with Russo-Turkish military operations; and it should therefore be useful for reference at the present time. It is based upon the map of Armenia prepared in 1901 by Messrs. Lynch and Oswald, but has been carefully revised and has had railways and other information added. Relief is shown by shading in brown, water blue, and the international boundaries by red, green, and yellow. There is a considerable amount of detail, and quite a large number of names are given, without the effect of overcrowding, so that small places that do not usually appear on ordinary maps may be found upon this map.

Federated Malay States. **Surveyor-General, F.M.S.**

Topographical Survey of the Federated Malay States. Scale 1:63,360 or 1 inch to 1 stat. mile. Sheets: 2-I 16, Lenggong, Perak; 2-M 4, Kuala Kangsar, Perak; 2-M 8, Gunong Bubu, Perak. Size 18 by 18 inches. Kuala Lumpur: Central Survey Office, 1914. *Price* $2.50 *each sheet. Presented by the Surveyor-General, Federated Malay States.*

These three sheets come one above the other, and together extend from lat. 4° 45′ to 5° 45′ N., and long. 100° 45′ to 101° E. They thus include a considerable section of the Perak river, with the country on either side. A lighter green has been introduced to indicate forests, as it was found that that previously used tended to obscure certain details.

Palestine. **Johnston.**

The Holy Land to illustrate the Old and New Testament. Scale 1:380,000 or 1 inch to 6 stat. miles. Two maps on one sheet. Size 50 by 42 inches. Edinburgh and London: W. & A. K. Johnston, Ltd., [1915]. *Price, mounted on rollers,* 12*s. Presented by the Publishers.*

A new edition of two maps on one sheet, mounted on roller and varnished, intended for use in schools. The hillwork, in hachures, and outline need further revision, as both are considerably out of date, and in many respects not in accordance with recent surveys. On the map illustrating the New Testament, relief is shown by layer tinting superimposed on the vertical hachures, with which, however, the contours are frequently quite discordant.

Sumatra. **Topographische Inrichting, Batavia.**

Overzichtskaart van Atjeh en Onderhoorigheden. Scale 1:200,000 or 1 inch to 3·15 miles. Sixteen sheets, each 22 by 19 inches. Batavia: Topographische Inrichting, 1913.

A comparison of this edition with that issued in 1903 shows that considerable progress has been made with the exploration and mapping of the western part of Sumatra during the interval. The results of this recent mapping have now been embodied in the map, and many areas that were previously left blank or roughly sketched are filled in. However, it is clear that much yet remains to be done before anything like a complete map can be produced.

AFRICA.

Egypt. **Bartholomew.**

Bartholomew's Tourist's map of Egypt and the Lower Nile. Prepared from the latest surveys. Scale 1 : 1,000,000 or 1 inch to 15·78 stat. miles. Size 42 by 19 inches. Edinburgh : John Bartholomew & Co., [1915]. *Price* 3*s. net, mounted on cloth. Presented by the Publishers.*

A new edition of a map that should be useful at the present time. Egypt, on the scale of 1 : 1,000,000, from the Delta to Wadi Halfa is given in three sections. There is also an inset of the whole region with the Sinai peninsula on a smaller scale, an enlarged plan of Cairo and surrounding country, and another of Alexandria.

Egypt. **Egyptian Survey Dept.**

Topographical map of Egypt. Scale 1 : 10,000 or 6·3 inches to 6 stat. miles. Sheets : N.E., 11–26, 11–28, 12–17, 12–18, 12–19, 13–17, 13–18, 13–19, 13–20, 14–25, 14–27, 15–19, 15–20, 15–21, 15–23, 16–23, 16–24, 20–18, 20–20, 21–17, 21–19, 22–17, Mudfiyet Esh-Sharqiya ; N.W., 21–19, Mudfiyet El-Beheira. Cairo : Survey Department, 1914. *Presented by the Director-General, Survey Department, Cairo.*

Italian Somaliland. **Ministerio delle Colonie, Rome.**

Carta della Somali Italiana. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets : 1–I. Muriole ; 1–III. Giumbo ; 1–IV. Torda ; 2–I. Camsuma ; 2–II. Vadda ; 2–III. Margherita ; 4–I, Arenaga ; 4–II. Gelib sul Giuba : 4–III. Aughele. Rome : Ministerio delle Colonie, 1910–13. *Presented by the Ministro delle Colonie, Rome.*

Nine sheets of a map of part of Italian Somaliland based upon recent surveys, including the Juba river and the country immediately to the east from its mouth to 0° 40′ N. lat. Relief is shown by contours at 10 metres intervals, combined with shading, and the character of the land, whether desert, bush covered, cultivated, etc., indicated by tints and symbols. Much other information, such as wells, paths, caravan routes, villages, trigonometrical stations, spot heights with the method by which they have been determined, is given on the sheets. Preliminary issues of some of the sheets were issued in black only in 1912 as a map entitled La Barsa Goscia.

Tripoli. **Ministerio delle Colonie, Rome.**

Carta Topografica della Tripolitania. Scale 1 : 100,000 or 1 inch to 1·6 stat. miles. Sheets : 1, Zánia ; 2, Tripoli ; 3, Garián. Rome : Istituto Geografico Militare, 1913. *Presented by the Ministro delle Colonie, Rome.*

Additional sheets of the new map now in course of publication, from the recent surveys of Italian officers. Nos. 1 and 3 include the coast from Tripoli to about 50 miles to the west, while No. 2 gives the country to the south of Tripoli as far as 37° 7′ N. lat. Contours are given at 50 metres intervals, and the new railway is indicated. The map is well executed, and carefully printed in colours.

AMERICA.

Canada. **Dept. of Mines, Ottawa**

Geological Survey of Canada. Map 58A, Explored routes in the lower parts of the drainage area of Churchill and Nelson rivers, Manitoba and Saskatchewan. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. Size 28 by 37 inches. Ottawa : Department of Mines, Geological Survey, 1914. *Presented by the Department of Mines, Geological Survey, Ottawa.*

Shows the geology along the explored routes by bands of colour, from maps and plans of the Canadian Geological Survey, the Department of the Interior, the Hudson Bay railway, and from explorations of Mr. W. McInnes, 1906–10.

Canada. **Dept. of the Interior, Ottawa.**

Map of Manitoba, Saskatchewan, and Alberta, showing the number of quarter-sections available for homestead entry in each township, also the pre-emption and purchased homestead area as defined by the Dominion Lands Act, 1908. Prepared in the Railway Lands Branch under the direction of F. C. C. Lynch, Superintendent. Scale 1 : 2,217,600 or 1 inch to 35 stat. miles. 4th edit. 1915. Size 21 by 33 inches. Ottawa : Department of the Interior, Railway Lands Branch, 1915. *Presented by the Department of the Interior, Railway Lands Branch, Ottawa.*

United States. **Day and others.**

United States Oil and Gas Fields in 1913. David T. Day and others. Scale 1 : 2,500,000 or 1 inch to 39·4 stat. miles. 2 sheets each 48 by 38 inches. Washington : Department of the Interior, U.S. Geological Survey, 1914.

A new edition of a large map first published in 1890. The special information concerning oil and gas fields in 1913 is indicated by colours and symbols, and includes (1) defined oil pools, (2) defined gas pools, (3) productive oil localities, (4) productive gas localities, (5) noteworthy occurrences of oil and gas without present production, and (6) trunk oil pipe lines.

WORLD.

World. **Bartholomew and Lyde.**

An atlas of Economic Geography. By J. G. Bartholomew, LL.D., with an introduction by L. W. Lyde, M.A. London: Oxford University Press, 1914. *Price 5s. net. Presented by the Publishers.*

Although many of the maps have appeared in earlier editions, their number has now been so greatly increased, and the introductory letterpress rewritten and so considerably extended that this may properly be considered a new publication. Altogether 27 plates of maps have been added, so that the total number instead of being 64 is now 91, while the text consists of 41 pages instead of 8 as before.

Some of the more important new maps are those dealing with meteorology, and among these may be mentioned 4B, Polar Hemispheres; Isotherms for April and October. 4C, World; Precipitation, 8A, World; Seasonal Rainfall, and 34A, India; Seasonal Rainfall. Other interesting new maps are 12B, Isochronic Distances; 12C, Polar maps showing rates to different parts, and Telegraphic communications; 30A, Ancient Trade Routes; 46A, Economic map of West Indies; and 46D, Economic map of East Indies.

Most of the maps show the special features with which they deal by colour layer tints, carefully selected and printed. The letterpress by Prof. Lyde is most instructive, and serves well as an introduction to the atlas.

World. **Philip.**

Philips' Mercantile Marine Atlas. A series of 35 plates containing over 200 charts and plans, with tables of 10,000 distances between ports, national and commercial flags, cable and wireless telegraphy charts with list of wireless stations, lists of British and United States Consulates, and complete index of 20,000 ports, etc. Specially designed for merchant shippers, exporters, and ocean travellers and for general use. Edited by George Philip, F.R.G.S. Fifth edition. London: George Philip & Son, Ltd., 1915. *Price £3 3s. net. Presented by the Publishers.*

The fact that this atlas has already passed through four large editions since it was first published in 1904 speaks well for its general utility and importance. To all engaged in maritime commerce and shipping it must have been of considerable service, and now, with the latest additions and improvements, it should be increasingly valuable. In the fourth edition new charts dealing with the Panama canal in its commercial aspects were given, and these form an important addition to the work. Not only are there charts and plans of the canal itself, but there is a most instructive series of small isochronic charts showing by colours and figures the member of days taken to reach certain regions from London, New York, San Francisco, and Valparaiso before and after the opening of the Panama canal. Wireless telegraph stations have received attention, and are now shown on the charts of the oceans and principal seas. The index has been revised and enlarged, so as to include all the seaports described in the last edition of the reference work, 'Dues and Changes in Foreign and Colonial Ports;' and throughout it is evident that care has been taken to make the atlas as complete as is possible in condensing so large an amount of matter into one volume.

CHARTS.

Atlantic Ocean. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, February, 1915; ditto South Atlantic Ocean, March, April, and May, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, March, 1915. London: Meteorological Office, 1915. *Price 6d. each. Presented by the Meteorological Office.*

Central America. **U.S. Hydrographic Office.**

Pilot chart of the Central American Waters, February, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **Meteorological Office**

Monthly Meteorological charts of the Indian Ocean, March, 1915. London: Meteorological Office, 1915. *Price 6d. each. Presented by the Meteorological Office.*

Pacific, South. **U.S. Hydrographic Office.**

Pilot chart of the South Atlantic Ocean, March, April, and May, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

French Equatorial Africa. **Renshaw.**

Seven photographs of Kwilu river taken by James C. Renshaw. *Presented by James C. Renshaw, Esq.*

A useful little set of photographs measuring 6¼ × 4¼ inches, showing tropical vegetation on the banks of this river. Most of the views are very clear and give a good idea of the scenery through which the river flows, which in places is quite picturesque.

(1) The approach to "Devil's gate" at Ngotu; (2) Entrance to "Devil's gate"; (3) In the gates (south bank); (4) Kakamocka and approach to Kakamoeka rapids; (5) Kakamoeka rapids, dry season; (6) Kakamocka rapids in flood; (7) Kakamoeks.

Nigeria. **Waterhouse.**

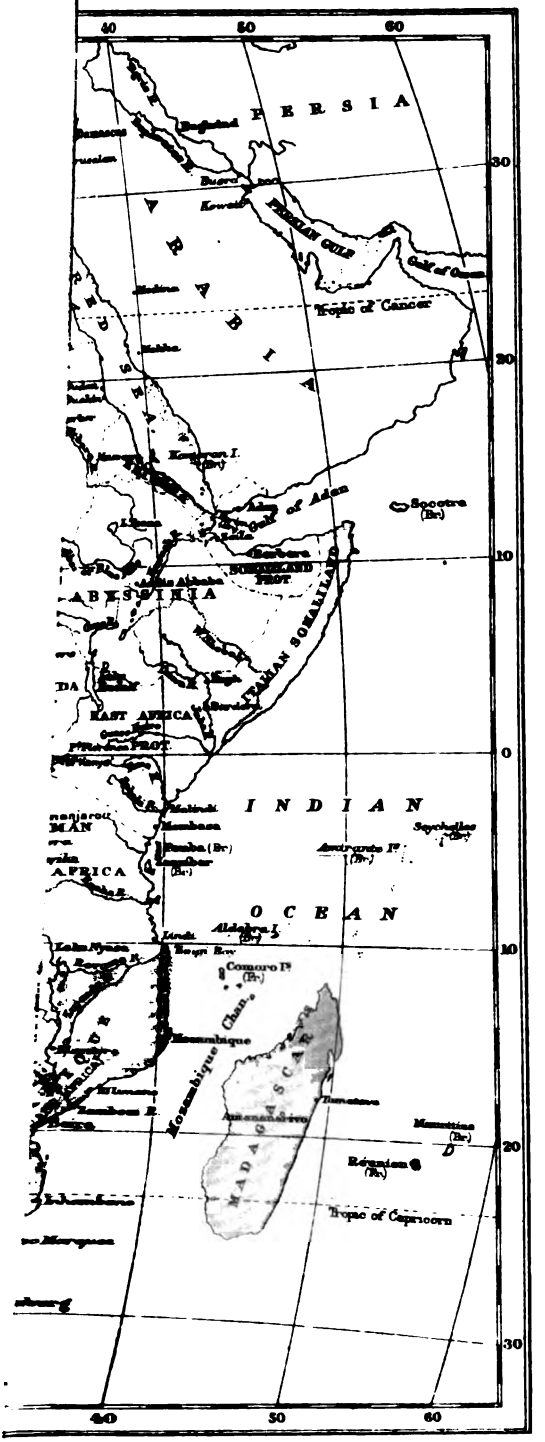
Fifty-two photographs taken by Captain G. G. Waterhouse, R.E., on a trigonometrical survey in western Province, Southern Nigeria, 1910–1913, and on Bauchi plateau and near Kano, Northern Nigeria. *Presented by Captain G. G. Waterhouse, R.E.*

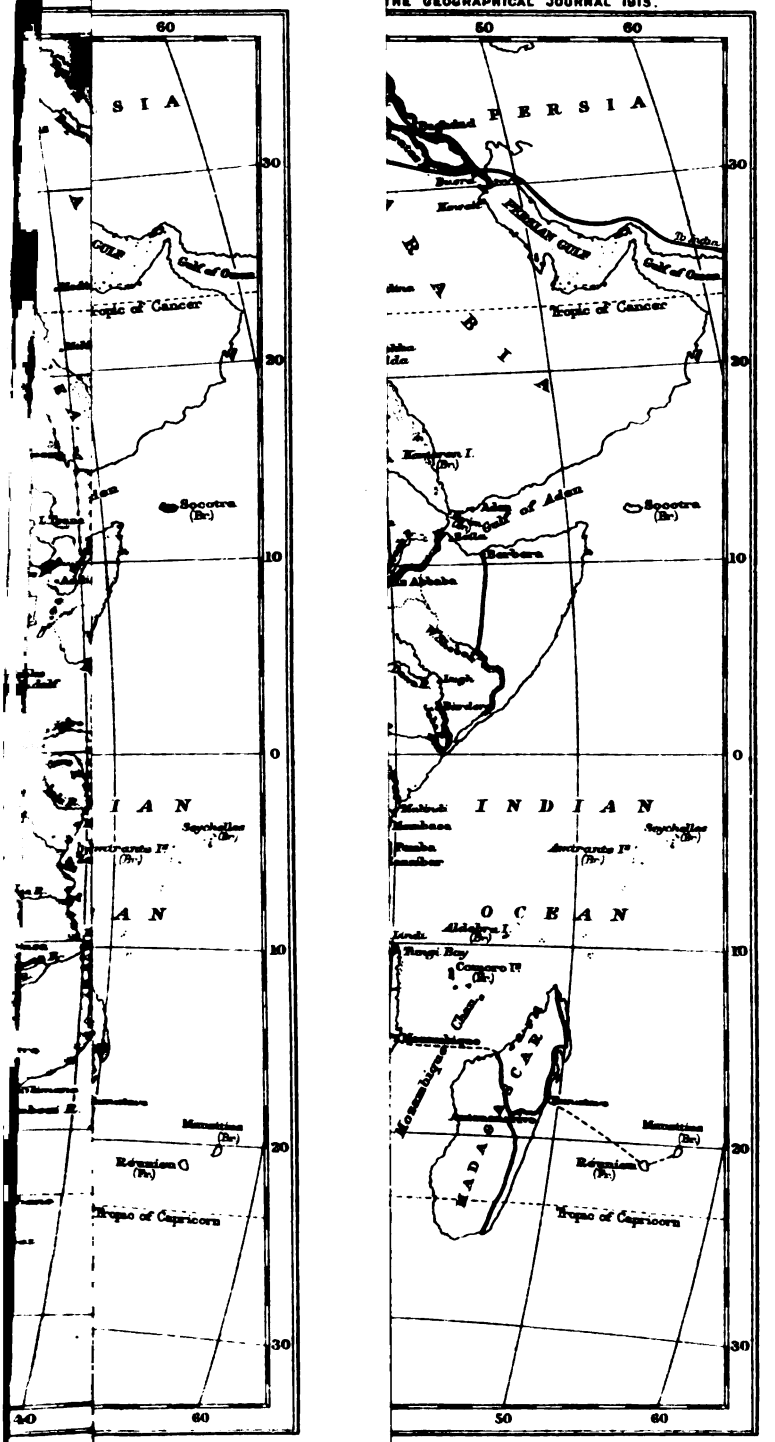
While engaged on survey duties, Captain Waterhouse has taken advantage of his opportunities for photography as is clear from this set, which he has carefully selected and arranged. The views dealing with the surveying operations will be specially interesting to others who have had to carry out similar work, while the types of scenery and natives are of considerable importance. The photographs are of two sizes, 5¼ × 3¼ inches and 2¼ × 1¾ inches.

I. *Types of country surveyed.*—(1) High bush near Ohoke-meji, S.N.; (2) Northern fringe of palm belt, near Abeokuta, S.N.; (3) Hills of "bastard" granite, S.N.; (4) Rock formation at Awgbawro, S.N.; (5) The Ado rock from west, 12 miles distant, S.N.; (6) The Ado work from west, 2 miles distance, S.N.; (7) A banana grove, north of Ife, S.N.; (8) The Niger, near Jebba, N.N., looking east; (9) Hills near Jos and Naragota, N.N.; (10) View from Gannawarri hills, N.N., looking S.W.; (11) View from Gannawarri hills, N.N., looking N.E.; (12) A cactus fence round pagan village near Jos; (13) View from Dalla towards Goran Duchi *inside* the walls of Kano, laterite formation. II. *Peoples and Customs.*—(14) Pot making at Igbetti, S.N.; (15) A market scene at Iragsiji, S.N.; (16) A market scene, S.N.; (17) Survey carriers arriving at Lanlate, S.N.; (18) Crossing the Awba river, dry season; (19) A native bridge over the Oshi river, S.N.; (20) Ju-ju doctors and villagers, Igbo-awra, S.N.; (21) Boys dressed as women at Ju-ju ceremonial; (22–24) Yoruba children; (25) Grain bins at Yowere, Illorin Province, N.N.; (26) Corner of the market at Illorin; (27) An Oyo court messenger, S.N.; (28) A pagan guide, Bukuru, N.N.; (29) Pagan women, Bukuru, N.N.; (30) Carriers crossing a torrent, near Naraguta, N.N. III. *Survey.*—(31) Tea-time; (32) A triangulation "cockshy," Ado Rock; (33) The trig. station, Tapa Rock, S.N.; (34–40) Base measurement with Invar wires; (34–35) On the level; (36) Completing a section, half a day's work; (37) North end of Kano base; (38) Looking south along Kano base; (39) Crossing a water "leet" for a tin-mine; (40) Crossing the Delimi river. IV. *Smaller photographs.*—(41) A gate of Kano; (42) Walls of Kano from inside showing recesses for the defenders; (43) Pagans near Ropp, N.N.; (45–46) A minor chief in Bukuru, N.N. Kano Durbar, January 1, 1913; (47) Sir F. Lugard and staff; (48) March past, Northern Nigeria Artillery; (49) March past, Northern Nigeria Infantry; (50) March past, Northern Nigeria M. I.; (51) Zaria Hoe dancers; (52) Native chiefs saluting the Governor.

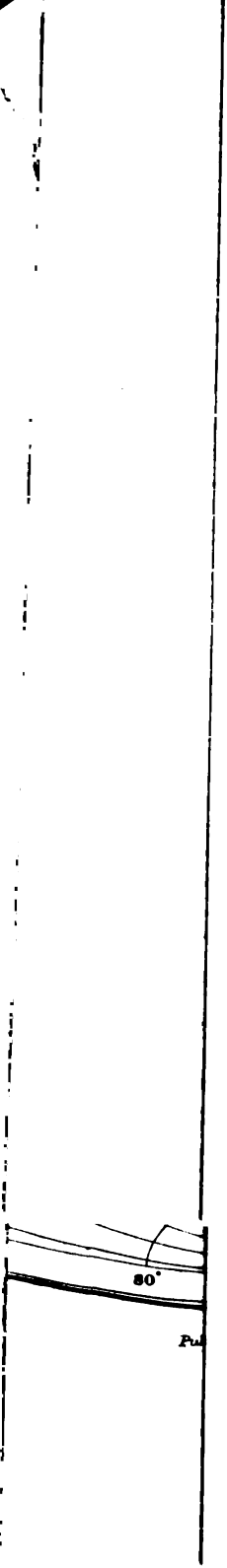
N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor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

LY 1914





AFRICA
Johnston.



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The

Geographical Journal.

No. 5. MAY, 1915. Vol. XLV.

A SEVENTH JOURNEY IN PERSIA.*

(*a*) Bujnurd, Nardin, and Kala Márán. (*b*) Darragaz.

By Lieut.-Colonel P. M. SYKES, C.M.G., C.I.E.

In 1908 I made a journey of 900 miles, during the course of which I was able to fill in some of the last unsurveyed tracts of country between Meshed and the Caspian Sea. This I described in my "Sixth Journey in Persia."† In 1912 I was able to supplement this journey by another which added to my knowledge of this same area. In 1913 I made a very short but not unfruitful journey to the district of Darragaz. In this latter journey I surveyed the sources of the river Atrek, no visit to which had previously been recorded. I was also able to make some interesting additions to our knowledge of the homeland of Nadir Shah, who was born in the Darragaz district; and, finally, I was fortunate enough to come upon some prehistoric pottery which is of special interest to the archæologist.

To deal with the earlier journey, I left Meshed on September 1, bound for Bujnurd, and on the following day reached Old Kuchan, situated 10 miles lower down the valley than New Kuchan. I had previously visited the old city in 1893, the year of the first earthquake there in recent years. It was followed in 1896 by a second and still more appalling earthquake, after which the ruins were deserted and New Kuchan was founded. The old site is once again becoming a centre of population, and has 2000 inhabitants.

Resuming the journey, I skirted the ruined city, close to which I was shown a still more ancient site which marks a city said to have been

* Royal Geographical Society, February 8, 1915. Map, p. 456.

† *Geogr. Journal*, January and February, 1911.

destroyed by Chengiz Khan. This is probably correct, as Mustaufi, the mediæval geographer, states that Kuchan was rebuilt by Hulagu Khan in the thirteenth century, and enlarged by his grandson Arghun, the Il-Khan of Persia and the ally of Christendom. On the fourth day I overtook my camp, which had been sent ahead, and rode into Bujnurd, being met by the usual reception, headed by one of the many brothers of the Ilkhani of the Shahdillu Kurds, generally termed the *Sirdar*. From Bujnurd I proceeded to Shahabad, the chief village in the Samalgan plain, where I was met by the *Sarhang*, or colonel, an old acquaintance, who told me that his brother had just returned from Meshed after being cured of a complaint at our hospital. The next stage was Zard, a typical frontier village, and the last inhabited centre on the Bujnurd side. The following day we crossed the beautiful Kastran valley, with its deserted village, and that night camped in the Kara Tikan Range. A few days were spent in stalking the magnificent wild sheep—*Ovis Vignei Arkal*—while the main camp moved slowly towards the forest-clad slopes of the Gurgan defile. Incidentally, both on this range and in the Elburz, additions were made to the collection of plants and seeds for Kew.

From Dasht, a deserted village at the head of the Gurgan defile, I made for the tiny and remote frontier district of Nardin, which had not been visited by any of my predecessors. On the way I crossed the meadow of Kalposh, one of the celebrated grazing areas in the province. There is a legend according to which Alexander the Great grazed his horses and rested his army on this meadow, and, as mentioned in my "Sixth Journey," it is at least possible that the great Macedonian crossed it.

Nardin, an elevated plain lying at an altitude of 5000 feet, contains three or four large fortified villages, including Nardin, with three hundred families—Huseinabad, Nánik, and Talbin, each with two hundred families; there are also a few small villages in the surrounding mountains, but none on the plain, as the Turkoman would destroy them. The district pays no revenue, but is supposed to support a hundred sowars to fight the Turkoman; three ancient field-guns and twelve gunners are also maintained. The inhabitants are Turks of the Tamr Tash tribe, who dispossessed an Arab population rather more than a century ago. Shirilla Khan, the governor, belongs to this tribe, and is at enmity, not only with the Turkoman, but also with the Kurds of Bujnurd, in which connection the *Sirdar* of Bujnurd recently raided Nardin and looted Shirilla Khan's property during his absence.

Leaving part of my heavy camp at Nardin, I continued the tour, my objective being Kala Márán, which I had been unable to visit in 1908 owing to the range being under snow. The governor accompanied me to Arab Mazzár, a low mound covered with the tombs of the dispossessed Arabs a few miles to the east of Nardin, and after leaving him I plunged into the Elburz Range, and, crossing the Gurgav Pass, descended a valley

which runs down to the Turkoman steppe. Passing Gulistan, the boundary village of Nardin, we entered a rich district inhabited by Geraili Turks, famous for its brown rice, termed *anbar bu or*, "ambergris smelling," and traversing the gorges termed Dahána-i-Kánchi, camped at Pursián. This large village is deserted by its inhabitants during the summer on account of the heat, and they were still absent when we passed on September 19. The Gerailis are very rich, as they crop both wheat and rice every year on the same land; they load their women with necklaces of coins. Those sections of the tribe which dwell in the Elburz are safe from the Turkoman, but the villagers on the northern skirt of the range suffer terribly from their raids. On the following day we quitted the valley and crossed a high ridge at an elevation of 7000 feet to the village of Rezi. This district is covered with a magnificent forest, but, sad to say, the trees are being burned either for charcoal or to clear the ground for crops, or, in many cases, from mere wantonness. From a high saddleback above Rezi we gained the first view of Kala Márán, which is a splendid limestone crag somewhat resembling Gibraltar in shape; and another stage brought the camp to the foot of the mountain at the village of Pá Kala.

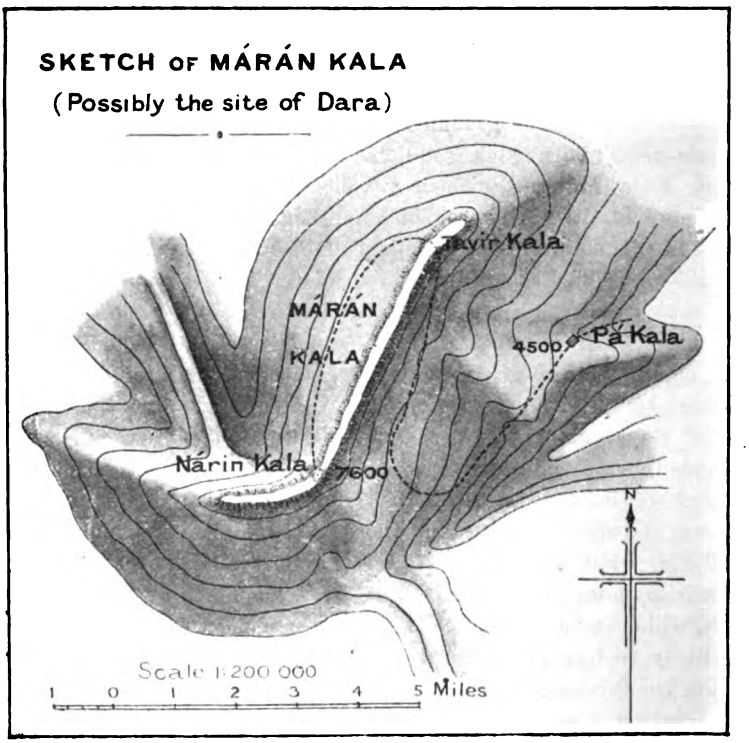
Before describing Kala Márán, a brief reference to Parthian history is desirable.* We read that Tiridates, the second monarch of the Arsacid dynasty, who reigned from B.C. 247 to 214, selected a site for a new capital, termed Dara (and later Dareion or Dareium), with the intention of superseding Hecatompylus. This he found in the mountain range of Zapavortenon, or Apavarta. The site is described as being surrounded by precipitous rocks, which enclosed a very fertile plain. In the neighbourhood were thick woods and many running streams, and finally the soil was very rich, and there was an abundant supply of game. In Parthia, which to the south of the Elburz Range is treeless, there are not many sites to which this description would apply, and during my travels, which include practically the whole of Parthia, I visited no site more likely to have been Dara or Dareion than Márán Kala, or the "Fort of the Snakes." Further than this I cannot go.

To resume, the ascent was somewhat steep, but the forest looked especially lovely after two years spent on the naked Iranian plateau. The actual crag was reached at a point termed Tavir Kala. Below it stretched an extensive area covered with kiln-burned bricks and stones occupying some low hills, and this, strictly speaking, was Kala Márán. The ancient city was supplied from springs, and these, it is said, have recently dried up, although the rainfall in the district is comparatively heavy. The chief fort towered above on the limestone crags, and is known as Kala Narinj, or "Orange," *i.e.* "Round Fort." It was surrounded by a wall of uncoursed stone, and contained a tank cut in the

* *Vide* my 'History of Persia,' chap. xxvii.

rock. The view from an altitude of 7500 feet was superb, ranging from Shah Kuh, the great mountain above Shahrud, in one direction, to the illimitable steppes in the other. Gunbad-i-Kabus was also visible in the distance, thanks to its lighthouse-like monument. No ancient coins or other objects could be bought from the inhabitants of Pá Kala, who stated that their village had only been founded some sixty years ago; and their knowledge of local history merely went back to a certain Zaman Khan, who had rebelled unsuccessfully against Fath Ali Shah.

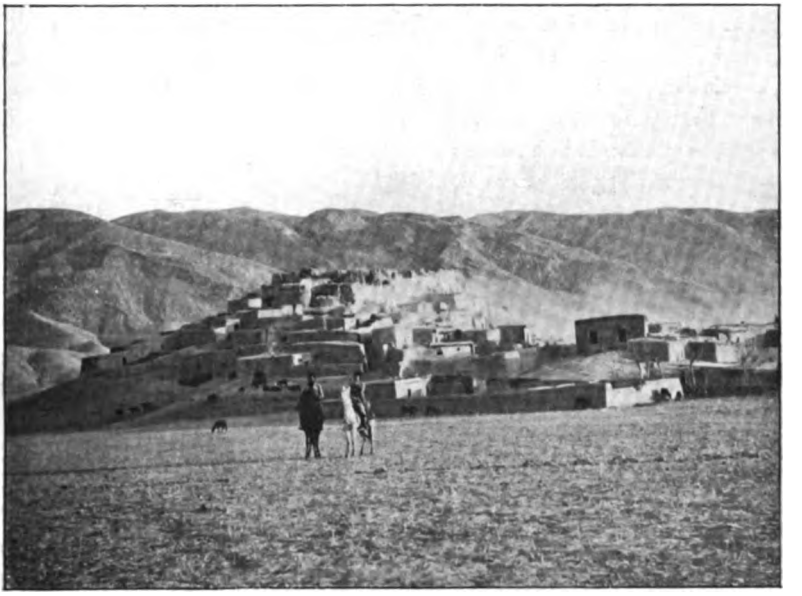
This was the limit of the tour, and the following day we descended through dense scrub to the important village of Rámian, which was



visited in 1908, and then marched due east to No Deh, situated in the same main valley as Pursián. Near Rámián the site of a skirmish between the Ex-Shah and the Government was pointed out. It appears that the Ex-Shah's force two thousand strong with one maxim gun had attacked and had gained the advantage on the first day. The Ramian villagers, however, obtained aid from Shahrud, and six days later they drove off the Ex-Shah's army, which was weakened by dissensions.

From No Deh we marched up the valley and rejoined our former route near Pursián, from which village we returned to Nardin. On the way we witnessed the funeral procession of a leading *Sayyid*, or descendant

VILLAGE OF ZARD (ON THE BUJNURD-GURGAN FRONTIER).



KUPKAN, THE HOME OF NADIR SHAH.

IN THE PURSIAN VALLEY (WHEAT IN RICK AND RICE IN FOREGROUND).

KALA MÁRÁN (POSSIBLY ANCIENT DAREION).

of the Prophet. First fifty women crossed the hillside in single file, and behind them came a similar number of men, also in single file, preceded by the bearers of the corpse, who were led by a *mulla* reciting passages of the Koran and prayers in which they all joined. The shrill ululations of the women mingling with the deeper voices of the men were most impressive.

A main object of my journey was to inquire into the question of *alaman*, or raids, by Persian Turkoman into Khorasan, which, after ceasing for some years, had recently recommenced. Whole districts were being devastated, young women* and children were being carried off into captivity, and the men, after driving their flocks to the Turkoman grazing grounds under escort, were killed. Needless to say, traffic almost ceased along the important trunk route from Teheran to Meshed. While stalking in the hills I collected a good deal of information as to the movements of the *alaman* or raiding parties, and immediately after one had passed, and the country became safe for a few days, I followed to continue my inquiries. The *alaman* route known as Rah-i-Durdi Khan, after a celebrated raider, was crossed about halfway between Dasht, the deserted hamlet at the top of the Gurgan defile, and Nardin. It starts from Tang-i-Rah at the western end of the defile in the country of the Goklan Turkoman, and runs across the hills to Kala Darázi, a deserted village situated near the point where I struck it. It is of interest to note that the Turkoman send out scouting parties, more especially to the watering-places, far ahead of the main body, which, to judge by the track, marches in single file. Further south we again crossed this route near the section known as the Band-i-Mahal. There it divides, the *alaman* generally breaking up into three or four sections and striking the Meshed-Teheran road at the famous "Marches of Terror" to the east of Shahrud, which have been graphically described by a series of travellers; the route by which the *alaman* travelled to the main road was unidentified before my journey.

I have collected some curious information about the Turkoman, who, it is to be remembered, are Moslems of the Sunni sect. It is almost incredible, but yet a fact, that in a recent raid they murdered a Shia *Sayyid*, and, after cutting his throat and collecting his blood, cut a strip of his flesh which was taken back to the widow of a Turkoman killed in the foray. The corpse of the raider was also taken back strapped to a horse, as is customary. This strip of flesh was cooked and a morsel eaten by every family. Similarly a drop of the *Sayyid's* blood was drunk, and another drop was sprinkled on the shroud, which is carefully kept by every Turkoman, the idea in both cases being that heaven was secured by these acts. A similar spirit of dreadful fanaticism impels the Turkoman to murder his prisoners, as he is taught that if he slays seven Shias he will escape the dread ordeal of the inquiry by Munkir and Nakir and be

* The young women blacken their faces, hoping by this means to appear old and ugly and thereby escape slavery.

carried straight to Paradise. I experienced much difficulty in verifying the above information, as, in spite of the fact that I heard it from two entirely independent sources, my Persian friends denied that such savagery was possible. At length I elicited the information that similar acts were known to have been committed in past times, and that the old Turkoman occasionally mention them. It is, therefore, to be supposed that this revival of raiding has brought back these cannibalistic, or rather, perhaps, ceremonial-cannibalistic, customs.

Upon leaving Nardin for the second time, the governor rode out for some 7 miles to the point where the last Turkoman raid had passed on its return, and showed me on how wide a front it had marched. The tracks of a large body of horsemen, of thousands of sheep, of camels, and of numerous ponies and mules were unmistakable. The governor had posted his sixty men on a hill and had been able to cut off some hundreds of sheep, but could not fight the Turkoman, who were estimated to be five hundred strong. He had, however, in the previous year, gained a signal success by the capture of Mohamed Geldi Khan, the leading Goklan raider, and, in spite of large offers of ransom, had blown him from the mouth of a gun. In 1908 I had been the guest of Mohamed Geldi Khan, whose portrait is figured in the "Sixth Journey."

After saying good-bye to the plucky Nardinis, we rode down the pass. Before allowing the mules to cross the wide open plain at its mouth, we looked anxiously towards the Band-i-Mahal with our field glasses, and were much relieved to see no signs of an *alaman* which was expected. We subsequently heard that it passed some hours later.

Nardin is separated from the district of Jájarm, which is under Bujnurd, by a waterless track of country some 30 miles wide, which we crossed as fast as our mules could move. Our Nardini guide was afraid to enter the first village, as there was a blood feud between it and Nardin; so giving him all our water we sent him back. At first our party was taken for an *alaman*, as one was expected. However, I rode on alone and explained our peaceful character, thereby preventing a stampede of the flocks. After stopping to rest the horses at the village of Darra, we pressed on and finally reached Jájarm after a march of 40 miles, the mules not arriving until late at night. Jájarm is a site of considerable antiquity, and among the coins brought to me were those of the Parthian monarchs, Mithradates II. and Volagases V. It was at its zenith under the Il-Khan Khudabanda, the founder of Sultania. He erected a mosque at Jájarm, from the ruins of which a tile was brought me for sale. The town was sacked by the Afghans in the eighteenth century, and its population has dwindled to about five hundred families, whose huts cluster about the deserted fort. From Jájarm we marched three stages due east to Miánabad, the capital of Isfaráyin, which I had seen in the distance during my previous journey. Its governor was a brother of the *Sirdar* and an old acquaintance. My object was to complete the survey of the

Isfaráyin district, and it was of considerable interest to be able to add to the map the little town of Bam (previously visited by Colonel Yate), the chief centre of a district inhabited by five hundred families of Bughiri Turks and other villages. My former route was struck at Hasanabad in the Sir Vilayat district, and Meshed was reached on October 5 after an interesting journey of 750 miles.

The second journey to be described was undertaken in November, 1913. Chinaran, some 40 miles from the capital of Khorasan, was reached in the afternoon of the day I started. To this point I was escorted by Russian Cossacks, who relieved one another every 5 or 6 miles, this being an attention on the part of the Russian military authorities. At Chinaran I was met by Zabbardast Khan, cousin of the Governor of Darragaz, who had been sent to accompany me to Mohamedabad. The night was passed on the edge of the Ulang Shahi or "Royal Marsh" in tents. After shooting some duck we left the marsh and rode to Radkan, a Kurdish centre, inhabited by five thousand families of Kayvanlu Kurds. The large walled village, with its fort, was built by Riza Kuli *Mirza*, the ill-fated son of Nadir Shah, who was blinded by his jealous father. The bazaar was particularly poverty-stricken in appearance, but Kurds have a lower scale of comfort than Persians and are comparatively well-off, so far as the necessaries of life are concerned.

Leaving Radkan, at first we marched north-west close to the foothills, passing the village of Khírich with a conspicuous shrine erected in honour of the *Imam* Hasan. After riding a few miles beyond this village, we quitted the more level but longer route to Darragaz (which Daffadar Shir Mohamed surveyed on his return journey), and swung due north up the Bahmangan valley. The guide pointed out an open part where some months previously Russian Cossacks had had a skirmish with Juju, the noted Darragaz bandit, who on this occasion escaped and fled across the border into Russian territory. He was ultimately shot by Russian Cossacks near Kuchan. Close by was a tree which Mithras-like grew out of the naked rocks, and was consequently considered to be sacred.

The ascent to the Gudar-i-Bahmangan was long and steep, and the mules lagged far behind. The rolling uplands which we found upon reaching the summit of the pass at an altitude of 6000 feet were of special interest to me, as in them the river Atrek, which at one time or another I have followed almost throughout its long course to the Caspian sea, takes its source. The main stream is that which we followed to Yadak, whereas the surveyor pursued a more westerly course *viâ* Imarat. So far as I know, no traveller has actually visited the sources of this river, although MacGregor,* Napier, Stewart and

* 'Journey through Khorasan,' 2, p. 82, by Sir Charles MacGregor; *Proceedings R.G.S.*, No. ix., September, 1881, p. 590, by Colonel C. E. Stewart; and 'Khorasan and Sistan,' by Colonel C. E. Yate.

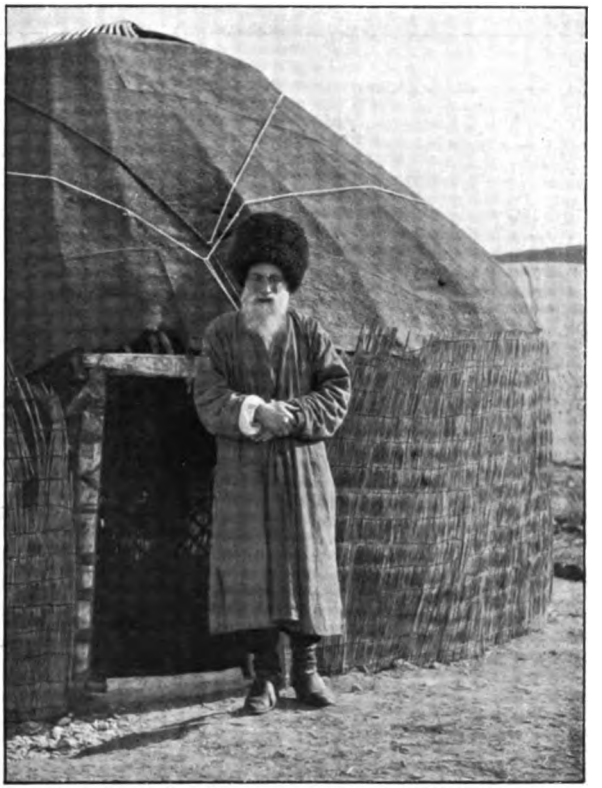
Yate all travelled between Darragaz and Kuchan, and consequently passed not very far off. Night fell before we had descended into the valley, and we reached Yadak several hours after dark, the mules, which were in very poor condition, not arriving until noon of the following day. The venerable *Katkhuda* or mayor of Yadak informed me that it was one of eighteen Kurdish villages which constitute the little district of Panj Taifa (Five Tribes), and that in the winter the flocks grazed in the plains of Darragaz.

From Yadak the march was of necessity a short one, as the mules had arrived so late. We descended the valley of the Atrek for a few miles, and then turned up a narrow but easy pass, the Zu Guna (Zu is the Turki for valley), descending from it into the Mian Kuh district, where we struck the main road from Kuchan to Darragaz. At the foot of the pass we were welcomed by the local governor with his followers; sheep were sacrificed to take on them our misfortunes, and rue was burned in braziers to avert the evil eye. The little hill district which we had now entered was inhabited by Butaliblu Kurds, who are a branch of the Shahdillu Kurds of Bujnurd.

At this point I propose to outline briefly the early history of Nadir Shah,* the last great conqueror of Asia, as we had reached the district from which he was sprung, and I was able to collect some new and interesting facts about his family. Nadir Kuli, as he was originally named, belonged to the Kirklu, a Turkish tribe descended from Oghuz Khan. As the tribe was weak it had joined the Afshar tribe, with which it was connected, and Nadir through life termed himself an Afshar. His father, Imam Kuli, was a poor villager who lived at Kupkan, which village I was fortunate enough to identify. He owned a few sheep and, following immemorial precedent, drove them across the Allah ho Akbar Range into Darragaz in the autumn of 1688 A.D., and when encamped close to Mohamedabad, the future Shah was born. The site of this event was subsequently marked by a building known as the *Mauludkhana*. Among other objects of interest which I acquired were the revenue accounts of Darragaz for the year 1746 A.D. In these interesting documents charges on the land are shown for the upkeep of the "Birth building," and also of the grave of Imam Kuli at Kupkan. These documents I have presented to the Royal Asiatic Society. They were written by a certain *Mirza* Vali Khan, who held the village of Khadimanlu near Kupkan in fief; his descendant recently discovered these and other accounts.

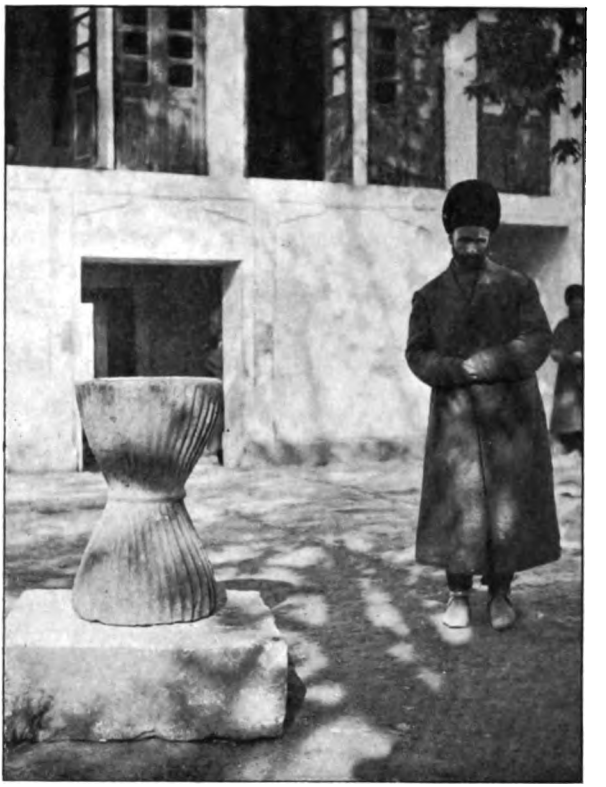
We found Kupkan to be a picturesque village situated on the slope of a deserted fort which had had a covered way to the river. To my disappointment I was unable to glean any legends of Nadir, as Aga Mohamed, the founder of the Kájár dynasty, drove all the Afshars out of the district, and the Butaliblu Kurds took their place. After

* *Vide* my 'History of Persia,' chap. lxx.

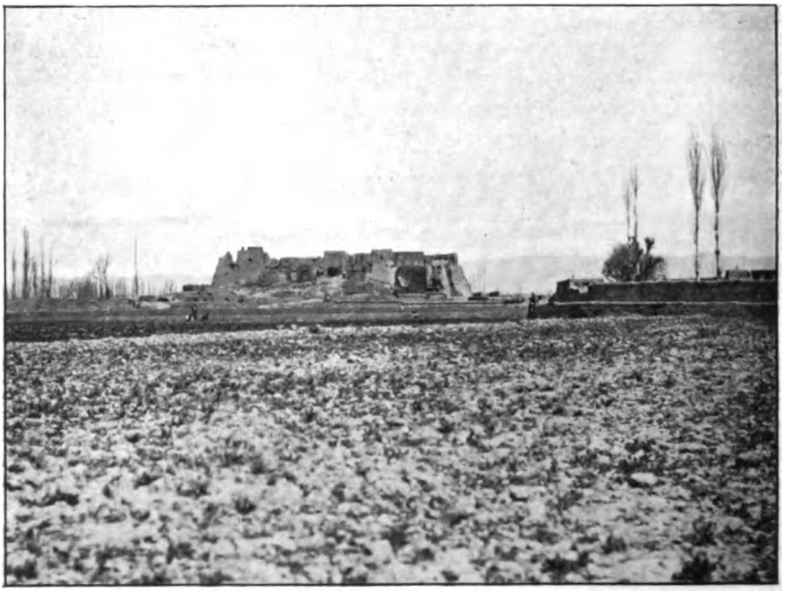


A CHAPASHLU TURK OF DARRAGAZ.

RAMIÁN.



STONEWORK FOUND AT YARIM TAPPA, IN THE DISTRICT OF DARRAGAZ.



FAZ, THE BIRTHPLACE OF FIRDAUSI (NEAR MESHED).

photographing this historical site we resumed our journey, and commenced to rise to the crest of the Allah ho Akbar (Allah he is Great) Range. On the way we were shown a series of steps cut in the naked rock for a distance of nearly a mile. This work, termed *Nardaban-i-Nadir Shah* or "The Ladder of Nadir Shah," was executed by the Great Afshar to facilitate guns being taken across the pass. The view from the crest of the Allah ho Akbar Range, at an altitude of 5400 feet, was superb, as the fertile plain of Darragaz lay at our feet, and beyond the low hills which shut it off from the vast plain of Turkestan white buildings marked the railway station of Artik on the Central Asian railway. Descending the range, we passed a humble family of nomads on their way to graze in the Darragaz district just as Nadir's parents had done, and I took a photograph to perpetuate the scene.

The plain of Darragaz was extremely level, and also less cold than the bleak uplands which we had quitted; and everywhere we passed through thriving villages whose headmen came out to welcome our party. Some 6 miles from Mohamedabad, the capital, I was met by Masud Khan Chapashlu, Governor of Darragaz. The Chapashlu, or "Owners of Goats," are a branch of the Turkish Istajlu, one of the seven tribes which set Shah Ismail, the founder of the Safavi dynasty, on the throne of Persia; the other branch is termed "Guchlu," or "Owners of Sheep." Baba Khan, its chief, was a favourite general of Nadir Shah. His nephew, Behbud Khan, succeeded to his honours when his uncle died, and from him this family of border chiefs is descended. The Darragaz Khans had had friendly relations with my predecessors, more especially with Colonel Yate, and also with MacGregor and Napier. The chief who welcomed me had been governor at Turbat-i-Haydari, and I had known him and his father for many years. Upon reaching Mohamedabad I was surprised to see the changes which are taking place. New streets and shops are being laid out, and the thriving bazaars were thronged with Russian Armenians, Turkoman, Turks, and Persians.

One result of my visit to Darragaz was, as stated above, a discovery of pottery, and to this I now propose to refer. My host knew that I was deeply interested in everything ancient, and informed me that when digging among ruins, at about 8 feet below the surface some stone columns had been found and also some pottery. The stone work consisted of bases of columns and a curious double stone drum. The illustrations show clearly the nature of these old-time remains, which were evidently hewn from the white limestone of the neighbouring range. The pottery consisted of one perfect piece and three fragments; and when shown it, I recognized with delight that it was similar to that discovered below the stratum of the earliest Elamite civilization by De Morgan in the great mound at Susa. Similar pottery has also been discovered in Russian Turkestan at Anau by an American mission under

Pumpelly.* This pottery, which is of a buff colour and ornamented with a black geometrical pattern, is believed to date from perhaps the sixth millennium B.C. It represents a culture earlier than the historical cultures of Sumer and Akkad, of Elam or of Babylon, not only in Elam (the modern Persian province of Arabistan), but also at Anau in Russian Turkestan, and now in the Persian province of Darragaz. Here, owing to the proximity of the high Allah ho Akbar Range and a comparatively good water supply, the conditions were especially favourable to the growth of such a civilization. I have presented the pottery to the British Museum.

On the day after my arrival I was taken to Yarim Tappa, the site of the discovery, situated some 2 miles to the north-west of Mohamedabad. The mound, which is perhaps 400 feet in length, rises to a height of some 60 feet, and is one of many similar mounds, which are undoubtedly artificial, and must consequently be of immense antiquity. I photographed my host and his cousin on the exact site of the find near the south-west corner of the mound.

From Yarim Tappa we rode south to a range of low hills situated to the west of Dastgird, the old capital. There my host pointed out that the hillside was covered with what were apparently tombs, which showed up clearly on the hillside. One had been broken into, and proved to be a circular underground chamber built of uncoursed rubble, and 12 feet in diameter. There were no signs of sepulture, but in the south-west and east corners were low arches which may have been made for tombs. The whole question was beyond my knowledge to express a definite opinion upon. To the east of Dastgird, a hill was pointed out termed Hindu Suz, or "Hindu Burning." The explanation was given that until about a century ago there was a colony of Hindus resident at Darragaz who burned their dead on this hill.

Riding home, we stopped to examine the ruins of the *Mauludkhana*, or "birthplace." To-day not one stone is left upon another owing to Kájár revenge, but in the 'Memoirs of Khojeh Abdulkurreem' the following description is given:—

"On the spot where he (Nadir Shah) was born a mosque is erected, on the dome of which are placed three golden vases one upon another, and at the top of all is fixed a scimitar of the same metal, implying that the sword issued from hence."

Truly Nadir acted up to his claim that he was the "Son of the Sword" for seventy generations!

On the second day we rode off west to visit various ancient sites.

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* *Vide* his 'Explorations in Turkestan.' Somewhat similar pottery is described in Archæolog. Survey of India, Annual Report, 1904–5; *vide* also 'History of Art in Persia,' by Perrot and Chipiez, Fig. 247, on p. 474.

Shahristan, which covers a considerable area, was first inspected at about 6 miles; it was said to have been destroyed by Chengiz Khan. Leaving the governor to examine his fine crop of cotton, we rode on for another 6 miles to a second ruined site, termed Sháhdmainá. Close by was a shrine to Hazrat Sultan (His Highness the Sultan). It was erected by Al-Muayyid, the *Ainadar* or "Mirror-bearer" of Sultan Sanjar, the last great Seljuk, in honour of Imam Muwaffak Shafai, who was in the camp of Al-Muayyid, and was killed at the siege of Shahristan. At the time of our visit we were able to photograph a group of pilgrims outside the sacred edifice. Three miles to the north-west of the shrine is a bare low mound. This is termed Tappa Kalisa, or "The Church Hill," and was so named in memory of a church founded by an Armenian colony which inhabited Julfan, a large neighbouring village. The name is identical with the Julfa on the Aras, whose Armenian inhabitants founded Julfa near Isfahan under the auspices of Shah Abbas. Their colony in Darragaz is believed to have been exterminated by the Mongols. We returned after dark to Mohamedabad, passing a Kurdish wedding party, with the bride on horseback, dressed in red and escorted by mounted men and by musicians.

My host and his cousin Zabbardast Khan insisted on seeing me off at Artik, and the next morning I said good-bye with deep regret to the able surveyor, the sowars and the servants of the Consulate-General. We drove across the low range by a rough carriage track, and the progressive Masud Khan stated that he intended to purchase a motor-car shortly. While we were driving along, he informed me that the Russian regulations by which irrigation water is distributed on the basis of families, as represented by married women, had raised the price of the fair sex in Turkestan to £300 as against £22 in Darragaz! He added that kidnapping was carried on extensively, every Turkoman naturally wishing for as many wives as possible.

At the frontier station of Artik I said good-bye to my kind hosts and travelled home, stopping at Merv, Bokhara, and Samarcand, sites I had longed to visit for many years.

The PRESIDENT (before the paper): It is scarcely necessary for me to say anything by way of introduction on behalf of Colonel Molesworth Sykes, who is well known to our Society. I believe his first paper was given to the Society nearly twenty years ago, and since then we have had narratives from him of successive expeditions. He began to devote himself to Persia in 1893, and recently he has been intimately associated with that country as Consul and Consul-General. He was awarded one of our Medals in 1902. Some years ago Lord Curzon paid him the compliment of saying he probably knew more about Persia than any man living. He has published at intervals the results of his extensive journeys, and now he is gathering up the results of his literary researches and personal experiences in a 'History of Persia,' which is about to be published in two volumes. To-night he will give us some of the results of his journeys during the last two or three years.

Mr. L. W. KING (after the paper): I feel that I owe Colonel Sykes and

also the Society an apology for the non-appearance of that vase we have just seen on the screen; for it was really due to a misunderstanding, I think, on the part of the Museum authorities. They did not realize, when Colonel Sykes gave it to the National Collection, that he would be wanting it to exhibit at a lecture, so it went forward in the ordinary way as presented to the Trustees, and was inserted in the Annual Report; and, as I wrote to Colonel Sykes, there was hardly time before to-night to get a special Act of Parliament through in order to get the vase out of the Museum! I think we shall all agree that Colonel Sykes's lecture has certainly fulfilled the aim of the Society as set forth by the President in his introductory remarks. He told us that the Society wished to have a series of lectures that should give information on the social and geographical conditions of the countries in which we are all interested at the present time; and I think there is no doubt that what Colonel Sykes has told us more than comes up to the standard we were led to expect. But there is one other aspect of the lecture upon which I should like to say a few words, and that is its archæological interest. He has told us how he found at Darragaz this ancient pottery, and he has shown us upon the screen the principal example of it. He also mentioned that this particular pottery is very like some that has been found at Susa, in just the opposite corner of Persia, in the south-west. There the "Délégation en Perse" has been doing for a good many years some very excellent work, and, as Colonel Sykes said, has found in the lowest strata of the site two distinct Neolithic cultures of very great interest to archæologists who study the history of the countries in that region of Western Asia. The country of which we know most, as a result of excavation, is Mesopotamia, but on all the sites there that have as yet been examined no certain traces of a Neolithic culture have been found. The first discovery of remains dating from so remote an epoch was that made at Susa during the French expedition there, and again at Tepe Mussian, about 93 miles to the west. There they found pottery, in the earlier of the two strata, very like that which we saw on the screen just now—a buff ware, with designs of a geometrical pattern and imitations of basket-work in brown pigment. The later periods showed an advance in technique and design; but the great interest of the discovery was that we had here, for the first time, an example of a Neolithic civilization. The next discovery of interest was made more in the immediate neighbourhood of the district which Colonel Sykes visited in 1912. There, at a place called Anau, a little to the north and to the west of Darragaz, an American professor at the beginning of the present century happened to pass through on his way home from geological and physiographical work in Central Asia, and he saw a cutting in a mound at that place as he was passing on the railway. This had been made by a Russian, General Komoroff, about twenty-five years before. Prof. Pumpelly saw the stratification in the cutting, and two years later he returned at the head of an expedition to excavate the mound. In 1903 and 1904 he thoroughly excavated the two "kurgans," or mounds, at Anau, down to the remains of a Stone Age culture in the northern one; and the interesting thing is that he found pottery and also other cultural objects very much like the pottery and the remains of the Neolithic civilization that had been found by the French excavator De Morgan at Susa. This fact seemed to show that Anau must have been the centre of a Neolithic culture that had developed there and afterwards spread further west. The great interest to my mind of Colonel Sykes's discovery is that it adduces additional proof of Prof. Pumpelly's theory in that respect. It suggests that the north-east corner of the Iranian plateau may have been, if not the birth-place, at least an important centre of development of this interesting civilization. It afterwards spread from that centre further south and west, and we find similar wares on sites in Cappadocia and Asia Minor, and even it has been suggested in

some parts of Thessaly. The whole of that migration must have been very like the migration of the Turkoman. This one discovery suggests to my mind the great interest Persia has for all those who are studying the history of civilization in Western Asia. For in the earliest period I have just referred to it was perhaps the cradle of the culture that was afterwards carried over more western lands; and in later periods it was the meeting-place—the bridge, as it were—between the farther and the nearer East. If I may venture a remark on the forthcoming 'History of Persia,' by Colonel Sykes, of which he has shown me some of the early chapters in proof, what struck me most is the manner in which the author has discussed the importance of Persia as a connecting-link in that respect. My own practical knowledge of Persia is confined merely to part of the western fringe, to a well-trodden caravan road between northern Mesopotamia and Kermanshah; but, such as it is, it makes me realize that a historian of the country gains immensely by a practical knowledge of its geography and its present social conditions; and it is needless for me to say that Colonel Sykes unites both those qualities to an admirable degree. Our thoughts are turned a good deal to Persia and Mesopotamia at the present time. This is a period of transition, and, whatever may be the political outcome of events, the work of exploration will certainly be carried out in easier conditions in the future than in the past. I think we may look in the future for a considerably renewed activity in the archæological sphere as well as in the sphere of exploration, and what Colonel Sykes has told us to-night has convinced me for one of the very great deal that still remains to be done in that part of the world; and I hope the mound he has told us about will be one of the first that will occupy the attention of any expedition sent out to that region of Persia.

Major-General Beresford Lovett: Colonel Sykes showed us a photograph of a famous mountain, the Shah-i-Kuh. I remember about thirty-two years ago I climbed to the top of that mountain. I was engaged surveying then, and I wanted to get a sight from Shah-i-Kuh on to Demavend; this I succeeded in obtaining, my aneroid marking an elevation of 12,500 feet when I reached the summit. I estimate that this is true to within 80 feet plus or minus, as is the custom of barometers. On the way up, I remember startling a flock of wild sheep, of the same kind as the one which Colonel Sykes stalked on the Kara Tiran Range. I am very much concerned to hear of this recrudescence of raids on the part of the Turkoman. I thought that under Russian influence in the north of Persia, all this kind of thing would have stopped. I know that when I left the Consulate at Astrabad in 1882, owing to that influence, the country was perfectly quiet, and immune from Alamans of all kinds. Some years previously, when the Seistan mission was returning through Khorasan to the capital Tehran, we came across many traces of such raids. I remember we crossed the tracks of an Alaman where it had just passed only a day or two previously. The track is unmistakable owing to the hoofs of the Turkoman horses being so very large; tracks showing small hoof-marks excite no alarm, as it is recognized they do not denote the passage of a Turkoman horde. We were travelling with a considerable cavalcade, and on one occasion the dust that arose from the trampling of our horses so frightened the villagers from afar that they, thinking we were Turkoman, promptly evacuated their village and climbed up affrighted into the adjacent hills—very much disturbed. Eventually we arrived at the village and found it deserted. We pitched camp not very far off, and sent men up the hill to shout out that we were "Feringhis" and not Turkoman; so gradually the villagers came down and reoccupied their village, and traffic and bargaining for fodder and provisions and so on commenced.

Colonel C. E. Yate: It is nearly twenty years since I took some of these journeys, which have been so well described to-night, and I can assure you it has

been, if possible, even a greater pleasure to me than it has been to you to see some of the old scenes over again. I well remember my various journeys in Khorasan. It is nearly thirty years, though, since I was first brought into connection with Turkoman leaders and Turkoman raiders. I had a good deal to do with them, but I must honestly confess I never heard of these so-called cannibal rites Colonel Sykes has told us about to-night. When I held the appointment of Consul-General at Meshed—which has been subsequently held by Colonel Sykes—I made these same journeys along the frontier, and though that is nearly twenty years ago, I can well remember travelling along the country he has described. It is a wonderful sight, as one marches along the crests of the hills to look down on the Trans-Caspian railway in the sandy plains below; and as an instance of the extraordinary difference in political feeling there was in those days between us and the Russians to what prevails to-day, I can tell you that when I returned to England I was summoned to the Foreign Office, the chief of which, I remember, gave me a most terrific wigging, and asked me what I meant by marching along the Russian frontier with guns and troops, as the Russians had complained of my doing. However, having assured him that there were no guns and nothing bigger than my tent-poles and no troops beyond my three orderlies, and that I had not contravened the rules in any possible way, we were able to talk quietly about the journey. I can remember how difficult it was to get into the Turkoman country at that time. I got into the Goklan Turkoman country after some trouble, and travelled up to that famous but then little-known Gumbaz-i-Kabus, which was described to us so vividly on the slides. I remember how my assistant, Khan Bahadur Moula Bakhsh, took days and days with his binoculars trying to decipher the Arabic inscription, which was written in Kufi character, at the summit of that huge tower. He was able eventually to decipher it, and if I remember right the inscription was given in the book I afterwards published. I would simply add that I endorse all that has been said by Colonel Sykes regarding the charms of that region.

I must say I listened with the greatest interest to what Mr. King has told us as regards the neolithic findings. I once came across what was called a Yarim Tappa or half mound—that was a mound of light earth, which was evidently the remainder of some very ancient pre-historic town or village, half of which had been washed away by a stream, and, consequently, you could see the various strata of which it was composed. Though I had no time to excavate it, I could see there was apparently nothing more than plain pottery in it; no stonework, nothing worth having in any way, and no coloured vases or anything like what Colonel Sykes has shown us the picture of. All these ancient mounds are deserving of excavation, and I hope some of these days, as Mr. King said, we may be able to do that with greater ease and facilities than we have had hitherto. The picture of Tus showed us one of the oldest capitals of the world, and shows how, in the case of those earthern buildings, made of sunburnt bricks, it is impossible to give any date to the buildings or find out anything to give a clue as to what they really were. Everything having been built of mud, you cannot trace any date, or give any clue to the origin of the buildings, and very seldom in that country do you come across written inscriptions. The find that has been brought home by Colonel Sykes will, I am sure, be a valuable one, and is something entirely new in that country. I do not know if Colonel Sykes can go back and pursue his investigations, but I sincerely hope so.

The PRESIDENT: I am sure you will wish me to wind up our proceedings by offering a most hearty vote of thanks to Colonel Sykes for the lecture he has given us, which has shown so amply his very long and detailed knowledge of Persia. I much wish that Lord Curzon was in my place, or, at any rate, here to-night, in

order that one who has travelled so much in Persia and written so much about it might have added to our information. I am afraid my personal experiences of Persia are limited. I have been to Tabriz, and I shall never forget the excitement of first entering a great Persian town, and its difference from the towns of the nearer East. The first view of the city, surrounded by its orchards, its grey flat roofs shining in the sun; the fascination of the arcaded bazaars, with their domed halls or khans, under which the merchandise is set out, and where—

"Above their merchandise
The merchants of the market sit
Lying to foolish men and wise,"

still, after nearly fifty years, remain in my memory. Persia is to many of us associated with the most beautiful carpets and tiles. The art of Persia has rivalled that of China, and far surpassed that of India. This is one of the charms of that remote and secluded country.

I confess there was one detail in the slides which rather surprised me. We saw a good deal of the cultivators, but very little cultivatable land. If they can force these stones and rocks and barren hills to produce any paying crops, I think the cultivators must be, as Colonel Sykes described them, "an exceptionally active race." No doubt the secret is irrigation; that is the foundation of the cultivation of the East. I do not think I can detain you profitably by any further reflections on the paper. I will only ask you to give a hearty vote of thanks to Colonel Sykes.

NOTES ON THE HISTORICAL AND PHYSICAL GEOGRAPHY OF THE THEATRES OF WAR.*

By VAUGHAN CORNISH, D.Sc.

HAVING regard to the extent of the British Empire and the known purpose of Germany to obtain extensive colonial dominions by conquest, it is necessary, in order to understand the geographical aspect of the present war, to examine the map of the whole world from the military point of view.

The Military Regions of the World.—For the purpose of military geography the world may be divided, like Ancient Gaul, into three parts —the American, Oriental, and European military regions, in which the dominions of the eight great military powers are scattered in such a manner that valued possessions of one are in many cases situated near the centre of force of another and remote from that of the parent state. Each of the three great regions reaches from Pole to Pole; the American extends from west of the Azores to west of Honolulu. Germany and Austria have no possessions in this region. The United States is the only power whose principal force is situated in it, and Great Britain is the only other great power which is represented there in any appreciable military strength. The eastern boundary of the European

* Royal Geographical Society, January 25, 1915. Map, p. 456.

region corresponds almost exactly with the area draining westwards to the south and north Atlantic Oceans, including in the latter the White Sea. The oriental military region comprises all that lies between this line and the western boundary of the American region.*

It is in the Pacific Ocean that the greatest break occurs in the communications of the British Empire, both on account of the distance between Australia and New Zealand and Canada, and on account of the fact that the naval strongholds of Japan and the United States (Honolulu) intervene. Thus, although Australasia and Canada face one another across the Pacific,† the strategic ties of Australasia are with India and South Africa. These three territories, situated at the corners of an equilateral triangle, have inter-communication free from any intervening centres of military force. The occupation of the head of the Persian Gulf, if permanent, will make the Indian Ocean practically a British lake. Moreover, the physical frontier corresponds with the historical facts which have made the Western nations what they are, for the whole of the Mediterranean lands were Roman and Christian. The fact that Asia Minor became the home-land and stronghold of the Ottomans enabled them to effect the unusual combination of all the territory from the Ægean to the Persian Gulf. Lower Mesopotamia was not held for long by Rome and never became Europeanized, and the recent operations from India on the Shatt-el-Arab illustrate the circumstance that this district falls naturally into the Oriental military region.

The Roman empire was divided in its later days into eastern and western halves from the headwaters of the Adriatic, and of all the maps required to illustrate the war none is more striking than that which shows how the present boundary-line between the western and eastern Church follows not only that original division, but marks the subsequent northern extension of west Roman and east Roman, or Byzantine, influence respectively. This line, which is the boundary of Eastern Europe, may be defined fairly accurately as running along the western and northern frontier of Bosnia, Serbia, Transylvania and Bukowina, and along the eastern boundary of Poland, the Baltic Provinces, and Finland. South and east of this line Tartars dominated the Russian Christians until the later centuries, and Turks the southern Slavs until our own day. The history of all Europe east of this line has much in common, but differs fundamentally from that of Western Europe. Thus the history of the Russian people creates a bond with the southern Slavs of

* In support of the view that the west coast of Africa falls into the European military region, and the east coast into the British area of the Oriental military region, I may cite the fact that the recent operations in the Cameroons were conducted on the arrival of a force despatched on August 31 from Liverpool, and that the attack on Tanga, in German East Africa, was made by a force which sailed from Bombay in October.

† This is seen on the globe, but disguised by distortion on the Mercator map.

the Eastern Church as truly as her economic deficiencies draw her towards the Ægean.

Across this direction of expansion of the great Russian people (mapped out as long ago as the days of Peter the Great) runs diagonally the line of expansion marked out for the great German race from, or soon after, the alliance of Germany and Austria, which was concluded secretly in 1879, at the termination of the Russo-Turkish war, and became known to the world about 1888. The later development of this alliance was the inclusion of Turkey, by which it was designed to extend a military confederation from the North Sea to the Persian Gulf, and thus at the same time to wall off Russia from the Mediterranean, and master our line of communication with India. The military advantages possessed by the interior position of this proposed middle state are very great, since it permits the confederates both to combine their forces and to deal alternate blows on either hand. It may be noted here that an isochronic map of the German Empire shows almost every point on the frontiers, except in Alsace and Lorraine, to be within ten hours of Berlin by express train.

Until the recent Balkan war Austria and Turkey were conterminous at the Sanjak of Novi Bazar. After that war, however, the continuity of the Berlin—Vienna—Constantinople confederation was destroyed. The map of the enlarged Serbia, comprising the whole of the valley of the Morava and most of that of the Vardar, shows that state as a corridor leading from Austria nearly to Salonika, the port facing Smyrna, which is the gateway to Asia Minor from the Ægean. The erection of a state of Albania walled off Serbia from help by maritime allies.

As Russia with her traditional ambition of expansion to the Mediterranean stood in the way of German expansion to the south-east, so the position and the traditional policy of Great Britain were inconsistent with the German scheme for expansion westwards, both on the continent and overseas. These schemes are known with absolute certainty, for her statesmen thought it necessary to obtain the driving power of national aspiration for their policy, and it is impossible to educate a whole nation for thirty years in secret. Only the times and seasons were concealed. The German policy consisted of two parts. First, to obtain the hegemony of Western Europe; second, to secure possession of overseas dominions now held by civilized powers, since Germany was too late to colonize on a sufficient scale by the legitimate means of occupying waste or savage countries.

The British Area of the European Military Region.—The power of Great Britain in the world depends upon her being mistress of the Atlantic communications of Western Europe, and consequently of free communication with her overseas dominions, and the ability of Germany to seize and retain the overseas dominions of weaker states depends upon her wresting that control from Great Britain.

The conception of there being lands on the Continent of Europe which

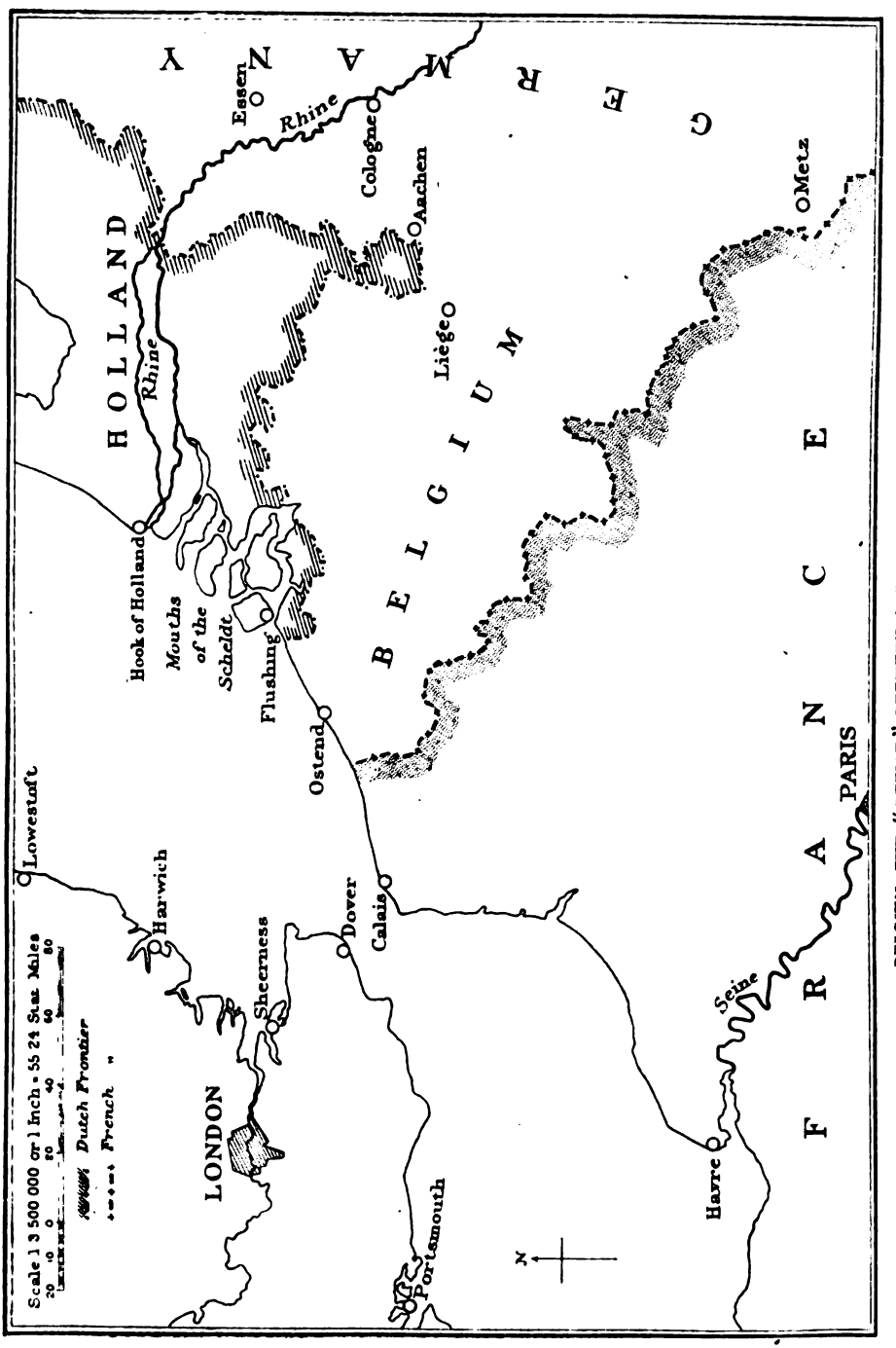
are part of a British military area may be illustrated by reference to the Monroe Doctrine of the United States. The foreign policy of that power is based upon the declaration that the acquisition of territory on the American continents by a nation from overseas will be regarded as a *casus belli*. We have a traditional policy which is equivalent to a Monroe doctrine, viz. that the acquisition of territory on the coasts or islands of Western Europe will be a *casus belli*. The doctrine, or policy, began at least as early as the days of Queen Elizabeth, when it applied to the Rhine delta and to the mouths of the Scheldt * (where the Spanish Armada was to pick up the landing force for the invasion of England). The extension of the policy to the coast of Norway is indicated in Professor Lyde's recent paper in the *Journal* by his reference to the joint guarantee given by Great Britain and France against any encroachment by Russia upon the Varanger Fiord. The fact that Norway has long since ceased to be a great power makes us too apt to forget that the fine harbours of her coasts are within 300 miles of Scotland and that they have direct access to the Atlantic, "turning our position" on the north.

The harbours of Portugal and her islands, Madeira, Cape Verde, and Azores, are important positions on our routes to Egypt, South Africa, and the Caribbean. Too little attention has been given to the important advantages which we shall derive in the present war and afterwards from the gallant action of Portugal in throwing in her lot with us.

Our country has often had cause to regret that the more continental position of Denmark, and the fact that its ports do not threaten the communications with our overseas dominions, inclined our statesmen to refrain from offering armed support against the encroachment of Germany. Disraeli, however, pointed out at the time that the acquisition of Schleswig-Holstein by Prussia would be followed by the growth of a new naval power in the North Sea.

The importance of the Low Countries, with the harbours of the Rhine and Scheldt, is as great for us now as it was in the days of Marlborough and Wellington; but the French departments of Nord and Pas de Calais have an increased importance for us owing to the development of artillery and of marine mines and submarine craft. In the first place, these means are sufficient to render the Straits of Dover perilous to a battle-fleet, and the loss of the interior line would be equivalent, from the naval point of view, to doubling the length of our coast. Thus, to reinforce Sheerness from Portsmouth, it would be necessary to steam round the

* There are two channels leading to the Straits of Dover—the English and what I propose should be called the Dutch channel, which for about 100 miles on either side of the strait are of equal dimensions and similar form. The Rhine and Scheldt empty themselves into the latter, the Seine into the former. From Harwich to the Hook of Holland, at the mouth of the Rhine, is 106 nautical miles; from Southampton to Havre, at the mouth of the Seine, is 105.



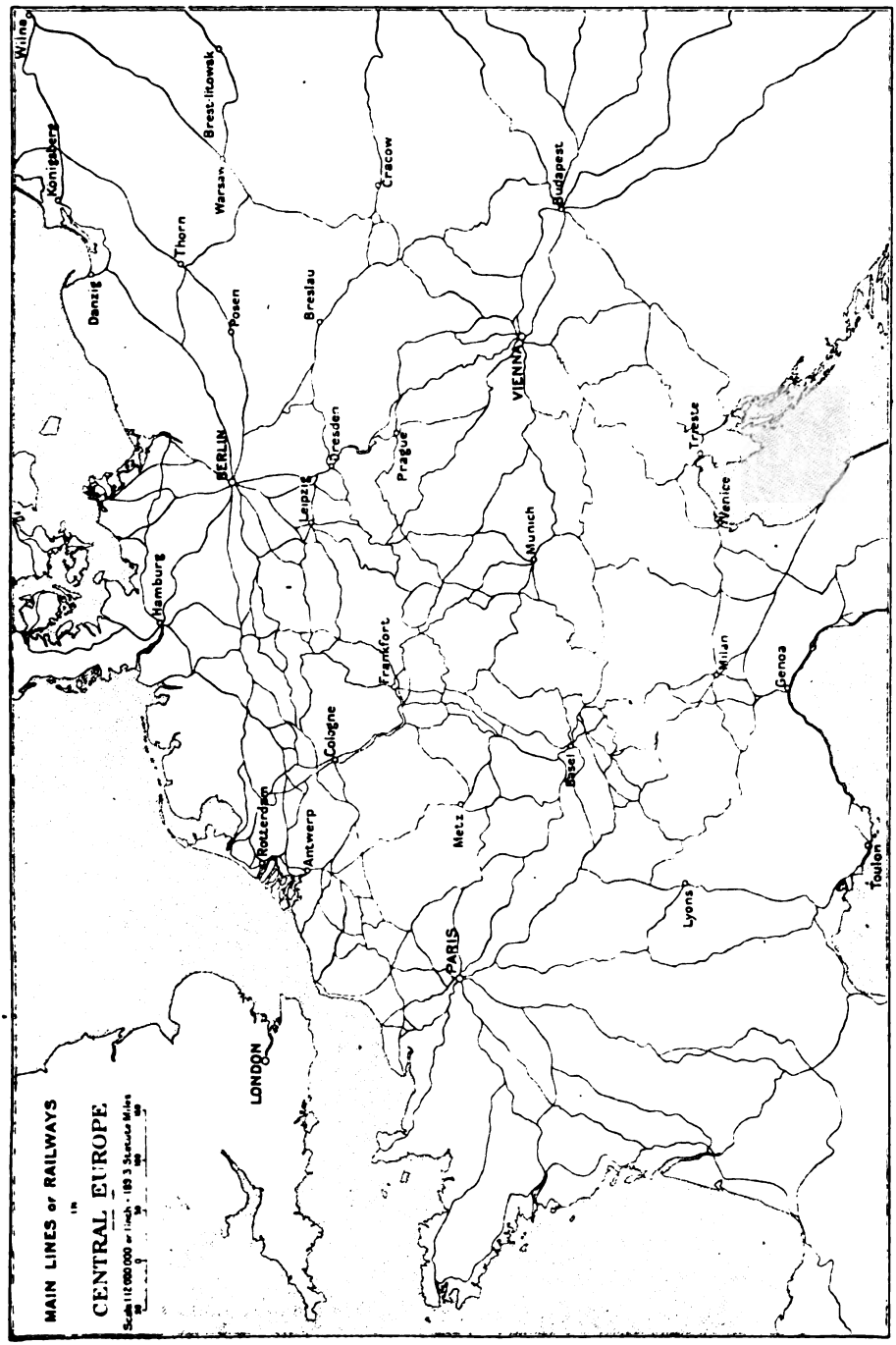
BELGIUM, THE "DEFILE" BETWEEN GERMANY AND FRANCE.

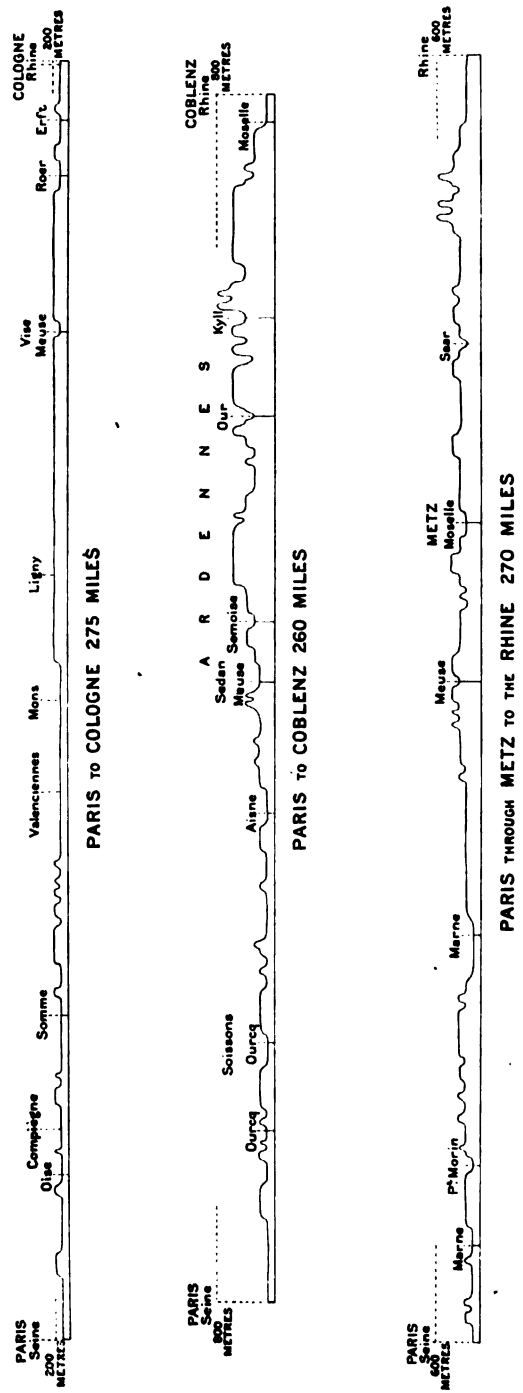
north of Scotland. In the second place, our communications across the English Channel would be jeopardized. In the third place, a German occupation of the opposite shore of the Straits of Dover would entail imminent danger of invasion.

I will not enter into the much-discussed methods for getting a force across the Channel and of securing the communications, but I will draw attention to one or two geographical points with reference to the line of invasion of England from Rhenish Prussia through Belgium and the North of France. The straight line drawn from Aachen through Ostend and Margate to London has a length of only 280 miles. Now, if there be any change in the relation of geography to military operations produced by the increase of armaments, it would seem to be that the importance of a short and straight line of communication is greater than ever.

It is held that a power invading Britain should seize a peninsula and establish a position analogous to that of Wellington behind the lines of Torres Vedras. Mr. Mackinder, in his 'Britain and the British Seas,' refers in this connection to the peninsulas of Cornwall and Fife. East Kent, however, is also a peninsula and affords one or more excellent lines of defence for an invader lying transversely to the direction of his advance upon London.

Lines of Invasion—At the outbreak of the war the ordinary maps then in the hands of the general reader, however detailed, gave no clear notion of the reasons which determined the lines of advance followed by armies on the Continent. Since then orographical maps of the country from Paris to Petrograd have been separately published and come into general use, and the connection between the relief of the land and the lines of invasion is now pretty generally understood. From the orographical map we see that heavy traffic (and there is no traffic so heavy as that of a modern army) has to skirt round the margins of extensive blocks of highlands, and find its way from lowland to lowland through defiles. The greater Roman roads and the lines of invasion followed in ancient times pass through the principal defiles of Europe, but the degree to which modern communications are restricted by these defiles is masked on the map by the number of local roads and railway lines. The accompanying map has been prepared from Bradshaw's railway map by the omission of all but what are there denominated main lines, which are generally the "through routes" passing from one country to another. If this map be compared with the orographical map of Europe, p. 456, it will be seen in Western and Central Europe that large blank spaces on the railway map correspond to blocks of highland on the orographical map, that important lines traverse the length of river valleys lying between highland blocks, and that the lines gather together into knots at such defiles between highlands as the Belfort Gap and the Moravian Gap. The intersection of the north-to-





south railways with those from east to west in the neighbourhood of Dusseldorf is readily explained by reference to the orographical map, which shows the Rhine valley as a natural route from south to north, and also that the blocks of highlands on either bank from the Alps northwards pond up the traffic from east to west, causing it to flow strongly in a concentrated stream where the north European plain reaches the foot of the Ardennes and the corresponding heights on the east of the Rhine. This region of Westphalia and Rhenish Prussia, of which Cologne is the principal centre and fortress, is, from a military point of view, perhaps the most important district in the territories of the Germanic allies. It shares with Silesia the advantages of coal-mines and miscellaneous factories. At Essen, east of the Rhine, not far from Dusseldorf, are the works of Krupp on which the German army so greatly depends, and as a collecting and distributing centre its position is

unsurpassed, as can be seen on examining its position on the north and south Rhine route, which here has water-carriage for large ocean steamers, and also with reference to the ports of Hamburg, Bremen, and Antwerp, and to Paris and Berlin, connected by the main railway line by way of Namur and Liège.

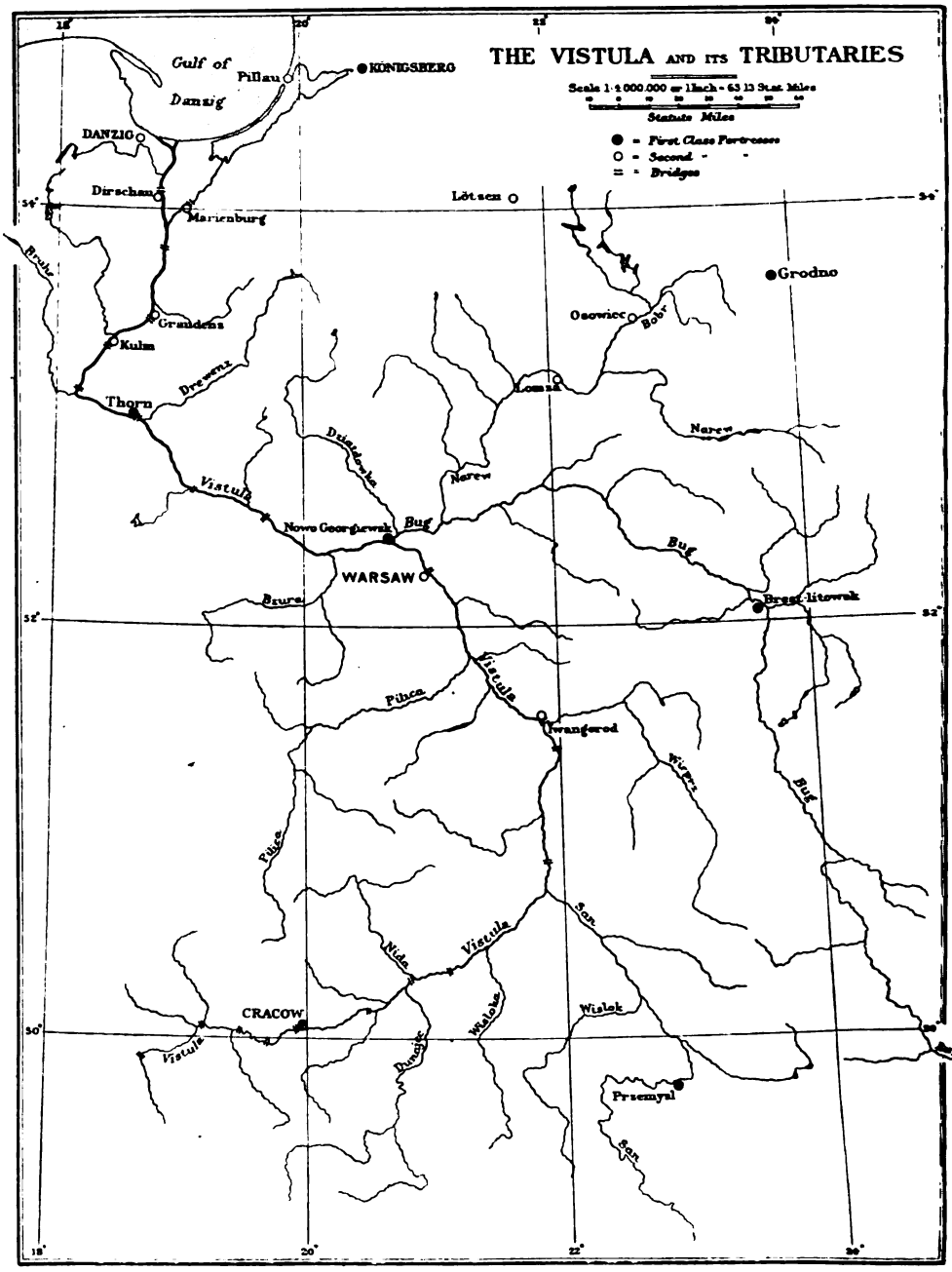
Belgium between the line of the Lys and lower Scheldt on the one hand and the line of the Sambre on the other is a strip of country not too broad to be correctly described as a "defile" between Germany and France, a character upon which so much insistence is laid in all writings dealing with such matters that it is unnecessary to labour the point, which is moreover enforced by the locality of such battles as Ramillies, Ligny, Mons, Waterloo, Oudenarde, and Fontenoy.

The fact that the country stands in a somewhat similar relation between Metropolitan England and the Cologne district of Germany was not obvious to the general reader as long as all ordinary maps, except the necessarily small-scale map of Europe, were limited by the Channel, instead of showing together the intimately connected countries on both sides.

Paris to the Rhine.—The semicircular outline of the Seine watershed causes a convergence of rivers and valleys upon Paris which is partly the reason of the capital being, to more than the usual degree, the radiant point of the country's railways.

The Rhine from Basle to the sea describes very nearly the quadrant of a circle with Paris as its centre and a radius of 250 miles. This is the distance to Strassburg and to Cologne. Mainz and Wesel lie about 30 miles further off, and the Hook of Holland about the same distance nearer. The principal obstacles are—first, the Vosges, which are lofty and wooded mountains; and, secondly, the Ardennes, of which the plateau summits are wooded, and through which the rivers run in tortuous gorges with steep sides. The easy routes are three: first, the comparatively narrow but low gap of Belfort, leading directly on to the valley of the Upper German Rhine; secondly, the routes by Nancy and Metz, where the elevation is moderate and the rivers do not run in gorges; and thirdly, that of the Belgian plain. A straight line from Paris to Valenciennes, and another thence to Cologne, leads from the Seine to the Rhine with only one considerable river crossing, that of the lower Meuse near Liège, and without reaching nearly the 600-foot contour line or encountering a single steep gradient.

Poland and the Basin of the Vistula.—Poland has disappeared from political maps except as the name of a Russian province, but a language map of Europe shows that the area occupied by Polish-speaking people comprises the whole course of the Vistula. This river with its tributaries is the dominating physical feature of the area in which the principal operations of the Eastern campaign have been conducted. The Eastern stronghold of the Dual Monarchy is the north-pointing salient between



the San and the upper Vistula, with the fortress of Przemysl on the right bank of the former and that of Cracow at a distance of 130 miles on the left bank of the latter. Defensively this stronghold guards, first, the approach to the Dukla and other passes in the depression between the Tatra group and the Central Carpathians, leading to the Hungarian plain, and, secondly, the gap between the Tatra group and the Sudetes, called the Moravian Gap, which leads to Vienna and Prague.

The lowest reaches of the Vistula, which are in Prussian territory, are crossed by a number of railways. These crossings are guarded by forts; and on the Baltic and near the Russian frontier respectively are the fortresses and depôts of Dantzig and Thorn. This chain of posts secures the communications of troops acting in East Prussia, a country tactically strong for defence, but which without a line of fortresses on the lower Vistula would be strategically very weak, as it would be isolated if the Russians seized that line.

Below the junction of the San and Vistula and above Thorn there are long reaches of the latter river without military works, but the position of the tributaries on the right bank has enabled Russia to organize her western stronghold behind the middle Vistula, centred on Warsaw. The southern line is that of the Wieprz, which joins the Vistula on the right bank at the fortified town of Iwangorod. The northern line commences on the Bobr, on which is the fortified town of Osowiec. This river enters the Narew (on which is Lomza), and the Narew in its turn enters the Bug, at whose junction with the Vistula below Warsaw is the fortress of Nowo Georgiewsk. The Russian railways (from north-east and south-east, not from east on account of the great area of the Pripet swamps) converge on Warsaw; and Brest Litowsk, at the railway crossing of the Bug behind Warsaw, is fortified.

The PRESIDENT (before the lecture): There is no need for me to-night to introduce Dr. Vaughan Cornish, who has lectured to us here on many subjects. We have listened to him with equal interest on sand-waves and on the Panama canal. He is going to talk to us on the historical and physical geography of the theatres of war.

Sir WILLIAM MACGREGOR (after the lecture): I can only say we have listened to a lecture here this evening to which certainly a very large amount of study has been devoted, but I think he would be a very bold man that would attempt to criticize what the lecturer has put before us, without having had time or warning to make some preparation. It is far beyond me to attempt to do anything of the kind, but I believe this—our lecturer has shown to all of us, with very few exceptions at all events, how very little we knew of the subject to which he has given so much time and attention, and I am sure we are all very much indebted to him for that. The suggestions he has put before us are so very complicated, that I do not think any of us need be ashamed in saying we have heard and we have seen a good deal that to most of us must be pretty new. For my part, I can only thank the lecturer for what he has put before us, and I am sure when I express my own thanks I am also justified in expressing yours.

Prof. L. W. Lyde: Unlike Sir William, I had the pleasure of seeing Dr. Cornish's paper before, and I read it, as I have listened to it to-night, with very great interest, interest both in the matter and in the method. The method interested me particularly because it seems to me so essentially geographical. Geography is nothing if it has not a wide outlook. But all these big geographical problems have two aspects—one shows you the relation of the part to the whole, the locality to the big Earth, the other shows you the relation of the people to the place. If I might venture to say so, he has treated admirably the former problem, and especially in some of his suggestions. For instance, that the Indian ocean is a potential British lake; that the frontier of Europe really runs along the line of great world deserts; that the Balkan war severed the continuity of the Berlin-Vienna-Constantinople-Baghdad line, and *therefore* made Serbia peculiarly obnoxious to the wire-pullers in Berlin. The only thing I should like to protest against is his suggestion that our civilization is Mediterranean. The Mediterranean was never till quite recently anything but a big lake; its civilization was not even maritime, still less oceanic, and that makes a great deal of difference from our point of view. The other part of his subject, the relation of the people to place, he did not touch on. In order to lead up to that I would suggest one point. In his paper he spoke about a Monroe doctrine in North-West Europe. It seems to me there has not been any such thing till quite recently as a Monroe doctrine. Many of us can remember the dismay with which we heard that England had given up to Germany the island of Heligoland, which belonged to us, in return for Germany's permission to annex the island of Zanzibar, which did not belong to her. Could anything have been less like a Monroe doctrine? Could any gift have inspired any vigorous people more fully to embark on a naval career?

Now for my point about the people and the place: perhaps Dr. Cornish avoided it for fear of being too political. I have myself been hauled over the coals more than once lately for remarks I made in this building, but my conscience is absolutely free from any sense of guilt, because I have offered you no opinions, only told you facts. On the other hand, you cannot exclude political and historical geography from the discussions of any geographical society simply because so many people will use the word "political" in the sense of partisan. I propose, therefore, to devote myself to this historical geography, and I think any worthy historical geography of the world-theatre of war should throw light on three problems. The first is one on which I dare not say much just because I have said so much already, but I must say something. The subject, of course, is the character, the origin, of the Prussian nation (you may laugh, but it is the bedrock of the whole thing) as a blend of Slav and Teuton blood, so mixed as to perpetuate chiefly the two marked characteristics of the original stock—the docility of the original female stock, the outraged Slavs, and the brutality of the original male stock, the robber soldiery; and these two characteristics were accentuated through centuries by the military and political and mechanical tyranny imposed more or less necessarily on the area by its geographical environment, and by the artificial pace with which its industrial development was followed. Many feelings have been roused by this war; all the opinions I have heard expressed about it, I have been able to understand with one exception—I cannot understand people being surprised at anything that has been done. It seems to me that every thing I have seen or read of is simply the logical sequel of phenomena I have been watching for twenty-five years. When one saw such an island given up in such a way to such people, one said the day must come when it would have to be recovered by force of arms.

There is a second point: a true historical geography should trace out how, when that little bathing resort was given up by us to them, at once it began to be

fortified. As soon as the fortifications were started, the Kiel Canal was started; then all over the world Germans began to give trouble in British spheres. In Africa especially German colonies began to encroach on what Dr. Scott Keltie or Mr. Silva White at the time would have told you was the legitimate hinterland of British colonies—in Togoland, the Cameroons, South-West Africa, East Africa. These colonies, which were obviously not going to pay, and which have been a dead loss, were made at once the basis for a demand for a navy, and that was focussed between the fortified island of Heligoland and the Kiel Canal, which—as their leaders explained to us—would link the German Baltic and North Sea fleets and simplify their work, while it would implicitly divide the British fleet and double our work. I do not complain of these things, still less do I want to blame them for doing the things; in any case one does not *blame* a mad dog. But I do want to press the point that these things are legitimate subjects for scientific investigation in a worthy historical geography—and I mean not simply a list of frontiers and battle-places, I mean a worthy outlook that tries to account for particular human developments taking place over particular geographical areas.

The third point on which I think a worthy historical geography should throw light, is our own position with regard to the war—why we are, if we are, and how far we are, innocently responsible for it. There is my point about the Mediterranean civilization. We are of oceanic civilization, evolved out of a sea fishery, developed into world-empire. "Those who go down to the sea in ships and occupy their business in deep waters" learn two things: one is tolerance, and the other is national modesty. You laugh, but please notice I did not say individual modesty; I said national modesty. We have, because of our oceanic civilization, learnt to be tolerant almost to apathy. We have tolerated economic and political encroachment, abuse and ridicule, veiled threats and other impertinences, until a people so reared in machine habits as to be incapable of spiritual insight believed firmly we would tolerate anything. That was their mistake, and that is where and how far we have been innocently responsible for the war. Many busybodies during the last twenty years have told us we were insular and parochial. If by insular you mean that an insular environment develops a marked racial type, it is a well-ascertained fact, if not a truism; and God forbid that, in that sense, we should ever become continental. If by parochial you mean we are narrow in outlook and in sympathy, earthquake records over the whole world, if nothing else, have proved the contrary, and the reason is that we are an oceanic civilization. We are tolerant because wide commerce, when it is developed out of a sea fishery perfectly naturally, must be coincident with wide tolerance, and in our case only our insular virtues have prevented that tolerance from becoming a flabby and maudlin cosmopolitanism. In a word, if historical geography has any real meaning, we can take comfort from one certain inference, and it is that no nation without that insular tolerance, no nation that is obsessed by a continental overweening arrogance, will ever rule that grey old democratic island-loving ocean.

The PRESIDENT: Before we part to-night, it is my privilege to move a vote of thanks to the lecturer, which I am sure you will accord with the greatest readiness. We are indebted to Dr. Cornish for his clear, comprehensive, and instructive lecture on the military divisions of the world. When we go to law we go to a lawyer, to know not our own case, but the case of the other side. This holds good in war. What seemed to me the most interesting part of Dr. Cornish's lecture was that in which he gave us to some extent the German point of view. He showed us, in the first place, that the alliance with Austria and Turkey was calculated to throw a great bar between the Western Powers of Europe and Russia, and further, to divide England from our Indian Empire. The head of the Persian Gulf was

meant to be a great German outpost from which, when the time came, they might have approached and isolated India. In the next place, he showed on the map that the most direct line of attack on England lay through Calais, and that although some said it was absurd of the Germans after they had failed on Paris to make their next attack on Calais, the Germans were acting on a simple geographical principle—they were taking the shortest road to London. We are also much indebted to Prof. Lyde, who always adds interest and instruction, and I may add entertainment to our evenings. By this time we all know his views on the racial origin of the Prussian people. I regret we have not been happy enough to have Major Darwin here to discuss how, by a better system of Eugenics, the Prussian stock may be modified. But beneath Prof. Lyde's theory there does undoubtedly lie a fact which may give us some hope for that future to which we would fain look forward—a future of peace and good-will among men; and this fact is that the Prussian race and the German are essentially different. We may hope, therefore, that in the future we may succeed in liberating not only Europe but also Germany from the burden of a military autocracy.

FURTHER FRONTIER WORK ON THE BOLIVIA-BRAZIL NORTHERN BOUNDARY.*

By Commander HERBERT A. EDWARDS, R.D., R.N.R. (Retd.), F.R.G.S.

In a former paper (May, 1913) I had the honour of presenting to you an account of the work that had been accomplished by the Joint Commission of Bolivia and Brazil on the northern boundary between the two countries during 1911 and 1912, and on August 6, 1913, the two Commissions met again in Manaos (river Amazon), and preparations were at once pushed forward to continue the exploration and delimitation of the frontier line of the rivers Abuna, Rapirran, and Madeira. In order to obviate the unavoidable errors in longitude inseparable from chronometric determination under circumstances so inimical to careful and satisfactory transport as those which confronted us, it was decided to attempt to utilize wireless telegraphic time signals from the powerful wireless station at Porto Velho. But as the position of Porto Velho itself was indefinite, our first work was to determine its longitude. For this purpose a survey party under Mr. Atkinson and Lieut. Mascarenhaes was sent forward to Porto Velho, whilst the main body of the Joint Commission camped at Point Ismail, near Manaos. By the courtesy of the Brazilian Government the wireless stations at Porto Velho and Point Ismail were placed at our disposal, and, after initial difficulties had been overcome, the position of Porto Velho was determined to be in lat. 8° 45′ 33″ S., long. 63° 54′ 40″ W. of Greenwich.† At the same time experiments were carried out by Mr. C. C. Chapman with a rough field set of receiving apparatus designed and made up by himself for use in the field, and on September 20, the

* Royal Geographical Society, December 14, 1914. Map, p. 456.

† See Appendix.

Commission proceeded with all stores and instruments, on board one of the river steamers *en route* for Porto Velho. Leaving Manaos and proceeding down the Rio Negro, after some hours' steaming we entered the river Madeira, one of the mighty affluents of the river Amazon on its right bank, and steamed for nine days up this noble stream, calling at various stations on our way and passing the mouth of the "River of Doubt" (river Duvida), the source and upper courses of which have since then been brought within geographical knowledge by Col. Roosevelt and his band of adventurous pioneers. I may say that the Duvida is one of the many large tributaries of the Madeira, which are still unmapped and unexplored to their sources, though some portion of each river, from its mouth upwards, is more or less known to the local settlers and seekers after rubber, whose search for new and virgin trees never ceases and is carried into regions of the forest remote from the main routes. Unfortunately for geographical science, these pioneers are not equipped with even simple mapping outfit, and seldom, if ever, do they return with any sort of intelligible map or sketch of the country they pass through, or of the rivers they navigate by canoe and raft.

The navigation of the river Madeira itself is open to ocean steamers as far as Porto Velho, some 1500 miles from the ocean, during high water, and to river steamers of light draught all the year round, though great caution is necessary in following the tortuous channels of its upper course during dead low water. Porto Velho, the base of that wonderful forest railway, the Madeira Mamoré, stands 2 or 3 miles below the first of the series of magnificent rapids and falls which make the river unnavigable above here, and is, of course, quite a considerable little town, with bungalows, engine shops and sheds, warehouses, some stores and shops, an hotel, and a wireless station in daily communication with Manaos. Here we received every kindness and assistance from the genial Dr. Kesselring, the manager of the railway, and his assistants. Our stores, instruments, launches, and canoes, etc., were landed from the steamer and transported by rail to Abuna, a station on the frontier, to which place we followed, leaving behind us at Porto Velho an observation party, under the charge of Mr. Atkinson and Lieut. Rabello Leite, with instructions to send time signals by wireless to us nightly at a specified time. Arrived at Abuna, our motor launches and canoes, fitted with motor godilles or auxiliary engines, were soon put together, our stores loaded up, and early in October a base was established at the island and falls of Fortaleza, some few miles up the Abuna river. At this point there is a break in the level of the river, the upper waters standing some 40 feet above the lower, and joining them by means of a narrow rocky channel gorge some 200 yards long, through which the water rushes with terrific speed, dashing from level to level with tremendous force and a great roaring noise which is unceasing and can be heard some distance away. The rocks are of beautiful red granite, worn smooth as velvet by the friction of the waters,

and in the watercourse are huge boulders, against which the water dashes, foaming and spraying the rocks on either side. No canoe or boat of any kind can live in the falls, even at high river, and we had to unload everything on the lower side, and carry it up the rocky portage across to the upper waters. Then by means of a winch and wire rope, which we had provided, we hauled our launches, canoes, etc., bodily out of the water on to special rollers, dragged them up the steep incline, across the level summit of the island, and then down again into the upper pool of the Abuna. Six days were occupied on the work of transportation from the lower to the upper level, and the nights were spent in testing and improving our field wireless receiving set, which we rigged up here for the first time under service conditions. The aerial wire was stretched across the upper level from a tree to a special pole, and we were delighted to find that we were able to hear the Porto Velho signals quite distinctly.

By October 14 all stores, etc., were sorted out, the launches and canoes loaded and in the water above the falls, and we were able to start on our journey up-stream. Each commission had its own launch, 30 feet long, driven by a kerosene motor engine, and also a large native canoe, to which was fitted a petrol-driven motor godille. The Bolivian Commission had also a 30-foot steel lighter, which was towed alongside the launch; and both parties had several small specially built punts and canoes towing astern. From one of these punts, which was fitted with a special compass and distance-recording log, a running survey of the river was made and adjusted afterwards between the fixed observation points obtained nightly.

The river Abuna above Fortaleza was about 100 yards wide and, outside the pools, was 10 to 15 feet deep. Very soon we had our first excitement in getting our convoy through the dangerous rapids of Tambaqui, where the water runs like a mill race between rocks and broken stone; but our motor launches proved equal to the occasion. The convoy was dropped below the rapids, and the launch alone steamed into the current. Our first attempt was unsuccessful, for, after breasting the stream for some time, she was carried back by the force of the waters, turned broadside on and floated back into the pool below the rapid. It appeared as if we should have to unload again and use ropes to drag everything through by hand. But our engineer opened out his engines for a second attempt, and again the little launch was put into the rapid. Inch by inch she crept ahead, with the water dashing over her bows, and men stationed on each side with long poles to keep her off the rocks if the current swept her broadside on again. There were some anxious moments, but all at once she seemed to gather way, and, shooting ahead, was safely in the upper pool. Once over, a long rope was paid out from her to the convoy below, and the barge, punts, and canoes were pulled through—though two canoes were swamped and their steersmen got a ducking in the endeavour. That night we camped at a barracão called "Primor," and had the satisfaction of receiving our time signals successfully. Proceeding next day, we soon had

evidence of the lawlessness of the scanty population in the district, for on rounding a sharp turn of the river we came across a canoe, manned by three men, towing alongside a naked corpse, in the breast of which was a hole large enough to put one's hand. It was a case of local justice or revenge. The dead man had shot the owner of one of the seringals (rubber estates) and then taken to the river in flight. The retainers of the seringeiro had pursued, captured, and shot him, and, cutting out his heart, were towing him down-river again when we came across them.

Day after day we steamed up the beautiful river, passing many small rapids and meeting and overcoming the usual difficulties of river navigation, but making good progress daily. At the Cachuela de Barro our passage was exciting enough for any one. The rapid is formed by a fall in level of the hard clayey river-bottom, and the channel follows a circuitous course between the "salãos," as the hard clay boulders are called, and the current is so strong that no man can stand up in it without being immediately swept off his feet. We steamed our launches in singly, and then, with engines going full speed and men pushing alongside and pulling and shouting, bit by bit we got them through. Several men were swept away, but luckily all were swimmers, and except for bruises they emerged in the deep water below the rapids none the worse for their journey through the Cachuela. The small canoes were able to pass through a straight but narrow and shallow channel, and the barge was hauled through by ropes. The insects at this place were very annoying, and everybody was severely bitten by "pium" and "mangrove" fly. Next night we arrived at Argelia, a large barracão belonging to Messrs. Suarez, but before arriving we had an anxious and exciting time, as, steaming in the dark for the first time, our launch and lighter ran high and dry on a huge snag, and two of our canoes were swamped as the launch swung round broadside on to the current. It was as dark as pitch, and we could see absolutely nothing, not even the river-banks. Yet the only thing to do was to swim ashore with ropes and heave the boats off. This we did, but swimming about in the dark in waters infested with alligators, cannibal fish called perania, sting rays, etc., is not very good for the nerves. Still, our Indian henchmen did not seem to mind much after the first plunge, and we all went in the water together so as to have the safety of numbers. It took us two and a half hours to get our convoy off that snag, and by that time the local mosquitoes had banquetted to their heart's content at our expense; we were all cold and wet and miserable when we arrived at Argelia, where, however, Mr. Stockman, an Englishman and representative of Messrs. Suarez, turned out and gave us a royal feéd. Next morning our Brazilian colleagues turned up; they had camped at dusk, preferring not to attempt the unknown navigation in the dark.

At Argelia we stayed four days, and Mr. Chapman was very successful in receiving our wireless time signals. We were able to carry out

the necessary repairs to our launch and canoes and recuperate our men, who had been worked very hard and were all more or less in need of medicine, cooked food, and rest.

Above Argelia the river narrowed and navigation became increasingly difficult; often we had to axe our way through fallen trees, and in many places the overgrowth from the river-banks met across stream and we had to cut our way through. Progress was comparatively slow, and Mr. Wilson and Mr. Gibbs, whilst carrying out the traverse survey from the canoe astern of the launch, had many narrow escapes from capsizing, and were frequently dragged through overgrowth and wreckage to their great discomfort; but on the 23rd we arrived at our objective, the mouth of the river Rapirran, where we unloaded stores and established our base camp on the high ground, clearing away the undergrowth and pitching our tents on a hilly ridge about $\frac{1}{4}$ mile below the actual river mouth. Here we prepared to stay some weeks, as we proposed to carry out our exploration survey of the lower Rapirran from this point, as well as clear away the trees on both sides of the river mouth so as to be able to erect the permanent boundary marks. Malarial fever and rheumatism were already rife amongst us, and, the season being well advanced, rain-storms were frequent, and forest work and exploration were carried out under difficulties, which increased daily. Bridges had to be built across the Rapirran, mule transport had to be organized from one of the Acre seringals, and we were forced to send one of our launches down-river again for more barrels of cement, as we found that the permanent marks would be almost submerged at high river, and it was therefore necessary to place them in a very heavy concrete foundation. Early in November, the Brazilian commissioner and I being ill and unable to leave our tents, Mr. Wilson, Mr. Gibbs, and a party were detached and sent off to attempt an exploration as far as Station A, 1911, the point at which we began our survey of the upper Rapirran. They were accompanied by Mr. Chapman and our wireless equipment and party. Five days later, Captain Braz and I, with our party, proceeded up the Abuna as far as Santa Rosa, and then cut across through the forest and met Mr. Wilson at Station A. After receiving very successfully wireless signals on three nights, we all returned to the Abuna River and to our camp on the Rapirran. By this time the boundary marks had been erected, and the necessary acts of inauguration were read, after which we started on our down-river journey. This was facilitated considerably by our having plotted our surveys; we therefore knew exactly where the Cachuelas, snags, and dangers were, and we were able to prepare for the dangerous places and negotiate them comfortably instead of blundering on them haphazard as on our upward journey. But even so the passage down was never tedious; every ten minutes had its exciting moment, and many times our little craft was threatened with disaster. One does not mind one's canoes being swamped, as usually it simply means some little delay and a wetting, but as the river had

fallen some 3 or 4 feet since our ascent, we encountered several rapids, new to us, and the dangers of snags and jagged rocks had increased tremendously. In many places tree-trunks were right across the river at the surface, and these we took at full speed, the force of impact carrying the launch right over them. Still, it was always dangerous, but we ran our risks, and by the 23rd we were back at Fortaleza. Here, of course, the launches and canoes were unloaded, and everything was transported from the upper to the lower pool. The few miles of the Abuna between Fortaleza and the mouth were then traversed and camp pitched at Manoa, the Bolivian frontier station at the junction of the Abuna and Madeira Rivers. Boundary marks were erected, and sick men were sent down to Manaos, for we were again in touch with the railway. From here all the officers of the Brazilian Commission, with the exception of Captain Braz de Aguiar and Lieut. Mascarenhaes, returned to Manaos, as they considered it was not desirable or possible to do any more work that year. We had, however, decided that we would attempt to do the 40 miles of the Madeira River with a view of erecting the permanent marks at Villa Bella, and thus completing the survey on behalf of Bolivia, and Captain Braz decided to remain with us for this purpose. The river stretch of the Madeira between the mouth of the Abuna and the junction of the rivers Mamoré and Beni, which form it, includes several very difficult rapids, and to Mr. Wilson and his party was entrusted the exploration of the river, whilst we fixed observation points to control his survey, and erected the boundary marks, etc. Mr. Wilson and party carried out this difficult work in a most able and satisfactory manner, and the marks having been erected, the commission returned to Porto Velho on December 19, and thence to Manaos and England.

The river Abuna is formed by the confluence of the rivers Xipamanu and Karamanu, which have their sources on the 1000-feet-high plateau east of Cobija, and its valley lies between the rivers Iquiry or Ituxy on the north and the Orton, Beni and Madre de Dios on the south. Its course is approximately from west to east through a dense forest region, rich in rubber trees, and its stream is fed on both sides by numerous tributaries, which drain the higher slopes of the valley. The Rio Negro or Pachaquara, the region of which is inhabited by the Indian tribe of that name, is its largest tributary, and at the confluence the two rivers are approximately of the same size. The tributaries of the southern bank are by far the more important as regards the volume of water discharged into the Abuna, and there is reason to believe that the main river course is on the northern side of the valley-plain between the adjacent watersheds. Its river-bed differs in character from the river-beds of the more northern rivers, the Acre, Purus, etc., inasmuch as the bed and banks of the Abuna are mostly of mud and clay, whereas those of the more northern rivers are decidedly sandy, with great stretches of sandbanks, called "playas," in nearly every reach. The absence of these "playas"

in the Abuna above the falls of Fortaleza was most noticeable and may be of some geological interest. The Rio Negro, already mentioned, is, of course, so named because of the dark colour of its waters, but I was unable to perceive any difference in colour between the waters of the two rivers at their confluence.

The annual rise of the Abuna usually commences about the middle or end of November, and by the end of January the waters have risen some 30 feet above low-water mark, and in many places the river overflows its banks and inundates the surrounding forest region for some miles. In March the water begins to fall gradually, but the banks are usually covered until the middle or end of April, and the extreme low-water mark is not reached until August or September. "Ripoquettes," or temporary rises, of from 2 to 12 feet, occur after local rains, but are of short duration.

The general level of the region through which the Abuna flows is from 300 to 500 feet above sea-level, and is, without exception, dense forest. Traces of ironstone are everywhere, but actual rocks were observed only at the cachuelas, or rapids, which were always, as far as we could see, composed of igneous rocks. The formation of the rapids of the Abuna, as those of the Acre, appears to be always similar, viz. that of an outcrop from which the softer strata have been washed away on the lower side. From our camp, when at the mouth of the Rapirran, we had to send our canoes down-river for 30 miles, in order to procure stones suitable to mix in with our cement for the foundation blocks of the permanent marks. The iron-bearing strata at the mouth of the Rapirran could be crumbled in one's hands, though in the mass it appeared to be solid rock.

For a distance of some 25 miles above the rapids of Tambaqui, there are practically no civilized habitations on either side of the river. It is a low-lying region, flooded more or less during high river, and its climate is said to be extremely deadly. Besides which, on the right bank of the Abuna and the region of the Rio Negro are the hunting-grounds of the Pachaquara Indians, who resent every attempt at settlement. On our return to Fortaleza, we met a small party of pioneers, who had just been driven out from the Rio Negro district, with a loss of several men killed, by an organized raid of the Pachaquaras, after an occupation of only a few months. They told us weird tales of their experiences with these Indians, but it is not wise to believe all one is told, for highly coloured stories of Indian attack and atrocity are often only attempts to cover the misdeeds of the narrators, committed in the supposed interests of the rubber industry. Somewhat naturally, the Indians, living a free and unrestrained life in their ancient domain, resent the intrusion of men whose one object is to exploit the wild rubber-trees to their own gain, and whose incursion into the remote forests with this object drives away and alarms the ground game and

spoils the tribal hunting. Besides which, the Indian, tame or wild, is treated with scant ceremony by the pioneer settler, despite the excellent laws that have been enacted by both Bolivia and Brazil for his security and well-being. It is difficult or well-nigh impossible to ensure the favourable execution of these beneficent legislations in the frontier region, where life is lived under more or less feudal conditions, where "might is right," and individual retaliation for wrongs received is the recognized order of the day. Armed strife between the retainers of rival rubber estates is common enough, and raids on their neighbours, carried out by men with rifles in their hands, are of constant occurrence. One such raid came under our notice during the short time we were on the Abuna. One of our launches was held up by a party of armed men, who were on their way to attack the headquarters of a neighbouring estate. They proposed to use her to transport their force to the attack, but the officer in charge protested strongly, and, after consideration, she was reluctantly allowed to proceed to her destination. I may mention that the attack was duly delivered, and, after considerable slaughter on both sides, the depôt was captured, and the victors established themselves in the seringal. I have heard by letter since that this band of robbers has been "wiped out" by another and stronger organization from up-river.

Now as these are the methods approved and adopted between the lawless pioneers themselves, one can well imagine how little respect the "legal rights" of barbarous Indians would receive at their hands. And the Governments appear to be powerless in the matter of enforcing obedience to their will. Of course they will gradually extend their stations, organize a force of international police, and enforce law and order, but the difficulties in the way of effective organized occupation of the region of the frontier by officials, with sufficient force at their behest to compel obedience, are enormous. The Madeira-Mamoré Railway Company, the officials of which administer a huge territorial grant south of the rivers Madeira and Mamoré, have issued very stringent regulations for the protection of their indigenous and imported Indians. And I am glad to be able to state publicly that, during the time we were working on the frontier line near this railway, no case of hardship or illtreatment of local Indians came under our notice, although we had free access to every camp and settlement all along the line. In this district the Indians appeared to be well treated, happy and satisfied, and much attached to their "padrones," or people for whom and under whom they worked, or with whom they occasionally bartered articles of native manufacture for tinned food, ornaments, clothes, etc.

Above this low-lying region of the lower Abuna and Rio Negro rubber depôts have been established at many places on the river-bank. These depôts usually consist of a store, rubber shed, and a few "barracas" or huts, erected on some high ground immediately overlooking the river. The barracas are built on piles driven into the ground, and around them

the forest is usually totally or partially cleared by axe and fire. In these clearings some sort of agriculture is sometimes, but by no means always, carried out, and beans, sugar-cane, macaxera, maize, yams, mandioca (from which is made flour and a spirit called cachacha, which tastes something like gin), coffee, pine-apples, limes, oranges, mamão, etc., are grown. In some of the clearings cattle are to be seen, but they are bought from the drivers of the huge herds which are yearly sent from the plains of Bolivia to the region of the river Acre, and which cross the upper Abuna on their journey. Very seldom are any green vegetables cultivated, but there are several native grasses that are edible, and many of the palm trees carry edible tops, which serve as excellent salad when raw, and are not unlike a sweet cabbage when cooked.

Many of the Abuna depôts are in communication with the river Acre by way of long straight "varadors" or mule tracks, which have been cut through the forest; and old Indian paths and "strada," or rubber paths, leading from one rubber tree to another, along which a man, but not a loaded mule or draught animal, may pass, form an interlacing network between the main varadors without, however, directly communicating. Links on the varadors are formed by the "centros," as they are called, which are simply large huts used as collecting and distributing centres. And far away from the "centros," remote in the depths of the forest, live isolated rubber gatherers in barracas of a very simple type, sufficient only to give some small protection from sun and rain, and the posts of which afford supports on which the sleeping-hammocks are slung. These huts are, of course, erected on piles driven into the ground. A platform or floor, made of laths of the outer skin of a species of palm tree, is fastened to the piles generally about 3 feet above the ground, though in some districts the floorings are as much as 8 to 10 feet above the level of the ground. The sides and partitions, if any, of the hut are also made of split palm wood, and the whole is roofed with the leaves and fibres of another species of palm, which is sometimes woven into a very efficient sort of plaited mat, affording most durable protection. Nails are not used, the fastenings being of fibre or thongs cut from the skins of wild animals. Near each barraca is the rubber hut, which is simply a palm-leaf shelter, under which is constructed an underground furnace and smoke chimney.

The life of a working seringeiro is a particularly hard and comfortless one. Living alone, or with one companion, in the depths of the forest, his day commences shortly after 4 a.m., when he rises, lights his own fire with wood gathered the night before, boils and drinks a cup of coffee, shoulders his rifle, and taking his small rubber hatchet and some little tin cups, he starts out on his morning round, visiting each rubber tree in his "strada" in turn, making little incisions in their bark, and fixing a little tin cup to catch the white sap or rubber milk that flows therefrom. After all his trees have been tapped, he returns to his hut, cooks and eats his

mid-day meal of xarque (dried meat) and beans, and at once, if he is alone, starts out to collect the milk from each little tin cup. For this purpose he carries across his shoulders a bag made of rubber, capable of holding from three to four gallons of milk. Returning home he lights the furnace in his little rubber hut, using a special kind of fuel, which, of course, he has to prepare beforehand, pours the milk into a large pan, and slowly heats it; when it is hot enough he proceeds to smoke-dry it on to his rubber ball, which is mounted on a long pole or stick, by pouring it over the ball, which is held in the smoke of the furnace, and must be kept revolving. As the chimney discharges its smoke inside the hut, and the fumes of the simmering milk are particularly pungent, the atmosphere in which he has to work is indescribably stifling and nauseating in the extreme. By the time he has dried all his milk it is dark; he eats his supper and goes to bed. Day in, day out, this is his life, varied, only too certainly, by attacks of fever and rheumatism, and by bouts of ptomaine poisoning caused by bad food. Sanitation is of the most elementary type, and the water supply is often most unsatisfactory, hence typhoid, dysentery, and kindred diseases levy their toll of life. Beri-beri, too, is rife, and the short hacking cough peculiar to phthisis is very frequently heard in the little communities, and malarial fever and ague, of course, are prevalent. Without exaggeration, I think it may be said that every man, woman, and child living in the forest is subject to periodic attacks of deadly malaria, with consequent spleen enlargement and liver complaints. Occasionally the seringeiro shoots some animal or bird of some sort, and, if he be near a stream, catches an occasional fish; but these are his only fresh food. Ill-nourished, hard worked in a fever-haunted country, improperly clothed, and often wet from morning until night, it is small wonder that the mortality amongst the rubber workers is very high, and every little isolated barraca has its own cemetery in which one nearly always sees a newly made grave.

It is difficult to describe the people who live in and around the valley of the Abuna, the type being the reverse of homogeneous. First of all there are the Indians, native to the soil. Of these the Pachaquaras appear to be the largest and most important group, but, owing to their hostility and fear of the settler, one came across only individuals, who had left the tribe, having either been captured when young or driven out for some breach of tribal law. As far as my information goes, these Indians are spread over the region on both banks of the Rio Negro, living in groups of families during part of the year, when each group carries out some little husbandry, cultivating maize and macaxera. During high river fairly large parties of them roam the country on hunting expeditions. They wear little or no clothing, paint their faces and bodies with vegetable colours, and are very expert in the use of the bow, using very long arrows, fashioned and fitted differently according to the purpose for which they are to be used. The tips of these arrows are

dipped in some kind of vegetable poison, which is deadly. The refugees from the Rio Negro had with them a young Pachaquara boy of about eleven years, who had been adopted by one of their number. He was most intelligent, but wild, and spent his time roaming among the rocks of the cachuela, practising shooting with his bow. The accuracy of his aim was extraordinary; from a distance of some forty yards he dropped a blunt arrow (which I had chosen) on my foot, thus winning a packet of cigarettes, which I had promised to give him if he performed this feat. The women of the Pachaquaras wear lip, nose, and ear ornaments of yellow vegetable gums, something like amber, and are by no means ill-looking, the colour of their skin being a light brown. But the habits of the tribe, from all accounts, are filthy and disgusting in the extreme, and the Peruvian Indians, who formed part of the party of refugees, said they were able to "smell" a party of Pachaquaras from some considerable distance. Their camps, for they cannot be said to have villages, are formed of dome-shaped palm huts, in which there is a small hole which serves as entrance and egress.

Near the Marmelios river we met a small tribe of "tame" Indians, some twenty-five in number. They lived in a "maloca" or group of huts two days' march from the river Abuna. They were exceedingly interested in us, and repeated every word Captain Braz said to them. As we had no interpreter we were unable to obtain any information about them, except that they were harmless and occasionally visited the depôt at the mouth of the Marmelios River for purposes of barter, and we had not sufficient time at our disposal to pay a visit to their "maloca." Higher up the river we met many types of Bolivian Indian, attached to the various estates, and heard plenty of stories of Indian bands wandering in the forest at the back of the rubber estates, but our work did not take us away from the main stream, and unfortunately we did not encounter them.

The working seringeiros are very largely from Ceara, but we saw types of almost every possible admixture of blood. Some overflow from the large gangs of imported labour at work during the making of the Madeira-Mamoré railway found its way up the Abuna, and there is no doubt that many fugitives from justice have fled thither and eke out a precarious existence among the more legitimate settlers. Full-blooded negros from Pernambuco, Peruvians from the region of the Napo and Putumayo, Germans in charge of rubber depôts, Brazilians and Bolivians of every shade of colour and political opinions, a few Chinese and Japanese, some Barbadians, may be mentioned amongst the heterogeneous collection of men who have drifted up to the frontier line of the Abuna, where every man who is strong enough is a law unto himself and a menace to his immediate neighbour. Yet to the stranger passing through they are hospitable as hospitality is understood out there; room is always given for a traveller to sling his hammock under some sort of cover, and a cup

of coffee is always offered the wayfarer when he enters a barraca by invitation, and the invitation is nearly always given at once. At the depôts in the clearings around which we often camped we received bountiful hospitality and such assistance and information as it lay in the power of the occupants to give, and the dwellers in the humbler barracas in the remote forest welcomed us frankly enough and helped us always, though without evincing much curiosity as to our occupation. It is a region in which one quickly learns that the best policy is to mind one's own business.

In the Abuna region the anta or tapir is frequently seen on the river between the clearings, and droves of cachada (peccaries) and wild hogs (porco espin) are encountered near the streams in the early morning and late afternoon. The caititu, another species of wild pig, roam the forest in pairs, while the capivara or capabara, a huge river rat, loves to browse in the rank vegetation which springs up on the steep slopes of the river-banks during low river. Two species of deer are fairly common—the "viado galtera" and the "viado capuera," the first being a small animal with large branching antlers, and the latter a much larger species with straight short horns. Otters (lontra) are found in the smaller streams, as well as in the main river, which also swarms with the bloodthirsty perania, the dangerous sting ray, and a multitude of wonderful fishes of all sizes, shapes, and description. Whilst camped at the Rapirran, it was our custom to send a party of men with a fishing-net down a lagoon in connection with the river, where an hour's work with the net would result in our having two or three hundred pounds' weight of beautiful fish of all sizes. We caught several alligators (jacaré or cayman) in this manner, but the Abuna, above the falls, is not as infested with the jacaré as are the larger rivers north and south of it. One of the small alligators had a peculiarly split or double tail, and our Indian followers said it was called "jacaré tiriri." The electric eel is common enough, both in the rocky pools of the rapids and in the river streams, and from observations of my own, I have reason to believe that this fish, which sometimes grows to a large size and is dangerous to man, uses his electrical powers to stun such small fish as come within range and form his prey.

In the forest the hunter will encounter armadillos, large and small (tatu canastro and pequenia), anteaters of two species (tamandua and tamandua bandera), the larger of which are very fierce and are much feared, foxes (raposa) black and red, agouti or cotia of three kinds (preta, vermilio, and cotiara), paca of two sorts (porkinio and pequenia), which are delicious to eat, coati or racoons, large and edible land tortoises, as well as the hideous mata-mata or forest devil. The jaguar or onçe is also a denizen of this region, and there are three distinct varieties, viz. the onçe preta or tigre, the onçe pintada or jaguar, and the onçe vermilio, which I take to be the puma, though its local name is the sucuarana. There is reported to be a fourth variety, viz. onçe pie de boi

or tiger with the feet of a cow, but I never saw one, nor did I ever hear of one as having been actually killed. Tiger cats (gatos maracaja) are very common and no doubt feed on the ground game, of which there is an abundance.

There are innumerable monkeys of many species, amongst which may be mentioned the barrel monkey (macaco barrigudo), a large monkey, with a barrel-shaped body, which becomes very tame and companionable in captivity, the "macaco guariba" or "old man with the beard," which is brownish-red in colour, lives in a company. At morning and evening these monkeys make the forest resound with their roaring, which is most fearsome and sounds exactly as if a party of lions were fighting over their prey. Of course, these are the well-known howler monkeys. Amongst sloth monkeys there are the macaco paraacu and the macaco prigisa, with beautiful coats and hairy ugly faces, while smaller types of the monkey tribe are the beautiful little lion monkey, the zogozog, the macaco soinhi, the macaco chairo, and the delicate macaco du noite, which moves only at night.

Snakes are common enough both in the forest and the streams. The sucuruju or anaconda haunts the backwaters and swamps and ranges in length from 10 to 25 feet. The jiboya or boa, a beautifully marked variety, becomes very tame when captured, but is harmless; while of poisonous species there are the cascaval, the jararaca or lazy snake, the curaboya, the coral, most splendidly coloured, the cobra cipo or whip snake, the papagaiu or parrot snake, the green capin, the yellow papauva or egg snake, the cobra da viado, and the cobra da duas cabeças or ant snake, which apparently has a head at each end of its body. It is called by the natives "the king of the ants," and is supposed to live in the ant-hills. Scorpions, centipedes, and spiders add to the discomforts of camp life in the forest. Some of these spiders have bodies 6 inches long, and their bite is painful and dangerous.

Of birds there is an abundance, and most of those we shot found their way into the cooking-pot. Mutum, jacumy, and inambu are as fine game as our pheasants and partridges. Toucans, some as large as a crow, others as small as a sparrow, but all with weirdly coloured beaks, out of all proportion in relation to the size of their bodies, gaily coloured araras or macaws, parrots of many kinds, screaming parraquets, jacu, hawks, and a multitude of small birds, are common in the forest. Wood pigeons and doves coo continually on the branches of the higher trees, and the tap, tap, tap of the carpentero or woodpecker is always to be heard. On the rivers kingfishers, some as large as a pigeon, others as small as a wren, but all most beautifully plumaged, flit from tree to tree; ducks, tern, and waders of many kinds, spur-winged plovers, marabou, and maquary storks are plentiful; and the "urubu," a kind of turkey buzzard, which is the "scavenger" of the forest land and rivers, is seen everywhere on the hunt for the carrion which is its food.

Life on the Abuna, as in all this forest region, is made miserable by insect pests. There is no getting away from them, and one is scratching or slapping one's body always, except when under cover of one's mosquito net, and even then, when not asleep. In camp ants are a continual nuisance; they eat one's clothes and gnaw the softer parts of one's boots; they ravage amongst the food, and many kinds bite savagely. One kind, called by the natives Itashi, live in trees named palosantos, or holy posts, hollowed out by themselves; their bite is like a touch with a red-hot iron, and if a person inadvertently touches or leans up against one of these palosantos these little red devils swarm out upon him instantly, and for an hour afterwards his life is almost unbearable. But most dreaded of all are the tucanderas, black ants with bodies 1½ inches long; they live in the forks of trees, but often invade one's tent; they bite very hard, and must inject some sort of poison, for swelling and excruciating pain are suffered in the part of the body bitten by one of them. The sauba, or leaf-carrying ants; black ants which make broad straight roads of their own, and move about in armies, with scouts and flanking parties; grey ants, living in mounds of red earth 6 feet high; yellow ants, whose dwelling-place is in rotten wood,—all make the traveller unwelcome, and do damage to, or inflict pain upon, his person and belongings.

Mosquitoes, of course, whose operations are not only painful and irritating, but who sow the seeds of malarial and yellow fever, phlebotomous flies of many kinds which inject germs of what is called three-day fever, wasps of all kinds, bees of all sizes, hornets as large as the smaller humming-birds, the matoucha and tabana, a sort of mangrove fly of bloodsucking propensities—each and every one of them does its share towards making the life of the explorer in these regions almost unbearable. There are flies which lay their eggs in one's flesh or in one's clothes, which, after washing, have been laid out on the grass or bushes to dry. Later on maggots hatch out and most horrible ulcers appear. Where there is any sort of grass it is impossible to guard against the attack of the muquim, a microscopic tick, whose sojourn on one's body causes a most tantalizing itch, alleviated only by sponging one's body night and morning with alcohol of some sort. And in many places the pium, a small black fly which has the appearance of a speck of dust, drives one half crazy by its bite, which raises a small red vesicle, that afterwards turns black and putrid. Chiggers attack the underpart of one's toes, but careful watching enables one to guard against the sores which result from these pests if unattended to.

In a short paper one can but mention the magnificent wealth of fernery, lianas, cipos, and all kinds of creepers of the forest; its flowering trees, glowing with colour; its patches of odorous plants perfuming the air with intoxicating scents. One may draw attention to its stores of ironwood, cedar, bacury, itambu or stonewood, which is reputed to resist decay for ever; its evergreen laurels, the red-wooded sabucaia and

the sabauma; to its magnificent palms of many kinds, from one of which the delectable purple drink called assai is made; from another the biriti or miriti tea; while yet another bears a most delicately flavoured and delicious nut, shaped and fleshed like a coconut, yet no bigger than a large walnut. Giants of the forest are the silk cottonwood and castaneira trees, the latter bearing the Brazil nut. These often reach a height of over 200 feet, and are from 30 to 40 feet in circumference. The buttresses of the cottonwood trees are often 20 feet high, and stretch 100 feet above ground from the trunk, with space enough between them for a house to be built between buttress and buttress.

On the Abuna we encountered the souveira tree, which yielded milk, equal in taste to that of the cow. We used it in our coffee, and one of our Brazilian colleagues from Matto Grosso assured me that in his country the yield from this tree took the place of ordinary milk, which was never used. This tree is distinct from the Massaranduba or cow-tree, mentioned in my former paper, which is a species of seringa. The region of the Abuna, of course, is wonderfully rich in rubber trees, and it is the ouro-prets, or black gold, that has attracted the attention of the Manaos investors and offered inducement to the pioneer sojourners, for they cannot in any sense be termed settlers, who are gradually exploiting this most pestilential though wonderfully interesting valley.

The wireless party, under the direct superintendence of Mr. C. C. Chapman, did excellent work; of course we had but a rough and simple light receiving set, and carried with us no poles or special masts of any sort. Our aerial wire was always stretched across, as high as possible, between two or three convenient trees. The special knowledge, unremitting zeal, energy and self-sacrifice displayed by the officer in charge merits high praise. Personally he swarmed up the trees, assisted by climbing irons, bound on to his legs by thongs of raw hide, and attached his own aerial, thus making sure of proper insulation, etc., and I have no hesitation in saying that the dangers, difficulties and personal inconveniences encountered in climbing some of the forest trees cannot be overestimated. In some of his ascents he had to pass over nests of ants, wasps and hornets, and his face and hands were often swollen almost out of recognition, his clothes torn to rags, and the exposed parts of his body scratched and cut by rough bark and jagged spikes, while his ankles, under the strain, would swell up most painfully. Yet he never failed to erect his station at every camp, and time signals were received from Porto Velho nightly, thus enabling us to establish most successfully the longitudes of our camping-places, which we used as controlling points, between which our river traverses were adjusted. I believe our wireless work to be the pioneer in the regions of dense forest, and we have proved the utility and feasibility of wireless determination of longitudes over comparatively long distances under most unfavourable climatic conditions.

In conclusion, I may say that during our three years' survey of the

northern boundary from the river Javerija (Tacna) to the Beni and Mamoré rivers (Villa Bella) which is now completed, the officers of my commission did excellent service and displayed qualities of energy, fortitude, and determination of no mean order. Messrs. Wilson, Atkinson, and Gibbs, of the technical staff, each one of whom received his training under the auspices of the Royal Geographical Society and holds its diploma, did splendid work; Dr. F. Walker, our genial medical officer, kept us all in trim when he could, nursed us then we were sick, and yet found time to carry out some independent studies and medical investigations with regard to the fever-carrying flies of the district; Mr. Cameron, in charge of our motor craft and canoes, did wonders as regards repairs and kept our craft always in fine state of practical efficiency, and I take this opportunity of recording my debt of gratitude to them all for their loyalty and good comradeship under the trying conditions under which our work was accomplished.

APPENDIX.

Notes on Determination of Longitude by Wireless Telegraphic Signals.

Mr. Atkinson and party arrived at Porto Velho on August 20, and, despite the difficulty of obtaining satisfactory observations owing to the cloudy nights general at this season of the year, a series of time-signals, comprising at least twenty-five stops nightly, from west to east and *vice versâ*, was exchanged on eight nights.

During the time that we were determining the difference of longitude between Point Ismail and Porto Velho, the longitude of Point Ismail was determined by the Brazil-Peru Boundary Commission by an exchange of telegraphic time-signals from Para, and found to be in long. 4 hrs. 0′ 13″·0 or 60° 3′ 15″·1 W. of Greenwich.

The result of our determination of the longitude of Porto Velho is as follows:—

Difference of Longitude between Observation Pillar, Point Ismail, Manaos, and Observation Pillar, Porto Velho.

Date.	Difference of longitude.
1912.	hrs. min. sec.
August 22 ...	0 15 25·96 W. of Point Ismail.
,, 25 ...	25·00 ,, ,,
,, 26 ...	25·60 ,, ,,
,, 27 ...	25·02 ,, ,,
,, 28 ...	25·18 ,, ,,
Sept. 1 ...	26·00 ,, ,,
,, 2 ...	25·73 ,, ,,
,, 3 ...	25·84 ,, ,,

The weighted mean difference of longitude is thus 3° 51′ 25″·2 W. of Point Ismail; and the position of the observation pillar erected near the wireless

station at Porto Velho was fixed in lat. 8° 45′ 33″ S., long. 63° 54′ 40″·3 W. of Greenwich.

On October 27, when the Joint Commission had proceeded up the river Abuna, Mr. Atkinson was able to hear the time-signals sent out nightly from the wireless station at Arlington (Washington), which series ends at 10 p.m. (M.T. long. 75° W.), and was thus able to establish a very valuable independent check on the longitude of Porto Velho, determined from Point Ismail, as follows:—

Longitude of Porto Velho, determined from Point Ismail	H. M. S. 4 15 38·7 W. of Greenwich.
Longitude of Port Velho, determined by comparison of L.M.T. Porto Velho and L.M.T. Arlington (one night only)	H. M. S. 4 15 38·5 W. of Greenwich.

Early in October the Joint Commission arrived at Port Velho and proceeded to the Abuna river, leaving Mr. Atkinson, Lieut. Rabello Leite, and party at Porto Velho in order to send a nightly series of wireless telegraphic time-signals at a pre-arranged time. The Commission carried with them a hastily arranged receiving set in charge of a wireless expert, Mr. C. C. Chapman. This set consisted of—

(*a*) A seven-stranded aërial wire of phosphor-bronze, 1200 feet in length.

(*b*) A 190-turn box inductance, rolled in square form, with bottom attached. This was used as a carrier for the outfit.

(*c*) An ordinary type loose-coupled Martini jigger; oscillation transformer.

(*d*) Two dry cells.

(*e*) Several crystal detectors of carborundum.

(*f*) One pair ordinary Schmidt-Wilkes telephones.

(*g*) Several hastily made small inductance coils for use as necessary according to length of aërial erected.

At Fortaleza (river Abuna) no difficulty was experienced in receiving time-signals, although the height of our aërial wire was less than 20 feet. Proceeding up the river Abuna to the river Rapirran, time-signals from Point Velho were received nightly, and on November 10, 11, 12 we tied up with our 1911 work at Station A. R. Rapirran, fixing its longitude as follows:—

November 10, long. Station A, 67° 34′ 56″·4 W. of Gr., weight 2.
„ 11, „ „ 55″·9 „ „ 2.
„ 12, „ „ 55″·5 „ „ 6.

Weighted mean long. 67° 34′ 55″·7 W. of Greenwich.

It is instructive to compare with this, the longitude of Station A obtained in 1911 from the occultations of A Ophiuchi (July 8) and τ. Sagittarii (July 10). Having obtained from Greenwich Observatory the corrections to be applied to the Moon's Right Ascension and Declination given in the 1911 Nautical Almanac, the

Longitude of Station A by occultation A Ophiuchi (Imm.) is } 67° 36′ 28″·02 W. of Gr.

Longitude of Station A by occultation τ Sagittarii (Imm.) is } 67° 36′ 27″·96 „

Mean longitude by occultation 67° 36′ 27″·99 W. of Gr.

which differs from that determined by wireless telegraphy by only 1′ 32″·55 or $1\frac{1}{2}$ miles. As the longitude by occultation, using uncorrected Nautical Almanac elements, was—

* A Ophiuchi (Imm.) 67° 39′ 30″·6 W.

* τ Sagittarii (Imm.) 67° 39′ 32″·55

Mean 67° 39′ 31″·58 W.

(which differs from that determined by wireless telegraphy by 5 miles), the necessity for explorers, who have observed occultations in the field, to obtain from Greenwich the corrections to the Nautical Almanac elements is made very plain.

Our aërial wire was stretched across open spaces in the forest from tree to tree at the greatest height possible. Mr. Chapman, using climbing irons on his legs, ascended the trees for the purpose of attaching the wires. As our experience increased we found that the best results were obtained under the following conditions:—

1. The aërial wire should be in line with the transmitting station. Thus, if Porto Velho bore from us N. 70 E., the aërial wire was stretched between trees bearing N. 70 E., S. 70 W. from each other.

2. The wire should be erected so as to obtain an open space at the end nearest to the transmitting station. Thus the aërial was erected in clearings at the end remote from Porto Velho.

3. A much longer aërial was necessary when only a low altitude was possible. A continuous zigzag wire stretched from tree to tree was used to obtain length when necessary.

Important points to be observed are: (1) The complete insulation of the aërial wire. We used ordinary glass bottles for this and found them answer the purpose much better than rubber insulation. (2) Good earth connections. We were fortunately always able to use a long lead of wire, with an earth plate attached, which earth plate was immersed in the river or nearest stream.

During our traverse up the rivers Abuna and Rapirran, Mr. Chapman heard distinctly every night the signals sent out from the wireless stations at (1) Lima; (2) Senna Madureira; (3) Empreza, as well as, of course, Porto Velho.

A mean-time box chronometer was used at Porto Velho, and the signals were received in the field on sidereal chronometers.

The following system of signals was sent from Porto Velho nightly. At 8 h. 29 m. 20 s. (P. Velho L.M.T.) a series of short signals was sent during 20 seconds. At 8 h. 30 m. the first group of six time-signals, with one-second intervals, commenced, ending at 3 h. 30 m. 5 s., which was

the signal noted in the field. At 8 h. 30 m. 10 s. the second group commenced, ending at 8 h. 30 m. 15s., and so on until 8 h. 30 m. 45 s. At 8 h. 30 m. 50 s. one long signal was sent to denote that the preceding signals belonged to the first minute. At 8 h. 31 m. the second minute began, and the same procedure followed, but at 8 h. 31 m. 50 s. two long signals were sent to denote the second minute. The first series of signals lasted for four minutes, and after an interval of five minutes a second and similar series was sent lasting four minutes.

The Joint Commission returned to Porto Velho on December 20, when the rainy season had well commenced and further work was impossible.

Position points on the rivers Abuna, Rapirran, and Abuna are tabulated in the following table:—

POSITION POINTS, RIVERS ABUNA, RAPIRRAN, AND MADEIRA, 1913.

Station.	Latitude. South.	Longitude. West of Greenwich.	Remarks.
	° ′ ″	° ′ ″	
River Abuna.			
Manoa. Mark "BOLIVIA"	9 40 9·4	65 26 42·3	Signals & observations on 5 nights.
,, Mark "BRAZIL"	9 40 7	65 26 49	
Fortaleza	9 47 6·3	65 31 44·9	,, ,, ,, 4 ,,
Primor	9 45 44·5	65 44 27·5	,, ,, ,, 1 night.
Bon Comercio	9 45 6·7	65 55 24·2	,, ,, ,, 1 ,,
Bon Futuro	9 46 45·5	66 6 17	,, ,, ,, 1 ,,
Quemada	9 49 31·7	66 16 16·4	,, ,, ,, 1 ,,
Nova California ...	9 52 16·8	66 27 7·8	,, ,, ,, 1 ,,
Argelia	9 54 10·1	66 34 52·1	,, ,, ,, 4 nights.
San Pedro	10 2 4·1	66 48 34	,, ,, ,, 1 night.
Villa Rica	10 14 28·8	67 0 39·6	,, ,, ,, 1 ,,
Barraca Rapirran ...	10 20 6·7	67 11 9·8	,, ,, ,, 8 nights.
Santa Rosa	10 36 11·5	67 24 33·2	,, ,, ,, 1 night.
River Rapirran.			
Boca del Rapirran ...	10 20 16·0	67 11 19·2	Traverse from Barraca Rapirran.
Mark "BOLIVIA" ...	10 20 14·6	67 11 22·7	,, ,, ,, ,,
,, "BRAZIL" ...	10 20 14·7	67 11 19·7	,, ,, ,, ,,
Vista Alegre	10 22 9·2	67 18 53·5	Signals & observations on 2 nights.
Puente Grande ...	10 28 19·5	67 29 47·8	,, ,, ,, 2 ,,
Station A	10 31 4·1	67 34 55·7	,, ,, ,, 3 ,,
Principal source ... Mark "BOLIVIA–BRAZIL"	10 36 13·0	67 40 30·9	Theodolite traverse from Station A.
River Madeira.			
Station 33	9 41 50·2	65 22 10·7	Signals & observations on 1 night.
Araras	9 57 36·8	65 18 34·3	,, ,, ,, 1 ,,
Villa Murtinho ...	10 23 2·7	65 22 59·5	,, ,, ,, 9 nights.
Mark "BRAZIL" ...	10 22 54·0	65 22 59·9	Tr. az. & distance from V. Murtinho
Villa Bella ... ... Mark "BOLIVIA" ...	10 23 10·3	65 23 29·7	,, ,, ,, ,,
Grande Cruz ... ... Mark "BOLIVIA" ...	10 22 49·6	65 24 02·6	,, ,, ,, ,,

All latitudes by observations of balanced pairs of north and south stars.

All longitudes by wireless telegraphic time-signals sent out from Porto Velho in lat. 8° 45′ 33″ S., long. 63° 54′ 40″·3 W. of Greenwich.

The PRESIDENT (before the paper): Last week we had a discursive debate on the principles upon which frontiers—ideal frontiers—ought to be delimitated, in which our eminent geographical professors somewhat disagreed. To-night we

turn to a more certain subject, the actual delimitation of a frontier—that between Brazil and Bolivia, which runs through some of the least-known portions of South America. I have no doubt that we shall be shown that it has been settled upon very excellent grounds, and will therefore prove very practical. The officer who is going to lecture to us, Captain Edwards, is not unknown to you. In the course of last year he described to us the delimitation, the first half of the delimitation, of the same frontier; to-night he is going to give us the details of its completion. Captain Edwards had his training in the *Conway*, from which he passed first in the list. He joined the Royal Naval Reserve, he has served in the Royal Navy, and obtained the Society's Diploma in surveying. In 1908 he entered the Nigerian service, from which he has obtained three years' leave in order to take part in this important boundary delimitation. In a few days, I understand, he is going back to take up his duties in Africa. He has kindly found time to give us an account of the last part of his survey work, and I now ask him to read his paper.

The PRESIDENT (after the paper): I have a letter from Colonel Suarez, who represents Bolivia politically in this country, in which he expresses his regret that, owing to severe indisposition, he is unable to attend the lecture to-night, and he adds that the Commission under Colonel Ovando has completed its task in regard to a portion of the Madeira, and has returned to La Paz *vid* Buenos Aires, together with the engineers, in order to make the map of the completed work. I will ask Sir Thomas Holdich, who is an authority on South American boundaries, if he will add something.

Sir THOMAS HOLDICH: I think, to begin with, we may take it as a great compliment, not only to this Society, but to our country generally, that English officers should once again have been called upon to undertake the duties of boundary arbitration, in defining an international boundary between two great South American republics. I understand that in case of any disagreement as to the position of the boundary arising between the two parties engaged in demarcating, the final court of appeal is this Society; which, I think, says a great deal for the general belief, in South America at any rate, in our spirit of fairness. I have never heard of any other country being appealed to in quite the same way. I have had the advantage of reading Captain Edwards's paper as well as of listening to him to-night, and I can assure you he has not told you half his story. In order really to appreciate the difficulty of the problem that was before him when he set out to demarcate that boundary, you must try to realize what is the extent and the impenetrability of those vast forests which cover the land from the sea to the sources of the Amazon. There is nothing, so far as I know, but deep and impenetrable forest as far as the tangle of foothills which ascend to the great divide between the Pacific and the Atlantic. Above the foothills there are a few open grass spaces. The only right of way that exists amongst these forests is afforded by the rivers about which Captain Edwards has told us to-night. You have seen what the difficulty is of navigating those rivers, and you have heard how it was accomplished. The rivers themselves practically afforded the only means of making any survey of the country at all, for I take it that it is only along the rivers of such a country that a traverse can be successfully run. If you look at your map you will see that the rivers generally have a trend southward and eastward from the mouth towards the source; consequently, the only method by which an efficient check could be brought to bear on those traverses was by means of longitude determinations; and the great feature of this expedition to my mind has been the introduction, so freely and so successfully, of wireless telegraphy for this purpose. Just as

modern development in scientific apparatus has so largely modified procedure in military affairs, so has it, indeed, in scientific matters such as this completion of an important survey. I think that the results of the work accomplished by Captain Edwards and his colleagues in this very peculiar and very remarkable boundary demarcation will give us new ideas and a fresh start in the process of similar demarcation in future. On the whole, I am inclined to think, from what I have read as well as what I have heard to-night, that no boundary demarcation which has ever been undertaken has so thoroughly well illustrated those peculiar qualities of courage, of determination to win through in spite of all difficulties, and that perhaps rather rare quality of resourcefulness which this country now seems to expect from British officers everywhere, no matter what sort of work there may be in front of them.

Dr. J. W. Evans: I have listened with great interest to the paper to-night, especially as some dozen years ago I passed through more or less the same ground. It is true that I have not been up the Abuna; but I have bivouacked close to the mouth, where it joins the Madeira. I was chiefly engaged in the parallel rivers more to the southward, the Orton, and next to that the Manutaba (Madre de Dios), and then the Beni. What has struck me is the contrast between these rivers and those on which Captain Edwards has travelled—that is to say, the Abuna and Acre. Above the cachuela or rapids of Esperanza there could not be a river more healthy and more pleasant than the Rio Beni. From where it leaves the foothills of the Andes over about 400 to 500 miles down to this point there is no fever. I passed through a number of rubber properties on the Madre de Dios and on the Orton, and found these rivers equally pleasant and healthy, though the latter runs close and parallel to Abuna. I heard, however, a good deal of the evil reputation of the Abuna and the Acre. Those who leave the Orton to make their way across to those rivers in order to look after rubber thought they took their lives in their hands, and if they got back to the more healthy regions to the south were very thankful. There are so many interesting points in the lecture that it is impossible to touch on all of them. I cordially agree with Sir Thomas Holdich in his expression of the importance of the introduction of the wireless telegraphy for determining longitude. Those who have made great preparations to observe an occultation which was obscured by cloud at the last moment, or have found they have left their chronometer behind where there was nobody to wind it up, will appreciate the advantage of wireless telegraphy. With regard to the Indians, I admit that the Pachaquaras, or Pacaguaras, as they are often called, have a very poor reputation, but some of the other tribes are very pleasant fellows indeed. I have travelled alone with them, and they seemed quiet, sensible, and quite cleanly people, and found that if you treated them well they treated you well. I should like to say, in conclusion, that I must congratulate the Government of Nigeria on possessing such a capable officer as Captain Edwards has proved himself in the interior of South America.

The President: If there is no one else who wishes to say anything I will wind up the discussion in few words, for the country described is one of which I have no personal knowledge. Like most of our older Fellows, my impressions of the Amazons are derived mainly from our dear old friend who used to sit at this table, Henry Bates. It seems to me that from the picturesque point of view the Amazonian forest must be one of the most depressing regions in the world. Those hundreds of thousands of miles of forest with no hills must be a dreadful weight on the mind of the traveller. A forest with hills or mountains is a living thing, but when you get a forest on anything approaching a dead flat its monotony

becomes almost appalling. Our ideas of this region were refreshed this year by Mr. Roosevelt, and I think we must have been struck by the similarity in many respects in the descriptions of the rivers given us to-night with that Mr. Roosevelt gave us in his lecture on the River of Doubt, which we can now read at greater length in the very interesting volume he has just presented to our Society. It seems to be a country engrossing for the zoologist. Mr. Roosevelt's book is full of the extraordinary and interesting animals he came across. But if it is a paradise for the zoologist, it seems to be still more so for the entomologist, though the ordinary traveller may not regard it in the same light. We can hardly hope that the boundary now laid down, which I have no doubt will prove an excellent boundary between the two states, will fulfil one requirement which our professors suggested a week ago. It is hardly likely to be a meeting-place of nations, but as a dividing-place between nations, which after all has been hitherto the idea of a boundary, it appears to be admirably suited. It is a source of pride to ourselves, to our Survey officers, and to this Society, that Englishmen should be selected as the best fitted to do this sort of work for other countries. We have all listened to Captain Edwards's lecture with the greatest interest, and have got many new impressions from it. I will now move a vote of thanks to him, which I am sure you will accord unanimously.

SIR AUREL STEIN'S EXPEDITION IN CENTRAL ASIA.*

As soon as a short halt in the Tun-huang oasis had allowed men and animals to recover from our trying winter campaign in the Lop-nor desert, I started by April 2 for the explorations planned eastwards. Their objectives lay mainly in the deserts which fringe on the south and east the vast region of barren hills known as the Pei-shan Gobi. The distances to be covered were great, and short the available season before increasing heat would stop work on waterless ground. So but little time could be spared for my renewed visit to the cave temples of the "Thousand Buddhas" near Tun-huang, which in 1907 had yielded so much antiquarian and artistic spoil. But rapid as my visit had to be, it proved once more fruitful.

Ever since my first discovery in 1907 of the ancient Chinese *Limes* to the west and north of Tun-huang, I had been anxious to follow up its line as far as possible eastward, and to explore whatever ruins might have survived along it. The work was successfully started, when, after striking across a difficult belt of salt marshes, we came upon the ancient border wall halfway between Tun-huang and An-hsi. From there we were able to follow its line for close on 250 miles eastwards. Along almost the whole of this distance the wall, with its watch-towers and small military stations, had been built across what already in ancient times was absolutely sterile desert. The immunity from human interference thus assured had helped greatly to preserve its remains; but the wall owed even more to its remarkable method of construction. Built of carefully

* Communication from Sir Aurel Stein, K.C.I.E., PH.D., D.SC., dated Turfan, November 22, 1914. See *Geographical Journal*, vol. 44, p. 69.

secured fascines of reeds or brushwood, with layers of clay or gravel between them, the wall was specially adapted to withstand that most destructive of natural forces in this region—slow grinding, but relentless, wind-erosion. Even where the watch-towers, once massively built in bricks or stamped clay, had been reduced to shapeless low mounds, difficult to recognize from a distance, the direction of the wall still clearly revealed itself, stretching away in characteristic straight line across wastes of gravel or drift-sand.

Where the *Limes* ran parallel to the deep-cut bed of the Su-lo Ho much of the ground it crossed consists of bare riverine loess, and in this the erosive force of the winds, blowing here with exceptional violence mainly from the north-east, could assert itself to the full. But even where it had succeeded in completely effacing all structural features, there remained on the wind-worn surface clear evidence, in the shape of pottery, coins, metal fragments, and other hard *débris*, enabling us to determine with accuracy the position of the posts once guarding the border.

Once beyond the sharp bend made by the Su-lo Ho valley southward, the line followed by the *Limes* approached closer and closer to the foot of the Pei-shan, taking us into ground which had so far remained wholly unsurveyed. The physical difficulties met became increasingly greater owing to the distances separating the long-forgotten border from the nearest places with water. But there was reward also in the ample finds of ancient records on wood, of furniture and implements of all sorts which our excavations brought to light at the ruined stations. Conclusive archæological evidence shows that all these had been left behind by the Chinese soldiers who during the first century before and after Christ had kept guard over this most dismal of frontiers. The finds furnish an important addition to the collection of early Chinese records secured during my former explorations west of Tun-huang. Here, too, often the inscribed slips of wood thrown out of some ancient office-room turned up in refuse heaps covered only by a few inches of *débris* or gravel. Their preservation in such conditions clearly demonstrates the remarkable dryness of the climate prevailing here since ancient times. Apart from the uniform barrenness, the topography of the ground crossed by this eastern portion of the *Limes* showed considerable variety, and this helped to bring out still more clearly the skill with which those old Chinese engineers of Han times had managed to adapt their defensive line to different local conditions.

I was more than ever impressed by the remarkable power of sustained administrative effort which the construction of the wall on ground wholly devoid of local resources demanded, when some 30 miles to the north-east of the little oasis of Ying-pên we found the wall boldly carried into what since ancient times must have been a big area of drift sand. Where not completely buried by high dunes, it still rose to close on 15 feet. Obviously the garrisoning and commissariat of this section must have offered special difficulties. It was clearly in order to safeguard an important line of

supplies that a chain of fortified stations was found to extend here southward independently of the wall, but constructed at the same period. It ran in the direction of the big oasis of Suchou, and to this we had to turn ourselves at the beginning of May in order to prepare our next move northward.

My object was to follow the united course of the rivers of Suchou and Kanchou down into Southern Mongolia, and to explore what ancient remains might be found along it and in its terminal delta. Apart from the ruins which the reports of Russian travellers had led me to expect here, I was specially attracted to this ground by the interest attaching to its earliest history. There could be no doubt that this region of the Etsin-gol, as the river is known to the Mongols, had formed part of the wide dominions held by those earliest nomadic masters of Kansu, the "Great Yüeh-chi," or Indo-Scythians and the Huns, whose successive migrations westwards so deeply affected the destinies of Central Asia, as well as of India and the West.

Provided by the Suchou Taotai with a recommendation to the chief of the Torgut Mongols who now graze on the lower banks of the Etsin-gol, I started by May 10 northward. While Rai Bahadur Lal Singh moved to the last Chinese settlement, the oasis of Mao-mei, by the hitherto unsurveyed route along the river Kanchou, where it breaks through the westernmost hill range of the Alashan, I followed the more direct track by the river Suchou. This offered me a chance of once more approaching the area where before we had lost the line of the ancient frontier amidst high dunes. By a reconnaissance pushed into the desert north-west of the Chinta oasis, I succeeded once more in discovering the *Limes* where it emerged on less impracticable ground near the south-eastern extremity of the Pei-shan, and subsequently we tracked it right through to the north of the oasis of Mao-mei.

The course of the river Etsina, affording water and grazing, must always have served as a main route for raids and invasions directed from the Mongolian steppes against the westernmost Kansu oases and the great natural highway which leads through them connecting China with Central Asia. So it could not surprise me to find the point where this route of invasion cuts through the ancient border, guarded by ruined forts of imposing size and unmistakable antiquity. One built with clay walls of exceptional strength curiously recalled the ancient frontier station of the "Jade Gate," famous in Chinese history, and previously identified by me on the Tun-huang border. There could be no doubt that the *Limes* had crossed the river Etsina a short distance to the north of the oasis of Mao-mei, and thence continued eastwards. But when we came back in June from the Etsina delta, the heat of the season had become already too great to permit of continuing the search into the waterless desert eastwards.

Moving north in long marches we followed the sandy bed of the Etsin-gol, in places nearly a mile wide, but absolutely dry at that season. Only in wells dug in places near the banks could water be found. After passing

a rocky spur jutting out from the eastermost Pei-shan, some 90 miles below Mao-mei, the river spreads out in a delta which extends for over 110 miles to the north and terminates in a series of salt lakes and marshes. A succession of low-water seasons had caused these to dry up for the most part. The conditions observed in this delta interested me greatly, as they strikingly illustrated what the ancient Lou-lan delta north of the extant Lop-nor marshes looked like before its final desiccation. Here, too, along beds left dry for long years many of the wild poplars prevailing in the narrow belts of riverine jungle were already dead or dying. The wide stretches of ground between the several beds were either absolutely bare or showed but scant vegetation. The chief of the two hundred odd Mongol families established in the Etsin-gol delta sadly complained of the increasing difficulties caused by inadequate grazing.

Limited as are the resources offered by this extensive riverine tract, it was yet easy to realize their importance for those, whether armed host or traders, who would make the long journey from the heart of Mongolia in the north to the Kansu oases. In this respect, too, there was a striking analogy to the ancient Lou-lan delta, without which the earliest and most direct route into the Tarim basin could not have been opened for Chinese expansion westwards. This analogy impressed itself still further upon me when I proceeded to examine the ruined town of Khara-khoto, which Colonel Kozloff, during his expedition of 1908-09, had been the first European to visit. Its position and remains clearly proved that it could be no other than Marco Polo's "City of Etzina." Of this the great Venetian traveller tells us that it lay a twelve days' ride from the city of Kanchou "towards the north on the verge of the desert; it belongs to the Province of Tangut." Travellers bound for Karakoram, the old Mongol capital, had to lay in here victuals for forty days in order to cross the great "desert which extends forty days' journey to the north, and on which you meet with no habitation nor baiting place." The position thus indicated corresponds exactly to that of Kharakhoto. Though the town had probably suffered considerably when Chingiz Khan's Mongol host first invaded and conquered Kansu from this side about A.D. 1226, there was ample antiquarian evidence to show that it continued to be inhabited down to the fourteenth century. But like the agricultural settlement for which it had served as the local centre and of which we traced extensive remains to the east and north-east, the town must have seen its most flourishing times under Tangut or Hsi-hsia rule, from the beginning of the eleventh century down to the Mongol conquest.

To this period belonged most of the Buddhist shrines and memorial stupas which filled a great portion of the ruined town and were conspicuous also outside it. In one of the latter Colonel Kozloff had made his great find of Buddhist texts and paintings. But this, as a systematic search soon proved, had not exhausted the archæological riches of the site. Careful clearing of the *débris* of stupas and temples brought to light

abundant remains of Buddhist manuscripts and prints, both in the little-known old Tangut script and Tibetan, besides many fine stucco relievos and frescoes. From the large refuse heaps of the town we recovered plenty of miscellaneous records on paper in Chinese, Tangut and Uigur, also many interesting remains of pottery and household utensils. Finds of coins, ornaments in metal and stone, etc., were abundant, particularly on wind-eroded ground.

Everything pointed to the conclusion that the abandonment of the settlement must have been caused by difficulties about maintaining irrigation. The dry river channel which passes Khara-khoto lies some 7 miles to the east of the nearest branch still receiving water, and the old canals we traced leading to the abandoned farms eastwards are removed considerably further. Whether this failure of irrigation was due to desiccation in the Etsin-gol delta or to a change in the river course at canal-head with which the settlement was unable to cope, could not be determined. But so much seemed clear that the water-supply now reaching the delta during a few months of summer would no longer suffice to assure adequate irrigation for the once cultivated area.

Rapidly increasing heat had rendered work at these desert sites very trying both for the men and our camels, upon which we depended for the transport of water. So I was glad when the completion of our task allowed me to send the camels for a much-needed summer holiday in the Kongurche hills north-eastward, and to move myself south to the foot of the Nan-shan. For part of the journey we were able to follow a new route which took us through hitherto unsurveyed portions of the desert hills to the east and north of the river Kanchou. In spite of serious fatigues, Kanchou was safely reached before the close of June. A short halt in that large oasis enabled me to make all arrangements for new survey work I had planned in the Central Nan-shan. Its object was to extend the mapping done in 1907, in the mountains near the sources of the rivers Su-lo Ho and Suchou, by accurate surveys of the high ranges further east which enclose the river Kanchou headwaters.

Great difficulties were encountered about transport owing to the reluctance of the Chinese to venture far into those mountains. But fortunately I found an old friend in the Chinese general commanding at Kanchou, and his opportune help allowed us to set out by the first week of July. The route followed during the first marches acquainted me with interesting Buddhist cave temples, and other remains dating from Sung times, near Nan-kou-chêng at the foot of the mountains. There, too, we struck a dividing line of distinct geographical interest. While to the west of it cultivation, whether in the plain or along the foot of the mountains, is possible only by means of irrigation, we now came upon Loess slopes and big alluvial fans which rainfall alone suffices to make fertile. This marked change in climatic conditions appropriately brought home the fact that we were now nearing the watershed of the Pacific

drainage area, and the eastern edge of that part of Kansu which may justly be considered a Central-Asian border land.

We had ascended to where the easternmost feeder of the river Kan-chou rises among snow-clad ranges, and were making our way westwards over high alpine grazing grounds, when I met with a serious riding accident. Fortunately the arrangements already made allowed R. B. Lal Singh, my ever-energetic surveyor, to carry through all the topographical tasks I had planned, and no time was lost in our programme. When after some weeks my injured leg had recovered from the worst effects of the accident, I managed to get myself carried down to Kanchou. Then by the third week of August, I set out for the long journey which was to take me back to Turkestan for the work of the autumn and winter. On reaching Mao-mei by a new route, I was rejoined by Lal Singh, who by exceptional efforts had succeeded in extending our Nan-shan surveys eastwards over an area quite as large as that mapped in 1907.

On September 2, we started to cross the desert area occupied by the ranges of the Pei-shan where its width is greatest, in the direction from south-east to north-west. The routes we followed for close on 500 miles had never been surveyed, and only at one point did they touch ground previously visited by Russian travellers. Wherever possible we moved in two parties and by different routes, thus considerably increasing the extent of the area mapped. The scarcity of wells and of grazing caused great difficulties, and we felt them even more owing to the inadequate local knowledge possessed by our Chinese "guides." Only at one place did we encounter a small party of Mongols.

It was a great relief when after nearly four weeks of continuous travel we had safely crossed the last barren hill range, without a single animal's loss. It proved an easternmost extension of the Tien-shan system, and beyond it we could descend to Jungarian ground at the foot of the Karlik-tagh. These extensive plane-table surveys, supported here as elsewhere by many careful height observations with mercurial barometer and clinometer, will throw fresh light on the morphology of the Pei-shan ranges. In addition this journey has served to acquaint me with the peculiar physical conditions of a region through which many of the great historical migrations westwards, since those of the Indo-Scythians and Huns, must have passed.

Interest of a similar character attached to the rapid journey which subsequently carried me during October along the north foot of the Tien-shan range to Barkul and Guchen (Ku-ch'êng-tzu). These territories, favoured by a climate less dry and possessed of abundant grazing grounds, have often played an important part in the history of Eastern Turkestan, and their physical and ethnic conditions differ greatly from those of the Tarim basin. The opportunity of familiarizing myself with this ground was hence a decided advantage. I was also able to survey, near Jimasa, west of Guchen, extensive remains marking the site of an ancient capital

of this region, which under the names of Chin-man and Pei-ting often figures in the Chinese historical records from Han to T'ang times.

From there I crossed the Bogdo-ula range, a portion of the Tien-shan rising to numerous snowy peaks, by a high pass hitherto unsurveyed to the deeply depressed basin of Turfan. There ruined sites of Buddhist times are abundant. A preliminary survey has shown me that their remains, though repeatedly visited by previous expeditions, and owing to their easy access exploited also by villagers burrowing for antiques, still offer scope for systematic excavations. To these I propose to devote the next few months, while my surveyors will find ample work in mapping the extensive and little-known desert ranges of the Kuruk-tagh between the Turfan and Lop-nor depressions.

PLANE-TABLE TRIANGULATION FROM ONE STATION ONLY.

By E. A. REEVES.

THE following is a short description of an attachment I have recently fitted to a plane-table alidade for rapid graphic triangulation and fixing the distance of points from one station only, with an example of work done.

Let 1, 2, 3, 4 (Fig. 1) be a plane-table over a station at A; B and C, distant points in the country, of which B is much nearer to A than C. To determine the distance and position of C by the ordinary method of plane-tabling, the distance from A to B is measured on the ground and set off to scale on the plane-table, on which it is represented by A*b*. AB now serves as a base, and after drawing rays from A towards B and C, the surveyor moves his plane-table to B, orients, and again draws a ray towards C, the intersection of which ray with that drawn towards the same point from A gives the position and distance of C. *c* represents this point on the plane-table.

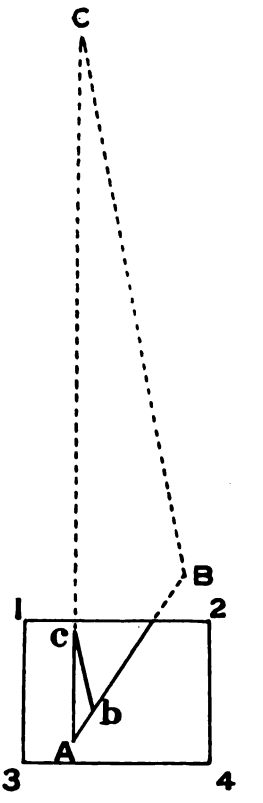


FIG. 1.

However, in order to carry out this operation it is necessary for the surveyor to move his plane-table from one end of the base to the other; and if distant points such as C could be fixed and a graphic triangulation carried out from one station only, without moving the plane-table, it would frequently be a great advantage, specially in country difficult for travelling.

The attachment here described provides means of doing this; and it is not limited to short distances as is the case with ordinary tacheometers and range-finders, but can be

used for distances of 5 or 10 miles, or even greater if the points are clearly visible, and the operation is carefully carried out with suitable triangles and altitudes as explained later.

When fixed points have been previously laid down on the plane-table sheet, one of these can be selected, as B, and its distance from A, the surveyor's position, taken from the scale; but when no previously fixed points are available, the distance AB which is to serve as a base can be obtained directly by the distance-finder alidade or any other suitable instrument, and then the problem will be solved if from *b* on the plane-table the line *bc* can be drawn parallel with BC in nature, while the surveyor is still stationed at A.

To enable this to be done, the telescope of a plane-table alidade (see Fig. 6), with an arc to measure vertical angles, has been fitted with a long

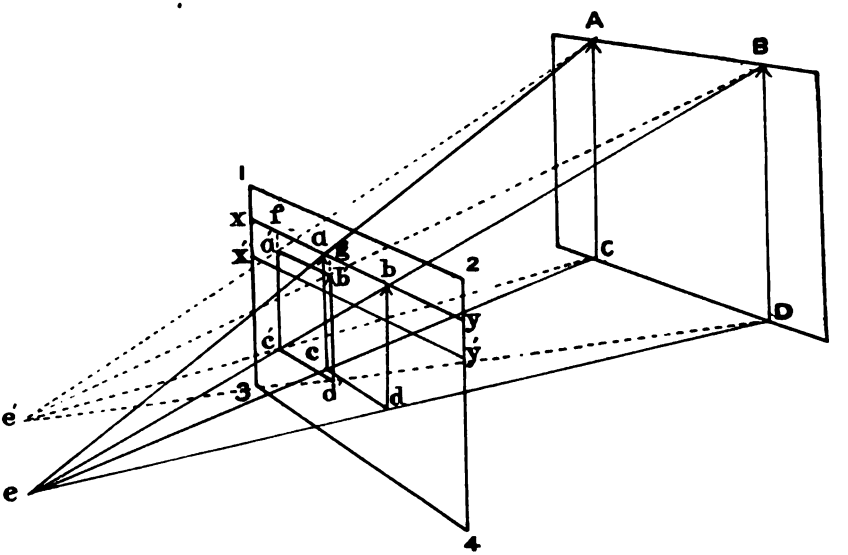


FIG. 2.

light frame carrying two, three or any suitable number of horizontal wires, all parallel with one another, parallel with the optical axis of the telescope and with the fiducial edge of the alidade when the instrument is levelled and pointing in the direction of the horizon line.

If now the vertical angle that one of the objects subtends from the other, as C from B (Fig. 1), is set on the arc, and the alidade, kept truly level, is placed over the point *b* on the plane-table, and turned round horizontally until the tops of the two distant points B and C are seen with one eye (the other being closed) to coincide exactly with any of the long horizontal wires, and both to lie in a line parallel with those wires in the spaces between them as the eye is moved up and down, the alidade must be parallel with the line joining the two distant points B and C in nature, and a line *bc* drawn on the plane-table will represent the same

line that would be drawn if the plane-table had been carried to B, the other end of the base AB, and the intersection of C made from there in the ordinary manner. This can be proved as follows:—

Let 1, 2, 3, 4 (Fig. 2) be a transparent vertical plane, with cross-wires *xy*, *x'y'*, etc., and suppose this plane placed so that these wires are exactly parallel with the line joining two distant points, shown by AB. Now supposing the eye at *e*, AB will be represented by *ab* on the wire *xy*, so long as the plane 1, 2, 3, 4 is parallel with the plane passing through the points A, B, and in the right-angled triangles AeC, *aec*, and BeD, *bed*.

$$ae : Ae :: be : Be$$

and

$$ac : AC :: bd : BD$$

since the line *ab* joining the two points is parallel with AB, and the points are on the same wire *xy*. When the eye is moved to another

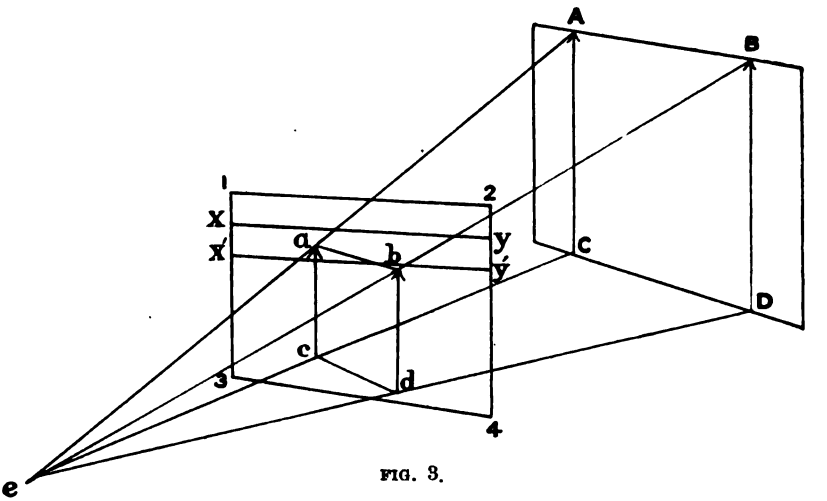


FIG. 3.

position, as *e'*, the points A, B will be represented by points in a line parallel with *a*, *b*, since the proportions hold good as before. In this case they will be at *a'*, *b'* below the wire *xy*, and $\frac{fc'}{fa'} = \frac{gd'}{gb'}$. Therefore, if the wires *xy*, *x'y'*, etc., are exactly parallel with the plane in which the points A, B are situated, the points *a*, *b* representing these points will be always either both on one of the wires or both parallel with these wires in one of the spaces between them. But unless this parallelism holds good this cannot be the case, as the proportion ceases to exist; consequently, the line *ab*, representing that joining the distant points AB, will be seen to intersect the horizontal wires (see Fig. 3), instead of to run parallel with them.

The vertical angle that one distant point subtends from another, such as C from B (Fig. 1), which it is necessary to set on the arc of the alidade, can be obtained with sufficient accuracy for the purpose from the distance of the near point B, the assumed distance of the further point C, which

may be merely a rough guess, and the vertical angle of each of these points as measured on the arc of the alidade from the surveyor's position, A.

With the required vertical angle set on the arc, the position of the distant point C can be found by intersection as previously described. If this position differs widely from that previously assumed the work should be repeated, using the new distance of C in the computation of the vertical angle.

The formula for computing the vertical angle of C from B is very simple, and can be worked out in the field in about two or three minutes. It is as follows (Fig. 1):—

$$\left.\begin{matrix}\text{Required} \\ \text{vertical angle}\end{matrix}\right\} = \frac{(\text{dist. } Ac \times \text{vert. angle C}) - (\text{dist. } Ab \times \text{vert. angle B})}{\text{dist. } bc}$$

The distances may be measured on the plane-table by means of a scale of inches and decimals.

When the vertical angle to the distant point C, as measured from A, is over 10 or 12 degrees, the distances Ac and Ab in the formula should be multiplied by the tangents of the vertical angles of B and C, instead of by the angles themselves, and the difference between the products divided by bc is the tangent of the required angle. As will be seen from the following example worked both ways, the difference in the results is small unless the angles are large:—

Vertical angle of C = 10°, tan 0·1763
" " B = 2°, tan 0·0349

$$\frac{(9 \times 10°) - (1{\cdot}7 \times 2°)}{7{\cdot}5} = 11°{\cdot}5 \text{ (or } 11° 32'{\cdot}4)$$

$$\frac{(9 \times \tan 10°) - (1{\cdot}7 \times \tan 2°)}{7{\cdot}5} = \tan 0{\cdot}2036 \ (= 11° 30'{\cdot}6)$$

Care must be taken to give the proper sign to the vertical angles measured at A, *i.e.* elevation is + and depression —, and it must be remembered that it is the algebraical difference between the two distances multiplied by the vertical angles that is required, so that the sign of the second term of the upper line in the formula must be changed according to the ordinary rule for algebraical differences.

In order that the assumed distance of the point C from A may be sufficiently accurate, even if considerably in error, it is necessary that the sides AC and BC should be at least three or four times as long as the base AB. In every case the product Ac × vertical angle C should be not less than six or seven times the product Ab × vertical angle B, and greater than this if possible. The vertical angle of B should not be more than a degree or two; but the vertical angle of the distant point C may be any magnitude. The position of B should be so selected that its distance from C does not differ greatly from the distance of A from C (see Fig. 4).

When suitable distances and altitudes are selected and the triangle is favourable in form, quite a large error in the assumed distance AC causes

little error in the vertical angle of C from B, which is to be set on the arc. This will be clear from the following example (Fig. 4), in which an error in the assumed distance of about 30 per cent. only makes a difference in the angle of just over one minute:—

Vertical angle of C = 8°
,, ,, B = 2°

Case 1.

$$\frac{(10{\cdot}2 \times 8°) - (2 \times 2°)}{10} = 7°{\cdot}76 \text{ (or } 7°\ 45'{\cdot}6)$$

Case 2.

$$\frac{(13{\cdot}15 \times 8°) - (2 \times 2°)}{13} = 7°{\cdot}78 \text{ (or } 7°\ 46'{\cdot}8)$$

Another method of finding the vertical angle to set on the arc is by means of a tangent scale, carefully constructed, and ruled into degrees. The operation is very rapid, but not so accurate as that already given.

With a pair of dividers, the distances Ac and A*b*, taken directly from the plane-table, are set off on the lower line 1–2; let 1–3 and 1–4 represent these distances (Fig. 5). A mark at right angles to these points is made at the respective vertical angles previously measured. Let 3` and 4` be these marks. Then the difference between the perpendicular lines 3–3` and 4–4` will be approximately the tangent of the vertical angle that the distant point C subtends from B. This difference, shown by 5–6, taken in the dividers, and set up vertically at the distance of C from B measured on the plane-table, shown by 1–6 (Fig. 5), will be the tangent of the angle required to be set on the arc of the alidade. If one measured angle is an elevation and the other a depression, the difference to be used as the tangent of the required angle is the total length of the two, or, correctly speaking, it is the algebraical difference.

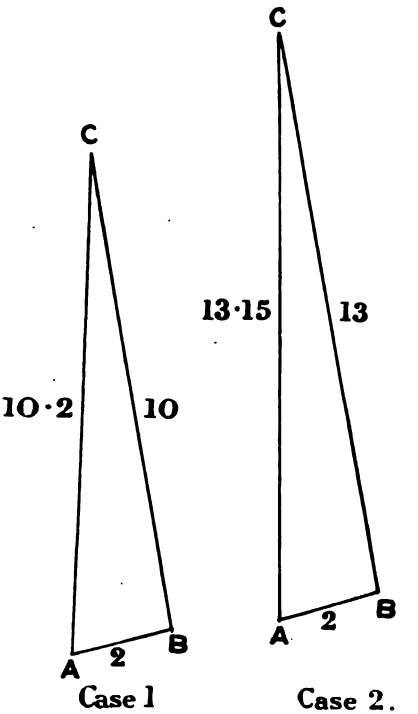


FIG. 4.

It frequently happens that maps can be obtained on which definite

points are already laid down, in which case this instrument can be used for fixing other points on the map without having first to measure a base with the distance-finder. The operation is as follows: Accurately level the plane-table, orient it, and fix the position occupied, by resection, by one of the ordinary methods. Select as B, a comparatively near visible point which is given on the map, on or near the same side of the plane-table as the point C to be fixed, so as to form a suitable triangle for the work; rule a line in the direction of this latter, and set on the vertical angle that one point subtends from the other, found either by the formula given, or the tangent scale. Place the alidade on the known point, *b*, on the plane-table, and proceed to set it parallel with BC, and make the intersection, as previously described.

Having fixed one point, others can be very rapidly determined from this, provided suitable triangles are selected.

In making the alignment, it frequently happens that the eye has

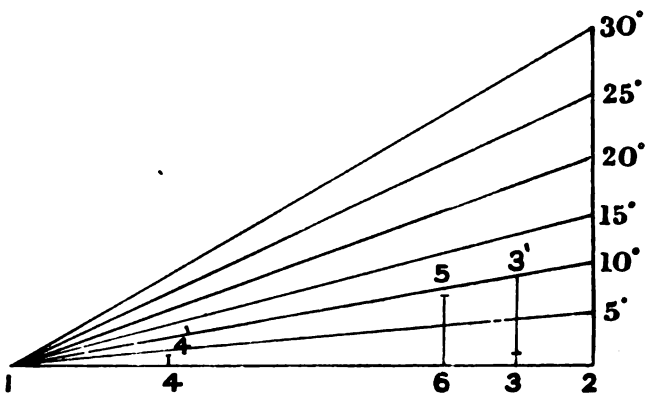


FIG. 5.

to be placed so close to the wires that they tend to become blurred and indistinct; but this difficulty can be overcome by cutting a narrow slot in a piece of cardboard, and sighting the wires through this slot.

The distance obtained by this instrument multiplied by the tangent of the vertical angle (already measured) gives the difference of height between the surveyor's position and the point observed, so that approximate contours can be sketched in, and the general topographical features drawn on the map, from the one station A only. For distances greater than 5 miles these heights should be corrected for curvature and refraction. As regards the accuracy attainable in the plane-table intersections, too much must not be expected of this or any other graphic method; but from work already done with the instrument it is clear that quite useful results are possible if proper precautions are taken. The board must, of

course, be accurately levelled, and every care should be taken to ensure a true parallelism in the alignment of the two points in the country with the wires and spaces between the wires. Practice has shown that this can be done with greater accuracy than might at first be expected, specially when means of several fixings are taken.

Referring to Fig. 1, suppose the alidade with the wire attachment placed over *b*. Then when the point B is seen at the end near the eye, the distant point C will, owing to the foreshortening, be near the farther end of the wires. Now, if at this farther end so large an error as 0·5 inch be supposed in turning the alidade laterally to bring it into a line parallel with the distant points, since the wires are about 30 inches long, this would only cause an error in the intersection of a ray 3 inches in length of 0·05 inch.

It is, of course, not intended that this attachment should be used

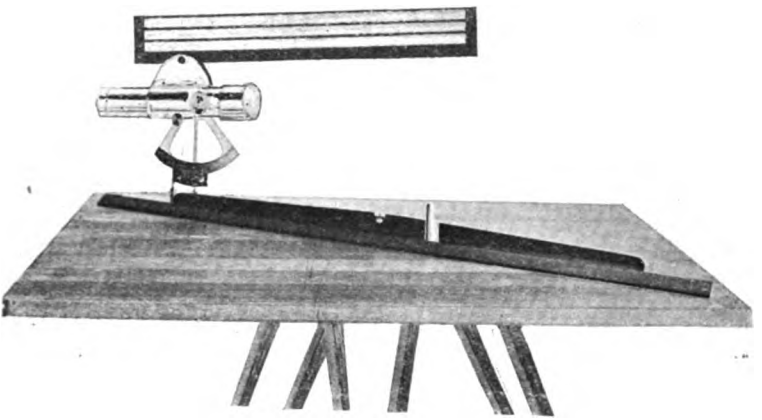


FIG. 6.—PLANE-TABLE ALIDADE FITTED WITH THE NEW ATTACHMENT.

when points can be conveniently fixed by ordinary methods; but it will enable a plane-tabler to do what hitherto he has had no means of doing, that is, fix with fair accuracy the position of points miles away, from one station only, without moving the plane-table. In rough and difficult country it is hoped, therefore, that it may prove of service.

Fig. 6 shows a telescopic alidade fitted with this new attachment, and Fig. 7 is an example of the fixing of two points from the top of Redhill Common by means of this instrument. The one with the greater distance (Outwood windmill) is about 4·3 miles off. The results as tested by the distances taken from the Ordnance map are quite as satisfactory as could be expected, considering that the work was done on a very misty and wet day. The error for the distance of 7580 yards is about 45 yards, or 0·6 per cent., and this after a second extension.

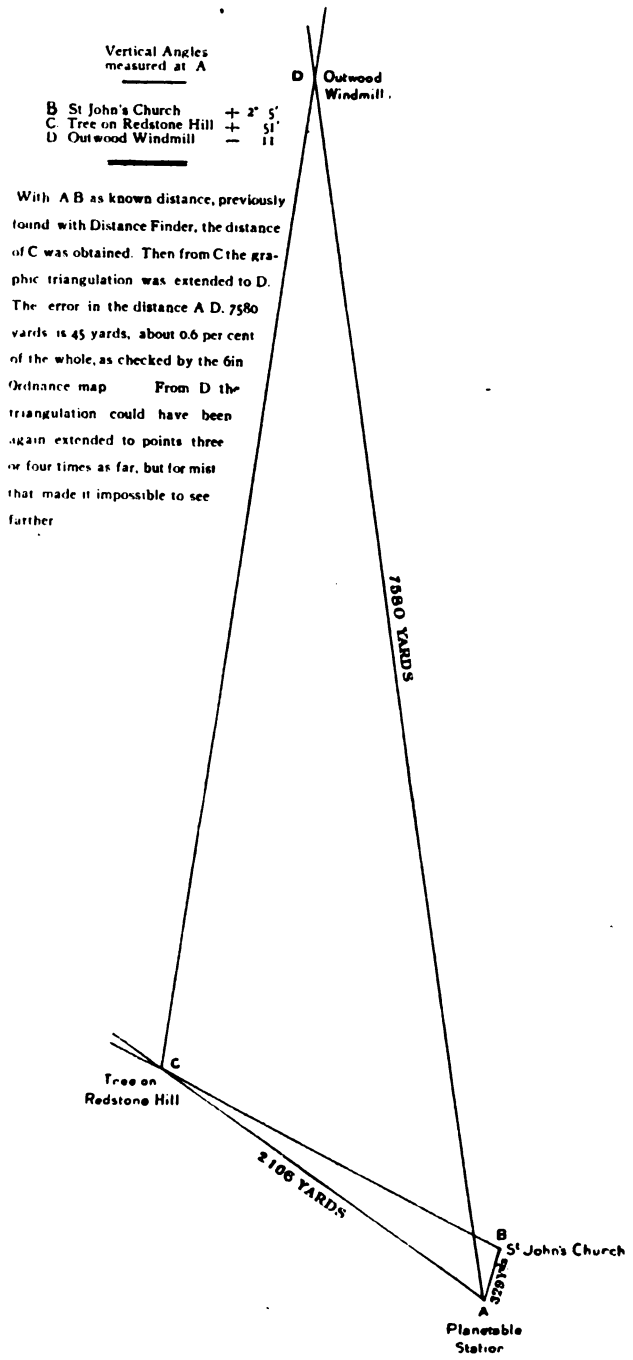


FIG. 7.—SPECIMEN OF WORK DONE WITH THE NEW ATTACHMENT TO PLANE-TABLE ALIDADE.

It is not absolutely necessary that a telescopic alidade should be used for this attachment, and it can be fitted to one of the ordinary

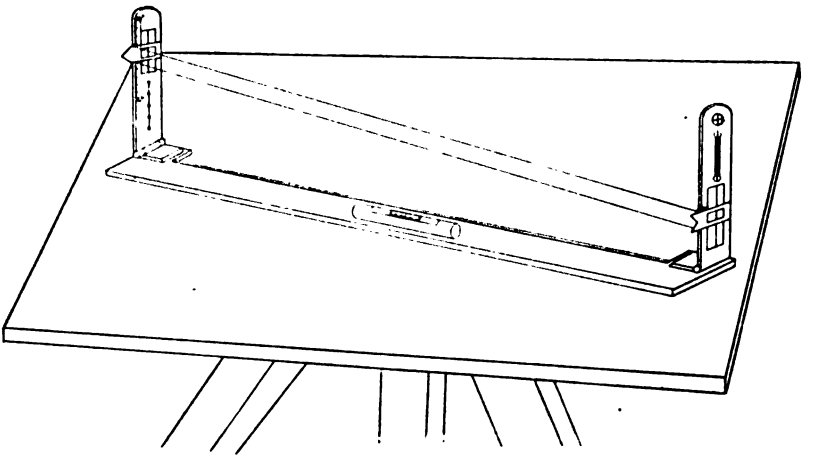


FIG. 8.—ORDINARY PLANE-TABLE ALIDADE FITTED WITH THE NEW ATTACHMENT.

pattern as shown in Fig. 8. It has been found that very fair work can be done with this simple form.

THE AUSTRALIAN ANTARCTIC EXPEDITION.*

By HUGH ROBERT MILL, D.Sc.

THE facts regarding the Australasian Antarctic Expedition have been so fully set out by the leader, Sir Douglas Mawson, in a recent number of the *Geographical Journal*, that this review may be more usefully devoted to an appreciation of its place in the work of opening up Antarctica than to the recapitulation of now familiar details. The scientific results can best be considered when they are published in full.

The brilliant achievements of Sir James Clark Ross during the immortal voyage of the *Erebus* and *Terror*, naturally attracted the main forces of reviving Antarctic exploration to the splendid opening of the Ross sea through which Borchgrevink, Scott, Shackleton, Amundsen, and finally, Scott again, carried the quest of the South Pole from the sea to the land and over the land to the very goal itself. Since the South Pole was often viewed as the end as well as the aim of all Antarctic discovery, it is not unnatural that some lovers of exploration before the publication of this work should have viewed the South Polar regions as exhausted of their secret and their charm. But though the search of the Pole has

* 'The Home of the Blizzard.' By Sir Douglas Mawson. London: William Heinemann. 2 vols. 1915. 36*s. net.*

been a worthy and a mighty motive towards exploration, attainment even here has brought no end, but only a new beginning, and in truth the Pole is only a point, while the continent of everlasting ice is girt by an unknown perimeter of more than 10,000 miles.

The Australasian Antarctic Expedition described in these magnificent volumes, aimed at a less sensational but a no less worthy object than its forerunners. It was designed to explore the portion of the Antarctic continent lying to the south of Australia, a region, the physical conditions of which were only guessed at, but were known to exercise a vital influence on the weather of Australia and New Zealand, which once elucidated would extend our knowledge of the meteorology of the whole world. Curiously enough, the reason why this nearest portion of Antarctica to the temperate territories of the British Empire remained practically unknown until the commencement of the second decade of the twentieth century is psychological rather than physical. At the beginning of the Victorian period when the study of terrestrial magnetism demanded exploration towards the south magnetic pole, it was precisely to this area that the expeditions of Wilkes and Ross were primarily directed, and it was here also that Dumont D'Urville, in a fine spirit of adventure, carried his ships after he had fulfilled the letter of his obligations regarding Antarctic exploration, and when he was free to throw his whole strength into the exploration of the tropical Pacific which was his own peculiar and beloved field, and the main object of his expedition. Along this section, too, Baleny, in 1839, had sailed his tiny vessels from east to west after discovering the islands that bear his name. Before the *Erebus* and *Terror* reached Hobart on their way out, Dumont D'Urville had landed on a rocky islet and named Adelie Land, while Wilkes' squadron had laid down a lengthy coast-line with many names of lands and capes. It only wanted Ross's consummate Polar seamanship to open out this coast to the knowledge of the world in 1840, but fortunately for the future progress of the larger explorations he felt himself at liberty to disregard the letter of his instructions, and, as he puts it, "impressed with the feeling that England had ever *led* the way of discovery in the southern as well as in the northern regions, I considered it would have been inconsistent with the pre-eminence she had ever attained, if we were to follow in the footsteps of the expedition of any other nation. I therefore resolved at once to avoid all interference with their discoveries, and selected a much more easterly meridian (170° E.), on which to endeavour to penetrate to the southward, and if possible reach the magnetic pole."

Now that Australia has grown to a maturity which permits the pursuit of intellectual as well as of material ambitions, we find the work passed over by Ross taken up by Australian men of science equipped with all the advantages for exploration which have been perfected in the intervening seventy years. Sir Douglas Mawson's Antarctic Expedition, moreover, was also the first Australasian scientific expedition beyond the confines of the

Australian continent to challenge comparison with exploration British in the narrower sense and with that of other nations. This fact has a peculiar historical interest, for when the problem of an Antarctic continent took form upon the maps of the sixteenth century, Australia itself was within the veil which shrouded the remoter regions of the southern hemisphere. In the map of Orontius Finné, 1531, it does not want much imagination to divine the outline of our present Australia in the Regio Patalis of the great southern continent which bears the motto still freshly true of the central core "Terra Australis recenter inventa sed nondum plene cognita."

The first voyage of Captain James Cook laid the foundations of the first colony of Australia, and we now see by what historic irony the development of the Commonwealth has stultified the rash conclusion of Cook's second voyage, which convinced him that any continent which might exist around the Southern Pole would always remain sealed up in its ice unknown to man.

Sir Douglas Mawson served his Polar apprenticeship in the Northern Party of Sir Ernest Shackleton's Expedition of 1908, when he accompanied Professor Edgeworth David on his great march to the south magnetic pole, and the experience gained on this journey, the first on which Antarctic explorers depended on seals and penguins for food and fuel after their own stores gave out, naturally directed his attention to overland exploration. He took, however, a much wider outlook than this in planning the Australasian Expedition, making ample provision for land exploration which he hoped to carry out from three separate points on the coast, but reserving an almost equal share of attention for exploration by sea along the coast and oceanographical investigations in the section of the Southern ocean south of Australia. He also formed the daring design of keeping in touch with home by means of wireless telegraphy, and for this purpose established an intermediate station on Macquarie Island, hitherto known only to sealers. The difficulty experienced in conducting the wireless work at the Antarctic station on Commonwealth Bay made communication irregular, but in the second winter many messages were exchanged between Australia and the headquarters of the expedition, while meteorological reports were contributed daily from Macquarie Island to the weather offices of Australia and New Zealand. The chapters by Mr. G. F. Ainsworth, who was in charge at Macquarie Island, give a fascinating account of the dreary sub-Antarctic island, and of the investigations and privations of the light-hearted scientific party who spent two years there. We hope that the more absorbing interest of the other parts of the book will not divert attention from this most excellent and essential portion of the expedition's work.

Sir Douglas Mawson was exceedingly fortunate in having as commander of the ship and second in command of the expedition Captain John King Davis, who had showed himself to be a born ice-navigator while an officer of the *Nimrod* in the Shackleton Expedition, and in command of that ship

on her voyage home. Captain Davis combined the qualities of a good seaman with a genuine love of exploration, and a determination to advance the science of oceanography on every possible occasion, and he proved himself worthy of the distinction of conducting the first steamer which ever entered the 1500 miles of ice-encumbered sea between the furthest point reached by the *Terra Nova* on the east and the famous southern dash of the *Challenger* in search of Wilkes's Termination Land on the west. An account of the preliminary results of the oceanographical work of the first cruise was communicated to the *Geographical Journal* * by Captain Davis in 1913, but some very interesting aspects of his work in high latitudes still await discussion.

In the volumes before us, repeated reference is made to the work of Wilkes's squadron in 1840, and we hope that Captain Davis may find it possible at some future date to annotate Wilkes's narrative from his own experience, as the historical interest lies mainly in the new light which is thrown on the old controversy as to whether Wilkes saw the mainland of the Antarctic continent. Into this matter it would not be fair to go fully on the strength of the popular narrative, but for two short stretches in the neighbourhood of Wilkes's charted discoveries, detailed charts are given showing the tracts of the *Aurora* and of the American ships.

The first of these in Vol. 1, p. 73, shows that the *Aurora* ran to the south of the track of Wilkes's *Vincennes* along the assigned position of Tottens High Land in 120° E., without seeing any sign of it, and she was also far to the south of Wilkes on the western side of the charted North's High Land in 124° E., and here again nothing was seen. Captain Davis was, however, unable to get so far south as Wilkes in the neighbourhood of Knox's High Land in 107° E., so that no fresh evidence is available on this point, and Wilkes must be credited with the discovery of land here unless it should be disproved in the future. Captain Davis got a short distance further south than Wilkes or Ringgold in the position of Budd's High Land in 112° E., and nothing was seen of it. Wilkes's Cape Carr, like D'Urville's Côte Clairie and the hypothetical Sabrina Land, was sailed over, but high land was discovered to the south-westward in 135° E., which Wilkes would undoubtedly have reached had the sea been less encumbered with ice in January, 1840, and to this Sir Douglas Mawson gives the name of Wilkes Land, of which we are glad, as it would be a deplorable thing if the name of so gallant and deserving an explorer as Wilkes were not perpetuated in the region of his great endeavour. In the exact position of Wilkes's Repulse Bay of the ice barrier (whence he believed he sighted the high land named Termination Land) a great ice tongue was found rigidly locked to the land south of it, and on the south-west of this Termination ice tongue the western party was landed.

It is to be hoped that a summary of the log of the *Aurora* with the

* Vol. 42, p. 361.

daily positions will appear among the scientific results of the Australasian expedition, accompanied by a chart on a sufficiently large scale to show clearly the tracts of all the few ships which have entered those waters. It is only from the study of such a chart that it would be possible to discuss the question whether, on account of abnormal atmospheric conditions, Wilkes or his officers may not have seen the land of the Antarctic continent at some points and underestimated its distance. In any case we do not think that any fellow-countryman of Wilkes can consider that his work has been ignored or lightly esteemed either by Sir Douglas Mawson or by Captain Davis.

The *Aurora* on her various voyages only cruised to the south of the Antarctic circle for a distance less than 10° of longitude in the neighbourhood of Adelie Land, but when proceeding westwards with Mr. Wild's party in 1912, and again while going to his relief in 1913, she sailed for more than 50° of longitude south of the 60° parallel, and for almost all that distance her course lay close along the parallel of 65°.

The second voyage to the westward in this high latitude was on the whole slightly to the northward of the first, and although of less interest as regards the discovery of land, some soundings were obtained which suggest that a continental shelf considerably deeper than that which surrounds the northern continents runs along the front of that section of Antarctica. The description of this voyage is one of the most thrilling chapters in the book, though Captain Davis characteristically refrains from "working up" the emotional interest. His brief and convincing statement of the five reasons which satisfied him that it was his duty to wait no longer for an opportunity of taking off the leader of the expedition and his party at the main base, but to proceed at once to the relief of Wild and his companions at the western base deserves to live in the history of exploration. The perils from wind and ice which beset the whole of that voyage in a ship too light for safe navigation in a storm and without anchors (they had all been lost in attempting to ride out the hurricanes in Commonwealth bay) compares in everything, except its curt conciseness, with the most moving passages in Ross's narrative of the *Erebus*.

In one point only did the expedition fall short of the programme. Sir Douglas Mawson very wisely decided, after reaching Adelie Land, that instead of two subsidiary bases on the coast of Antarctica one was all that could be justified, considering the difficulties of reaching a given point on the ice-beset and fog-veiled coast-line. He himself, with seventeen companions, landed at Commonwealth bay in Adelie Land at a point where both D'Urville and Wilkes had sighted unmistakable land. The second party, numbering eight all told, was landed on the Shackleton ice shelf between the Termination ice tongue and Drygalski's Kaiser Wilhelm II. Land under the leadership of Mr. F. Wild, who may justly claim to be a naturalized inhabitant of Antarctica, as he is a veteran of the *Discovery* and *Nimrod* Expeditions, and after his return from the *Aurora* has again

gone out with Sir Ernest Shackleton on his 1914–15 expedition. Wild made good use of his twelve months' residence in this region, which has been named Queen Mary Land, the sledge journeys carried out by the party extending mainly between the parallels of 66° and 67° of latitude as far as 89° E., where they visited Drygalski's Gaussberg, and 99° E., where they discovered the Denman glacier rising amongst mountains of about 4000 feet in height, and the seaward slopes were for Antarctica very fully explored and mapped throughout a distance of 250 miles from east to west, and 50 miles from north to south, a very notable achievement.

From the main base Sir Douglas Mawson organized a series of great simultaneous land expeditions with many minor journeys in support, or for the purpose of detailed investigations.

Starting from the main base in lat. 67° S., long. 143° E., the southern party, consisting of Mr. Bage with Messrs. Webb and Hurley, reached a point in lat. 70° 30′ S. and long. 148° E., and an altitude of 5900 feet upon the plateau. None of the other expeditions reached so high a latitude as 70°, their object being to explore the coast-line on the sea-ice and on the upper slopes of the plateau parallel to the coast. This was done on the east over King George V. Land as far as 152° E., and on the west in Adelie Land as far as 138° E., a range of 14° in longitude. The result was thus to map out a block of coast and plateau measuring about 370 miles from east to west and 250 from north to south. To enter into details regarding these land journeys would be to repeat what has already appeared in this *Journal*, but reference must be made to the able manner in which Mr. Bickerton, with Messrs. Hodgeman and Whetter, carried out the main western journey, and Mr. Madigan with Dr. McLean and Mr. Correll accomplished the eastern journey over the sea-ice and the bewildering confusion of the splintered glacier tongues. In all these the explorers were in peril of crevasses and in peril of blizzards, and their movements were strictly limited by their food supplies. But like the party at the western base, the men themselves did not suffer any permanent harm, and all returned in health and safety to the base in time to meet the relief ship.

The tragedy which befell Sir Douglas Mawson's party, who were engaged on the main eastern journey over the high plateau, was the one disaster of the expedition, and undoubtedly to the general public the interest of the book centres in the moving account of the engulfment of Lieut. Ninnis in an unsuspected crevasse, and in the long-drawn misery of the return march, during which illness broke down the strength of Dr. Mertz, and in the unexampled endurance of Sir Douglas Mawson himself when, after the death of his companion and the loss of all his dogs, he struggled on alone for 24 days until he reached the ice cave near the base.

These experiences recall the most terrible privations and struggles of early Arctic explorers. They have naturally been seized upon by reviewers in the press and perhaps convey to those who have not read the book the

impression that the expedition, as a whole, was spent in gloom and in the shadow of death. A perusal of the volumes dissipates this impression; the disasters were such as every member of every Antarctic land expedition has repeatedly escaped by a hair's breadth, and considering the extent of the ground traversed and the number of parties in the field, one cannot help wondering rather at the extraordinary immunity from accident or privations than at the loss of two members of the party, and the suffering of the leader in his heroic struggle alone in the ice desert with the blasts and the mist and the imminent presence of "the Arch-Fear in a visible form."

The result of the land journeys has been to block out two long stretches of the Antarctic coast, leaving no room for doubt as to the character of the remaining land seen between King George V. Land and Cape North by the *Terra Nova* and named Oates Land from the hero of Scott's last expedition. No doubt remains either that similar conditions prevail westwards through the Wilkes Land sighted by the *Aurora*, but between that and Queen Mary Land there intervenes a stretch of at least 800 miles, concerning which nothing is known save that the soundings of the *Aurora* indicate that the continent runs continuously across. So little room for doubt can exist as to the character of this portion of the continent that it would seem less useful now to press for further exploration in that quarter when the stress of war permits the resumption of exploration. The tracts which now demand the attention of Antarctic navigators are the 2500 miles between Kaiser Wilhelm II. Land and Coats Land, and the 1800 miles between Alexander I. Land and King Edward VII. Land which no steamer has yet entered. We trust that before the subordinates on the Australasian Expedition have grown too old for the reasonable aspiration to lead expeditions of their own, the spirit of Australia will call them to these tasks.

The descriptive narratives of recent Antarctic expeditions have appeared so soon after the completion of the work, that it was scarcely fair to look critically upon their literary style, although in both Scott's and Shackleton's work there are many passages and some chapters which will live as literature. In the present case the outbreak of war has caused a considerable delay in the appearance of 'The Home of the Blizzard,' a delay which is wholly advantageous so far as the permanent value of the book is concerned, and will not, we believe, deprive the volumes of any of their powerful human interest.

Sir Douglas Mawson has shown a wise and generous discretion in allowing his senior assistants to write the chapters describing their own work; this gives a fine edge of freshness and vivacity to the necessary repetition of details which cannot fail to read monotonously when written throughout by the same hand, however capable. Sir Douglas Mawson also recognized that the born explorer or investigator has not always the gift of a facile pen. As on the *Discovery* expedition the editorship of the

South Polar Times first drew attention to Sir Ernest Shackleton's power of literary arrangement and vivid description, so the production of the *Adelie Blizzard* which kept up the spirits of the winter party in Commonwealth Bay, brought to light the exceptional literary gift of Dr. A. L. McLean, who has seen the volumes through the press, and by his revision has secured that degree of homogeneity without which the work of a group of authors, different in their powers of expression and in the range of their vocabulary, would inevitably have become disjointed and displeasing.

Dr. McLean's foreword gives a fair sample of his command of language and an insight into his poetic outlook on the ideals of modern exploration, while many fine pieces of word-painting throughout the narrative testify to his appreciation of the imaginative aspects of the play of light and colour in Antarctic scenery.

The maps on various scales which set out the cruises of the *Aurora* and the tracks of the sledge parties reflect the greatest credit on Mr. A. J. Hodgeman, the cartographer of the expedition. The photographic illustrations have never been surpassed either in technical perfection or artistic grouping; the only regret which they inspire is, that as usual the shape of the photographic plates too frequently involved the printing of two pictures on one page, giving somewhat the effect of two paintings in one frame. The photographic work shows that Mr. J. F. Hurley, the official photographer of the expedition, is a master of his art, and the description of the difficulties under which he usually worked shows how cleverly he learned to adapt his methods to his difficult environment. The reproduction of photographs in natural colours is extraordinarily successful. The publisher has given a worthy setting to this unique assemblage of scientific, literary and artistic work, enshrining as it does a story of daring adventure and heroic endurance saddened by tragedy, second only to that of the Scott expedition, and relieved by a fresh and light-hearted humour which makes the reader proud to belong to an Empire the most distant states of which produce such sons.

REVIEWS.

EUROPE.

Gloucestershire and Somersetshire Maps.

'A Descriptive Catalogue of the Printed Maps of Gloucestershire, 1577–1911, with Biographical Notes.' (*Transactions of the Bristol and Gloucestershire Archæological Society* for 1912, vol. 35.) Pp. 238, and 12 *plates*. [Bristol, 1913.]

'A Descriptive List of the Printed Maps of Somersetshire, 1575–1914.' Pp. xii. + 231, and 16 *plates*. Taunton: published by the Somersetshire Archæological and Natural History Society. 1914. 10*s*.

By Thomas Chubb, of the Map Room, British Museum.

These catalogues of the maps of two of our English counties continue the work of the author in this department of cartographical research commenced

in 1911, by the publication of his catalogue of the maps of Wiltshire (*Geographical Journal*, vol. 39, p. 472 (May, 1912)), itself following the catalogues of the maps of Hertfordshire and Cambridgeshire published by Sir H. G. Fordham in 1907 and 1908 respectively. Including the publications of Mr. William Harrison on the county maps of Lancashire and Cheshire, detailed catalogues of the maps of the following English counties have now been given to the public: Hertfordshire (1907) and supplement (1914); Lancashire (1908); Cambridgeshire (1908); Cheshire (1908); Wiltshire (1911); Gloucestershire (1913); and Somersetshire (1914). The form and method of this class of cartographical studies are now, therefore, well established, and substantially all the sources of information have received general investigation. The reviewer has thus little to criticize in the lists now under notice, which incorporate all the latest results of research, and have reduced such work, by comparison of various tentative methods found in the earlier efforts to systematize the descriptive cataloguing of maps to, probably, its final form.

The second of these two catalogues has a rather clearer general appearance than that given by the types and arrangement used in the earlier one, although the actual differences between them are small. In such matters, however, very trifling alterations in the spacing, arrangement, and variety of types go for a good deal in the ultimate result, and the author is to be congratulated on having, in the Somersetshire catalogue, avoided certain small defects which appear on the face of the Gloucestershire volume. The former may now probably be taken as a satisfactory model for cataloguing the maps of the remainder of the English and Welsh counties which, as time goes on and interest is aroused locally on a sufficient scale to justify the work of compilation, will, it is hoped, be attempted.

Both these volumes are illustrated by a series of plates of facsimile reductions or full-sized reproductions of the earlier maps of the counties of Gloucester and Somerset, admirably selected to illustrate the gradual development of the cartographical art from the time of Saxton onwards. These illustrations will do more to bring home to students, as well as to general readers, the variety and interest of the subject of historical cartography than any descriptive text, and they are alone well worth the price of either volume.

The author prefixes to each volume a short introduction, reviewing the history of English cartography, which both cover, necessarily, the same ground. It may be noticed that the description itinerary and map ascribed to "Richard of Cirencester," and referred to on page 5 of the introduction to the Gloucester catalogue, was a forgery. The whole was, indeed, a most ingenious deception, and held the field as a piece of real history from its appearance in 1757 until as late as 1866–67, when the then librarian of the Royal Library at Windsor Castle, Mr. B. B. Woodward, investigated the case completely and fully exposed the original fraud. The matter, which is sufficiently curious, may be found shortly stated in the 'Dictionary of National Biography.' The author of the pseudo-itinerary, and of the map published with it, was a certain Charles Bertram, teacher of the English language at Copenhagen, where he pretended to have discovered the original manuscript alleged to belong to the end of the fourteenth century. He imposed on Stukeley. He has been described as "the cleverest and most successful literary impostor of modern times." Indeed, since its complete exposure, accepted by all competent authorities, Bertram's fraud has maintained sufficient vitality to obtain re-publication as authentic in 1872, in Bohn's Antiquarian Library, and even to appear now again in perennial vigour.

The notice of the efforts of the Society of Arts to promote the survey and engraving of large-scale county maps by the awarding of premiums, to which public attention has also recently been drawn by Sir H. T. Wood, in his articles on the early work of that Society (*Journal of the Royal Society of Arts*, vol. 60, p. 268 (January, 1912)), found in the introduction to the Somerset catalogue, is particularly interesting and original. A large number of important county maps were published, and premiums and medals were awarded between 1759 and the beginning of the nineteenth century. Some of these maps have now become very scarce, though most of them are well known to cartographers.

The very important geological map of England and Wales, and those of individual counties, surveyed and coloured by William Smith and published by John Cary early in the nineteenth century, which mark the commencement of systematic geological cartography, appear to have had some connection also with the encouragement of such work by the offer by the same Society in 1802 of three gold medals for geological maps of England, Ireland, and Scotland respectively, though these particular maps do not seem to have been ever actually produced.

The tabular index to the maps, arranged under the names of authors, engravers, and publishers, to be found at the end of each catalogue, giving the date of publication, short title, and dimensions of each map, and the title of the work in which it is found, follows the form adopted by the author in the index to his Wiltshire list, and is a very valuable addition to these catalogues, enabling the inquirer to readily identify any map of which he is in search.

The whole subject of method, as applied to the cataloguing of maps, is illustrated by Mr. Chubb's studies, and from this point of view alone, the works under notice are worthy of careful examination. At the same time they are of great interest to the general student of the history of the cartographical art, and especially to those who follow Richard Gough in the great foundation laid by him for our knowledge of British topography, and are a considerable and satisfactory contribution to British cartography also.

H. G. F.

'Place-names of South-West Yorkshire.' By A. Goodall. (Cambridge: University Press. 1913. Pp. vii., 314. 7*s.* 6*d. net.*) 'The Place-names of Sussex.' By R. G. Roberts. (Cambridge: University Press. 1914. Pp. xxxii., 210. 10*s.*) When the many difficulties, both theoretical and practical, of the study of English place-names are taken into account, it must be acknowledged that much praiseworthy and valuable work has been done in this field of recent years, and the Cambridge Press, through its Archæological and Ethnological Series and other channels, deserves high commendation for its efforts. So also do such students as the authors of the volumes now under notice, who have clearly brought profound knowledge and minute care to bear upon their tasks. Mr. Roberts carries us straight *in medias res;* his book is not one which can be taken up without preparation; Mr. Goodall, however, provides an explanatory historical introduction of a simpler sort, and his explanations of individual names are furnished in a form more intelligible to the general reader.

'The Survey Gazetteer of the British Isles.' Edited by J. G. Bartholomew. (Edinburgh: Bartholomew. 1914. *Maps.*) This is in great measure a new work, so much revision upon previous editions has been necessitated. It is very full and compact, and has been clearly compiled from most recent sources with great care. The work is of use not for facts of the present only; an appendix deals with the ethnology of geographical names, furnishing an alphabetical

glossary of common forms, which will be found useful, though sometimes dangerous as a weapon in the hands of the amateur etymologist. The Gazetteer also refers to such features as ancient roads: authorities may cavil at the definition of Icknield Street as a Roman road running from Norfolk to Land's End. One observes here and there the desirability of further editorial consideration; thus on page 600 (col. 2) the name of the Coolin hills of Skye will be found in three different forms within two dozen lines. The volume contains, in sections, the map of the British Isles on the 1 inch = 10 miles scale, with solid colouring according to counties.

'Tourists' Guide to the Island of Madeira.' By C. A. Power. (London: Philip. 1914. Pp. 72. *Maps and Illustrations.* 3*s.* 6*d.*) This guide would be found valuable to travellers on the spot, though less so for the purpose of studying the island in advance of a visit, as it is arranged principally in tabular form, according to routes, with length of time occupied, and short descriptive notes. There are also tables of distances and heights, a glossary of terms found in geographical names, and other necessary particulars. The maps, though rather rough, are valuable, and contain original information; the general map has also the virtue of being indexed so far as concerns the principal places. The illustrations are very small, but give some idea of the beautiful scenery of the island, and references to the text are carefully furnished.

'Die Riviera.' (Junk's Natur-Führer.) By Alban Voigt. (Berlin: W. Junk. 1914. Pp. vi., 466. *Illustrations.*) There are several English monographs on the Riviera flora, but as there was no book on this subject in German, the author had a good reason for including his botanical studies of the Riviera in Junk's Natur-Führer series. Of special interest to English readers is the very full description of the gardens of La Mortola at Menton. A complete list (occupying 135 pages) is given of this fine collection, so well known to Riviera tourists. Brief descriptions are also given of the show gardens of Cannes and district—Chateau de Thoreno, Chateau Vallombrosa (now Hotel du Parc), and the Villa Eilenroc. The illustrations are well selected and clearly reproduced. Instead of an index a complete list of all the plants of the Riviera is supplied.

ASIA.

YEMEN.

'Arabia Infelix; or, the Turks in Yemen.' By G. Wyman Bury. London: Macmillan & Co. 1915. Pp. x. and 213. *Illustrations.* 7*s.* 6*d. net.*

ALTHOUGH Mr. Bury hardly diverged from the most beaten track in Yemen—the Hodeida-Sanaa road—never travelled without an escort, and was seldom free, except at Menakha, to roam at his will, this book gives us the best account of Yemen which we have seen since Manzoni's, and in many respects it is superior to his. Owing to its author's unusual familiarity with South Arabian society and language, and power of expressing himself in vigorous colloquialisms, 'Arabia Infelix" has a remarkable freshness. One accepts instinctively all that Mr. Bury has seen for himself as being just so and not otherwise, and feels that what he has got at second-hand he has understood. Most of the opening chapter could be dispensed with. We can go to the 'Encyclopædia Britannica' as easily as Mr. Bury could, and find out, if we want to, about Queen Hatshepsut (though it is most improbable that she ever had anything to do with Yemen!), and about the introduction of coffee

into Europe (it was much earlier, by the way, than 1652, the date of the first London coffee-*house*). What we could not find there is what we ask Mr. Bury to tell us: and he tells us a good deal.

It is mostly political and social information, rather than strictly geographical. The unexplored part of Yemen, north of the Sanaa road, was as rigidly forbidden to Mr. Bury as it has been to, virtually, every one else, and he made no such attempt, as Mr. Wavell had made, to push east of the capital. But though he could not go up to Khamir, he learned a good deal about the Imam Yahya, who keeps his subsidized court there, and something also about the still less known Asir, which lies north again, and about Idrisi, its ruler. It is about a century since the interior of that district has been visited by a European. Can Mr. Bury break the charm?

Although the sub-title of the book raises expectation of a verdict on Turkish rule in Yemen, we closed it with no clear idea what its author's final verdict would be. He certainly thinks Yemen is no good to the Turks, though it might possibly go hard with them in other parts of Arabia if they let this province go. But whether the Turks are any good to it, he seems to have two opinions. On the one hand, he says that Ottoman rule has been the curse of Yemen; on the other, that the Turks are the best imperial rulers of Moslem peoples, and that all native Yemenite rule has been and is worse than theirs. He praises the Ottoman *personnel* discriminately, but distinctly, again and again, representing it as, on the whole, making the best of a bad job—better than, he thinks, any other aliens (*e.g.* ourselves) would make of it. This inconsistency is, oddly enough, one of the merits, as well as the charms, of the book. It stamps the author as a very candid writer who has not used any artifice to conceal the fact that his mind is not made up on a very knotty problem. As the evidence, bit by bit, has come his way, he has put it before us, together with the impressions made on himself from time to time. The result is that one learns a great deal on both sides of the question; indeed, the present writer does not know any book more informing on Ottoman provincial administration. Nor are the synthetic chapters in the latter part of the volume, which deal with the land and the native people, any less valuable. One has not often had so good a picture of the four main zones of Yemen, the Tihama, the foothills, the highlands, and the inner plateau; and certainly none so good of the highlands and their people. Of these last Mr. Bury's long "honeymoon" at Menakha enabled him to see more in detail than any previous traveller who has survived to write about them. He is very interesting, and more strictly geographical, on climate, fauna (he went to Yemen primarily to collect birds), and trade. All these synthetic chapters are good reading. Instead of being, as might be expected, the heaviest, they are the lightest in the book. The author has not only relieved them with tales and experiences, both curious and comic, but he has let his style run riot in a colloquialism which is as entertaining as it is artless. They strike us as having been written more light-heartedly and under other conditions than the earlier chapters. The whole book, however, should be read by any one who reads books of travel at all, and it must be read by every one who wants to know what Yemen and its people are to-day, and how Southern Arabia is likely to fare, whether the Turk wins or loses the present war.

D. G. H.

'The City of Dancing Dervishes.' By H. C. Lukach. (London: Macmillan. 1914. Pp. xii., 257. *Illustrations.*) This series of short sketches collected from

the writer's experiences in the Near East adds one to the many volumes of scholarly reminiscences which are included in the literature dealing with this area. Not only the city of dancing dervishes (Konia), but various broader topics connected with Turkish life and rule in Asia, a picturesque Cypriote episode of miracle-working, and other interesting matters find place in this volume.

'Java and her Neighbours.' By A. S. Walcott. (New York: Putnam's Sons. 1914. Pp. xvii., 350. *Map and Illust.* 10*s.* 6*d. net.*) Though covering no new ground, the party whose journeys are recorded here wandered very far from the beaten track, not only visiting Java, but touching also at Macassar, eastern Borneo, northern Celebes, Ternate, Sulu, Buru, and other islands, the west coast of Sumatra, and Achin. The narrative and description show evidence of close observation, and the writer has prepared himself and prepares his readers with a geographical and historical summary. Travellers who are to follow him to the archipelago should not fail to refer to his book.

AFRICA.

'Shots and Snap-shots in British East Africa.' By E. Bennet. (London: Longmans. 1914. Pp. xii., 312. *Maps and Illustrations.* 12*s.* 6*d.*) The writer of this book made a fine sporting journey during a year's leave from his duties as an Indian civilian, and he narrates his experiences with much skill. In the geographical sense the part of the book which is of chief interest is that which deals with his travels in the region of the Uaso Nyiro. A rather rough route map is provided showing the country along this watercourse, with notes as to its character, the game seen, etc., from Archer's Post to the Lorian swamp, on the scale of 1 in. = 4 miles. There is also a still rougher map of the whole Protectorate, of value, however, because it shows the nine game reserves, of which two are general, and the others concerned with particular animals. The book is well illustrated with photographs of interest principally to sportsmen and zoologists.

'Through Unknown Nigeria.' By John R. Raphael. (London: T. Werner Laurie. 1914. Pp. xxiii., 361. *Illustrations.* 15*s.* net.) Mr. Raphael was Travel Editor of *The African World* when he made the journey described in this book. The title is apt to mislead. From Lagos to Kano, a tour through the tin-fields, and back to the coast *vid* Baro and the Niger—such was the course of the journey. Mr. Raphael's account of it is that of a skilful if not very profound journalist. Without attempting a serious study of the country and its problems, he has produced an interesting narrative. The illustrations (from the author's photographs) are numerous and exceptionally clear. There is no map.

AMERICA.

'Lands Forlorn: A Story of an Expedition to Hearne's Coppermine River.' By G. M. Douglas. (New York: Putnam's Sons. 1914. Pp. xv., 285. *Maps and Illustrations.* $4.) A pleasant record of an interesting journey undertaken without any elaborate preparation by men well accustomed to the type of travelling involved. The narrative acquires a retrospective interest when two of these wanderers were picking their way in the neighbourhood of the Dismal lakes with the guidance of Hanbury's and Simpson's accounts. To these they add substantially, not only in letterpress but by means of admirable photographs, of which throughout the book there are many. A map showing the possible copper-bearing area in the Arctic region, and a geological map of the lower Coppermine river, are valuable additions to the book.

AUSTRALASIA AND PACIFIC ISLANDS.

Civilization in Australasia.

'A Century of the Pacific.' Edited by James Colwell, F.R.HIST.S. Introduction by W. H. Fitchett, B.A., LL.D. London: Charles H. Kelly. 1914. 21*s. net.*

This book contains matter of considerable interest, especially at the present time, when it seems certain that great changes must shortly be made in the political-sociological conditions which have grown up in the now Europeanized Pacific. With the exception of the two excellent scientific chapters, respectively by Prof. Woolnough, on the geology, and by Mr. G. T. Baker, on the biology of the area with which the book deals, there is little to demand the careful attention of the student of pure geography, but, on the other hand, there is much of the "human geography" which is of interest and importance to the student of the political sociological conditions of a definite area of the globe.

The title of the book would have been more apt had it been called 'A Century of Australasia, including some of the South Sea Islands, as seen and told by Wesleyans.' This means, not that the book is merely another book on missionary effort in the Pacific, but that it is an account, mainly from the Wesleyan missionary's point of view, of the civilization affected in Australia, New Zealand, and of such of the adjacent South Sea islands as have been under the care of that particular mission during the century which has now just elapsed since, in 1815, the Australian Wesleyan Missionary Society was founded and began to exercise its indisputably potent influence for good within the area in question. As a *résumé* of this good work and of the results which have been brought about largely by its co-operation, the book should be useful to all who will shortly have to consider the rearrangement of Australasia and of the whole Pacific.

Though the *Journal* is not the right place in which to deal with this book in any detail, a special word of commendation may be given to the chapter in which the Rev. Cyril Bavin, a Wesleyan missionary who has lived and worked both in Fiji and in the East Indies, has given his views on the question of "the East Indian in Fiji." Mr. Bavin writes in a manner which, in the opinion of one who, from a very different point of view, has had as good an opportunity as Mr. Bavin of understanding the good and bad effects of the remarkable experiment in State-directed migration of native labour, from an area where it is superfluous to places in which it is urgently needed, is an entirely fair statement of the whole story and a noteworthy defence of the system of "indentured immigration," if only due precautions in the interests of the immigrants are taken.

The book closes with a long, if somewhat uneven, bibliography, and with a very fairly good index. E. M T.

The Voyage of the "Pandora," 1790–91.

'Voyage of H.M.S. *Pandora*, despatched to arrest the Mutineers of the *Bounty* in the South Seas, 1790–91; being the narratives of Captain Edward Edwards, R.N., the Commander, and George Hamilton, the Surgeon.' With Introduction and Notes by Basil Thomson. London: Francis Edwards. 1915. 6*s. net.*

The account, by Mr. George Hamilton, late surgeon of the ship, of the voyage round the world of His Majesty's Frigate *Pandora*, in 1790–2, in search of the mutineers of the *Bounty*, is so scarce that this reprint is very welcome, and very much the more in that it includes Captain Edwards's report to the Admiralty, as well as Mr. Basil Thomson's most interesting introduction and notes.

The value of this publication of Captain Edwards's official reports is hardly, if at all, lessened by the fact that Captain Amasa Delano, of New Plymouth, in his 'Narrative of Voyages . . . in the Pacific Ocean,' published at Boston (U.S.A.) in 1817, has printed a very considerable part of the journal from which Edwards wrote his letters to the Admiralty. Delano, who was at the time serving under Captain John McClure in the East India Company's ship *Panther*, was at Coupang, in Timor, early in 1792, only a few months after the survivors of the wreck of the *Pandora* had reached that place, and there "found in the possession of Governor Vanjon a manuscript history of the cruise of the *Pandora*, written by Captain Edwards himself." This manuscript Delano was allowed to copy, and he "presents the substance of it to the reader." Comparison of Delano's version with Mr. Thomson's clearly shows that both were founded on the same original, which was the diary kept by Edwards during the last cruise of the *Pandora*. But Delano's book, though formerly often quoted, is scarce, and has now almost dropped out of ken; moreover, the manuscript from which that author copied was concluded before the refugees from the *Pandora* reached Samarang and there found the lost tender, the adventures of which are the main theme of Mr. Thomson's book.

It has long been known that the little schooner which had been built by the mutineers at Tahiti, where it was found and seized by Captain Edwards, was converted into a tender for the *Pandora*, and that this tender, during some bad weather off Samoa, parted company with the *Pandora*, and was not heard of again till her crew and the survivors of the wrecked *Pandora* met in the East Indies; but it was not known where the tender went after she parted company with the *Pandora*. Mr. Basil Thomson has now ingeniously fitted together various hints supplied by Edwards and Hamilton with others derived from his own intimate knowledge of the Fiji islands, and has thus given fairly strong, but not conclusive, reason to believe that the tender passed some weeks at one of the southern Fiji islands, and in communication, perhaps not very friendly, with the natives of that island. If Mr. Thomson is right, he has unearthed the earliest instance of Europeans, not merely sailing by, but actually touching and remaining for a time at, any island of the Fiji group.

E. im T.

'From Tasman to Marsden: A History of Northern New Zealand from 1642 to 1818.' By Robert McNab. (Dunedin: Wilkie. 1914. Pp. xv., 236. 6*s. net.*) Dr. McNab here continues his profound researches into the history of New Zealand. His earlier chapters cover the visits of Tasman, Cook, De Surville, and Marion Dufresne, and his critical analysis of their proceedings, the exact scenes of their landings, and so forth, are of great interest. In later chapters the initiation of the timber and whaling trades is discussed; the "Boyd" massacre and episodes following upon it, in the period 1809–14, occupy two chapters, and the missionary effort of the years 1807–15 is also dealt with at length.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

An Advanced Text-Book of Physical Geography.

'College Physiography.' By R. S. Tarr. New York: The Macmillan Co. 1914. Pp. xxi., 837. 15*s. net.*

The greater part of this book was written by the late Prof. R. S. Tarr, of Cornell University, but it has been amplified and brought up to date by Prof. Lawrence Martin, of the University of Wisconsin, who was associated with Prof. Tarr in field researches both in Alaska and in New York. As an exposition

of modern physiographical science, the volume is remarkably complete. It reviews the results of recent American research, and is of especial interest as showing the extent to which some of the hypotheses advocated by American workers are accepted by university teachers. The glacial erosion hypothesis, for example, is adopted in its most extreme form, the formation of hanging valleys being considered inexplicable on any theory of river erosion (p. 232). Fiords are said to be now generally recognized (in America) as "mainly the result of glacial erosion, subsidence, if present, having been merely an incident of secondary importance" (p. 351). Again, it is categorically stated that "the Earth itself is impervious at depths well above the level of the magma in the zone of rock flowage, which lies at depths no greater than about 12 miles," and the suggestion that the water emitted from volcanoes may be largely surface water is termed "too utterly incredible for belief" (p. 491). Such statements as these are calculated to give an unfortunate bias to those advanced students and laymen for whom the book has been written, and for this reason it is unlikely to be widely recommended as a class-book on this side of the Atlantic. At the same time it is of great value as a book of reference. Many chapters are most reasonably written and amply illustrated from both local and foreign sources. Altogether there are over five hundred maps, diagrams, and illustrations, many of which will be found most useful for teaching purposes.

J. D. F.

HISTORICAL GEOGRAPHY.

'The Ancient East.' By D. G. Hogarth. (Home University Library. London: Williams & Norgate. 1914. Pp. 256. *Maps.* 1*s.*) The series to which this volume belongs maintains a very high standard, which is fully kept up in this particular instance. Nothing could be clearer than Mr. Hogarth's summary of the chronological and topographical relationships of the nations which played great part in the early history of the near East, and the book will be found a necessary work of reference to the historical geographer. It amplifies and carries forward the narrative supplied in Prof. Myres' 'Dawn of History' in the same series.

GENERAL.

Atlases for Students.

(1) 'Morphologischer Atlas.' By Dr. S. Passarge. Lieferung I.: Morphologie des Messtischblattes Stadtremda. [With] Erlaüterungen. Hamburg: L. Friederichsen & Co. 1914.

In the first part of his morphological atlas Prof. Passarge attempts to show how the various factors which have been most important in the evolution of the present surface may be investigated and elucidated by means of large-scale maps. His method is to take a single survey-sheet of any structural region, and to construct for the given area maps showing the solid geology, the soil, the vegetation, the predominant slopes, the valley forms, the physical and chemical characteristics of the rocks, etc. Then, by a comparison of the various maps, he arrives, if not at a definite solution of the origin of the topographical features, at least at a clear conception of the problems involved. In the first part of his atlas, he takes the Stadtremda sheet as typical of the Thuringian basin, and illustrates in this way the origin of the morphology. He suggests that characteristic sheets of the Alps, the karst lands, the steppes, the tundras, the deserts, the tropical forests, etc., might be treated in the same manner. Each sheet will be accompanied by a short explanatory memoir.

Some of the maps of the present part are so overburdened with detail that they are very difficult to read; others are conspicuously clear. It is obvious, as Passarge says, that the detailed mapping of large areas in this way could be undertaken only by a Government survey. The method might profitably be adopted by research students in the investigation of small areas, but it is doubtful whether the results obtained would be at all commensurate with the time and labour involved.

(2) 'Methodischer Atlas zur Landerkunde von Europa.' By Dr. Max Friederichsen. Lieferung I.: Ost-Europa und die Ostseeländer. Hanover and Leipzig. 1914. 3 *M.*

Prof. Friederichsen has issued the first part of his geographical atlas of Europe, designed for the use of University students already familiar with Sydow-Wagner's school atlas. The atlas has also been compiled in illustration of the new edition of Guthe-Wagner's 'Lehrbuch der Geographie,' Bd. II., which has been revised by Dr. Friederichsen. According to the plan of the atlas, three double plates, each with eight maps, are to be devoted to each of the countries of Europe. The first plate will illustrate the origin of the topography and the natural landscapes by the interaction of geological, tectonic, orographical, hydrographical, climatological, and other factors. The second will be devoted to a detailed consideration of the climatic factors themselves, such as January and July isotherms, annual and monthly rainfall, duration of winter and summer, etc. The third plate will illustrate various anthropological and economic factors. The first part of the atlas now published contains sets of maps for Russia and Scandinavia, and these, compiled as they are by a practical teacher, should prove of very great academic value. An exhaustive bibliography of the sources from which the maps have been compiled is printed on the cover. J. D. F.

Travel at the Close of the Eighteenth Century.

'The Letters of John B. S. Morritt.' Edited by G. E. Marindin. Pp. xi., 319. *Illustrations.* London: John Murray. 1914. 10*s.* 6*d. net.*

A pleasantly written account of a "Grand Tour," by the owner of the Rokeby Park estate towards the end of the eighteenth century, with an introduction and notes by the editor. Morritt, who in later life was an intimate friend of Sir Walter Scott and formed a valuable collection of sculptures and paintings, was already a young man of cultivated tastes when, fresh from Cambridge University, he set out from England in 1794. France was closed to him by the Revolution, which had already plunged a large part of Europe in war, but notwithstanding the disturbed conditions of the times he carried out to the full the programme of a fairly comprehensive tour, extending over two years. From Ostend he crossed the continent to Constantinople, making stays of some duration at Dresden and Vienna; visited from Constantinople the north-east corner of Asia Minor; slowly toured along the European side of the Mediterranean; and made his way home from Italy through Vienna once more. The letters are largely occupied with accounts of the social and political conditions observed by the traveller, but geographical description also has a place in them, and in particular questions of classical geography and archæological interest come in for a good deal of attention. The views expressed with the vigour of youth are not always those which find favour in the light of modern research, and the character of the correspondence—the letters were addressed to various members of Morritt's family—precludes

exhaustive discussion. None the less, the letters, vivacious and scholarly, are worth preserving from oblivion, and thanks are due to Mr. Marindin for bringing them to light.

'A Woman in the Antipodes.' By Mary Hall. (London: Methuen & Co. 1914. Pp. viii., 374. *Sketch-maps and Illustrations.* 16*s. net.*) The authoress is well known for her journey from the Cape to Cairo: the present book is a record of travels along more beaten tracks. It describes an extended tour through New Zealand and Australia, and the journey home *viâ* Manila, Hong Kong, Peking, and the Trans-Siberian railway. It is distinguished from the ordinary globe-trotter's diary by the vivacity and shrewdness of Miss Hall's observation and comment. Handsomely illustrated, the book is an example of the literature of tourist travel at its best.

'The Old East Indiamen.' By E. Keble Chatterton. (London: Laurie. *N.d.* Pp. viii., 343. *Illustrations.* 12*s.* 6*d.*) An attractive volume, written with Lieut. Chatterton's authoritative knowledge of shipping matters, and at the same time with a breadth of interest and a pleasant style calculated to hold the general reader's attention. Judicious quotations from original accounts of early voyages never cease to fascinate, and such accounts are often drawn upon in this volume. Moreover, the story, beginning retrospectively from the time of the discovery of the African sea-route to India, has a lesson, for, as the author says, "People ordinarily do not realize the full extent of their indebtedness to the ships and sailors of the past in respect of discovery, empire, power, and wealth. . . . Without these India would have been in the possession of some other European nation."

THE MONTHLY RECORD.

THE SOCIETY.

Award to Dr. Keltie.—A special gold medal has been awarded to Dr. Keltie by the Paris Geographical Society in recognition of his contributions to geographical progress during the past thirty years.

EUROPE.

The Weston Tapestry Maps.—Attention may be called to the fact that these fine and interesting maps of parts of the English Midlands (the largest measuring some 19 feet in length, apart from the border), are now being exhibited at the Victoria and Albert Museum, South Kensington; all the specimens known to exist having been brought together for the first time. The best account of the maps yet written is that of the Rev. W. Bedford, in the *Journal* for February, 1897 (pp. 210–215), being a paper read at an afternoon meeting of the Society, at which one of the examples was exhibited. It may be recalled that the maps were woven in the looms installed in Warwickshire in the sixteenth century by William Sheldon, of Weston and Brailes, though the three best specimens—those in the possession of the Yorkshire Philosophical Society—seem to date from the next century. They appear to have been the actual work of Francis and Richard Hicks (or Hyckes). Two others, in a very fragmentary condition, with a quite small portion of a third, are the property of the Bodleian at Oxford. While closely corresponding to two of the York maps as regards the counties represented, they have quite different, pictorial, borders, and are probably of an earlier date. Besides these, it was known from printed references that other fragments had been

preserved down to recent times, and two of these—now the property of Mr. Henry Birkbeck, of Westacre High House, Swaffham, Norfolk—have come to light, and have been lent for exhibition with the rest. The larger, representing the lower right-hand corner of an original map, has been mounted as a folding screen, with oak frame; while the smaller has apparently formed part of the same original map, which must have embraced Gloucestershire and parts of neighbouring counties.* Thus the scale is the same in both, in both the east is at the top, and both can be suitably fitted in as parts of an original of about the size of the complete York maps. The authorities at the Museum consider the fragment forming the screen to be the same as one referred to by Gough in his 'British Topography,' and thought to be also identical with that sold (as a screen) at the Strawberry Hill sale in 1842. There are, however, some puzzling discrepancies which it is difficult to account for on this supposition. Thus Gough's fragment embraced "the east part of Surrey," and the Strawberry Hill screen was described in the catalogue as of mahogany (not oak), and as representing part of Surrey and Middlesex, while in other ways the description, if referring to Mr. Birkbeck's screen, was loose and inaccurate. As already recognized by Gough, the maps bear distinct traces of the influence of Camden and Christopher Saxton.

ASIA.

Voyage down the Tenasserim River.—Lieut. J. D. Mackenzie, I.A., sends us a short account of a voyage down the Tenasserim River, from Myitta to Mergui, which, as no account of a previous descent of the river throughout this section appears to be in existence, is of some interest.† With two servants and a Myook (Burmese official), Lieut. Mackenzie made the journey in Karen dug-outs—clumsy boats, each paddled by two boatmen. The starting-point, Myitta, lies east-north-east of Tavoy, near the junction of the two headstreams of the river—one flowing from the north, the other from the south—known respectively as the Kamonthwe and the Ban. It is a flourishing settlement, and many of the Karen inhabitants are Baptists. The river, 200 yards wide and sluggish below the junction, changes character as it drops down to the Tenasserim gorge, where it narrows and foams between high steep banks. The smooth bare rock-face, rising 40 feet from the water, showed the extent of the rise in the rains. The banks above are thickly wooded, and the mule track on the right bank is much obstructed by fallen bamboos. The work of the boatmen was here almost limited to steering clear of the huge rocks which stud the river. Camp was pitched from day to day on any convenient island or sandbank, the first village of importance being Sinbyudine, where the mule track crosses by a ferry and leads over the watershed into Siam. Here it was necessary to change boats and boatmen, as the Karens will not leave their own beat, the negotiation of the rapids requiring local knowledge. The same was the case at Amya, a village much reduced by small-pox, where a caravan route crosses the river, again by ferry, going east to the frontier at the Amya pass; it is now less used than that further north. About a day's journey above Aungthawara, near the boundary between Tavoy and Mergui, there is a very dangerous rapid, and it was necessary to make a portage. Tradition has it that a large number of Burmese soldiers perished here

* The small Bodleian fragment is likewise part of a map which embraced Gloucestershire.

† The lower Tenasserim river was navigated pretty constantly in the early days of European intercourse with this region, by those making the journey across the isthmus to Siam. In modern times, Mr. Warington Smyth on one occasion planned a descent from a point on the upper river, but was unable to obtain boatmen for so long a voyage.

during Alaungpaya's invasion of Siam in 1760. There is a strong undertow, and the channel is choked with large rocks. Below Aungthawara the rapids are less dangerous and the stream is larger, the jungle remaining dense. Forty miles lower down, the Sarawa, the largest tributary besides the Little Tenasserim river, enters on the east. It was formerly the most used route between Mergui and Siam.* From this point the river increases rapidly in width, the banks are lower and less densely wooded, and the population becomes less sparse, patches of cultivation being noticeable here and there. The Little Tenasserim river—which joins the main river at Tenasserim, a fair-sized township placed on hilly ground—is navigable for some distance by shallow-draught steam launches. There are plantations in the district, and at the time of Lieut. Mackenzie's passage the British India Company was about to place on the river a steam-launch to ply between Mergui and Tenasserim. A little lower down the dug-outs were exchanged for larger boats more suitable to the tidal waters now reached, and the voyage ended at Mergui on the fourteenth day after the start from Myitta. During the journey sambhur and bear were seen, and various species of monkeys; also the tracks of rhinoceros, tiger, and tapir. Peafowl and hornbills were plentiful in the upper reaches, and the river swarmed with mahseer and other fish.

Surveys on the North-Eastern Frontier of India, 1911–13.—The first connected account of the various surveys on the extreme north-eastern frontier of India in the years 1911–13 is given in vol. 4 of the 'Records of the Survey of India' (Calcutta, 1914). This volume contains detailed reports by the officers in charge of the detachments at work in the extreme north of Burma, the Mishmi country, the Abor country, and the Miri country, by which accurate knowledge of a large part of these wild tracts has for the first time been obtained. As remarked by Sir Sidney Burrard in a short introduction, the country in question is perhaps the most impassable in the world, and the successful results of the operations is to be attributed mainly to the perseverance of the officers and surveyors in the face of great difficulties and hardships. In north Burma, the chief survey officer was Captain E. B. Cardew, whose report describes the work done northward from Myitkyina, on the previously little-known ultimate headstreams of the Irawadi. Altogether an area of 10,000 square miles was surveyed, mostly on the scale of 4 miles to the inch, the area triangulated being approximately 8750 square miles. While certain of the Irawadi feeders have been shifted westwards, it has been found that the Irawadi-Salwin water-parting, and the Salwin itself, must be shifted 8 to 10 miles eastward, between the latitudes of 27° and 27° 45′ N. The Mishmi surveys were in charge of Captain (since Major) C. P. Gunter, and with him was Captain H. T. Morshead, since known for his exploration (with Captain Bailey) of the great bend of the Tsang-po. In 1911–12 the main sphere of operations was the valley of the Luhit (the eastern branch of the Brahmaputra) and its tributaries, and the results included the fixing of the positions of the Tibetan villages of Sama and Rima, so often brought into notice in connection with the early exploration of this region, and of various passes leading across the bordering ranges. Rima was found to be in long. 97° 3′ instead of 97° 30′, and the trace of the Luhit's course was appreciably modified by the survey. The general steepness of the sides of the valley makes them impassable except where broken by the larger tributaries. Features of special interest are the Dati falls (where a stream falls 3000 feet by three cascades into the Luhit), and two huge rock pinnacles rising to over

* The route followed by Alaungpaya on his invasion of Siam was probably that by the Little Tenasserim river, the return being by the Sarawa. His outward route was taken, in the reverse direction, by Mr. Leal in 1826.

17,000 feet. The work of the next season (1912–13) was concerned with the basin of the Dibang and its tributaries, and the precipitous nature of the gorges of these streams outdid anything of the kind on the Luhit. But in spite of all difficulties the whole programme laid down was completed. The Dibang was traced to the source of each of the five large rivers which combine to form its lower course. Its whole basin was surveyed except the valley of the Ithum (a tributary from the east), and the main watersheds from which all the branches emanate were fixed. The surveys connected both with the Abor survey on the west and the Burma survey on the east. The whole area was triangulated by Captain Morshead, the stations of observations being 25 and intersected points 180. A striking feature is the very steep gradient of all the branches of the Dibang, rendering easily intelligible the tremendous force with which the river rushes through the gorge at Nizamghat. The work of the Abor survey parties, in charge of Captain O. H. B. Trenchard, which covered the basin of the Dihang and its tributaries and the Himalayan ranges by which that river is enclosed, was fully equal in importance to that of any of the others, and Captain Trenchard's report is a mine of valuable information on this interesting region. Many of the results have already been referred to in the *Journal*, including the discovery of the great peak of Namcha Barwa, verifying Sir Sidney Burrard's surmise that, like the Indus and Satlej in the west, the Brahmaputra might be found to cut its way across the Himalayas at the base of the point of supreme altitude. The Miri survey detachment, under Lieut. C. G. Lewis, worked chiefly in the basin of the Subansiri, where important corrections were also introduced into the maps. Altogether an area of 28,000 square miles was surveyed by the above parties, whilst excellent work has been done in the same region by the expeditions of Captains Morshead and Bailey, and Captains Pritchard and Waterfield, already described in the *Journal*.

AFRICA.

Dr. C. Christy's Zoological Researches in the Congo Forest.—In a communication written at Khartum in January, Dr. Christy gives a short account of his collecting expedition in the forests of the North-Eastern Congo basin, carried out by him during the past three years on behalf of the Musée du Congo Belge. After a trip on the Kasai and a stay of six weeks at Stanleyville for fish collecting, Dr. Christy proceeded to Avakubi on the Ituri, going thence south to the Lindi, and subsequently making a base camp for several months at Mawambi on the Ituri. From this and other spots he explored the great forest area to the south, cultivating the acquaintance of the Bambuti pygmies, on whose help he relied in his quest of zoological specimens. He often camped for days together in their company, and was fortunate enough to shoot two okapi—a feat so far accomplished by few white men, owing to the excessively shy and elusive nature of this animal. Success was only achieved after months of stealthy hunting day after day in the dank and almost impenetrable forest. Besides these, Dr. Christy secured several of Meinertzhagen's black forest pig, many of the dwarf Ituri buffalo, as well as specimens of the ant bear, the giant pangolin, and a good series of forest duikers—the largest the size of a Shetland pony. He also obtained a large collection of birds, and some fifteen hundred small mammals. His various journeys took him to Lakes Albert and Edward, the Semliki valley, the Babairu gold-mines, the forest between the Gayu and the Nepoko, and eventually, in 1914, to the Welle district, where he was pleased to be among a new and interesting type of people, totally different from the interloping half-caste Arabs of the Ituri. No other natives of Tropical Africa, except perhaps the Kavirondo and Jaluo of British East Africa, had made so favourable an impression on him. At Poko, on the Bomokandi, he found a rich field for

collecting work, and spent two months hunting for the elusive animal known as the "bongo" (of which he obtained one male specimen), and for hypothetical pygmy elephants. On hearing rumours of the war he started for the Nile, exploring *en route* the country round Faradge (especially the sources of the Gango), where he secured two heavy tusker elephants, but failed to get a good white rhinoceros, although they are still quite numerous and several were seen. Eventually he made his way to Rejaf and so down the Nile to Khartum.

Railway Communication in the Belgian Congo.—The announcement has been made that the Belgian railway, which has for some years been under construction from the Lualaba or upper Congo to Lake Tanganyika, was laid to its terminal point on that lake during March. The line will supply an important link in the means of communication between the east and west coasts of Equatorial Africa—an object which has been regarded in some quarters as of equal importance with the north and south communication by the "Cape to Cairo" project. With the help of the navigable waterway of the Congo, and other sections of railway constructed along its course where obstructed by rapids, steam transport will shortly be available from the Atlantic to Lake Tanganyika, while the German railway from the Indian ocean to the same lake completes the communication from ocean to ocean. The route by the great river is however somewhat circuitous, and schemes have not been wanting to supply a more direct connection by means of a railway across the southern basin of the Congo (cf. *Journal*, vol. **37**, p. 318; vol. **39**, p. 284). The line now approaching completion leaves the Lualaba at Kongolo (just above the gorge known as the "Portes d'Enfer"), and follows the north side of the Lukuga valley to its exit from Tanganyika. Its length is 267 kilometres (166 miles).

AMERICA.

Reported Discovery of Large Islands in Hudson Bay.—The surprising announcement has been made from Montreal that some hitherto uncharted islands of very large extent have been discovered near the centre of Hudson Bay, by Mr. Robert J. Flaherty, "leader of the Sir William Mackenzie expeditions to Hudson Bay." The islands are said to extend from north to south nearly 400 miles, and to have a total area of over 4000 square miles. They are said to consist of low hills, and to be uninhabited save by Eskimo in a few places. They correspond to what have been known as the Belcher Islands, but are of much greater area. This discovery, if at all answering to the above report, is evidently of very great interest, and may be expected to throw some light on the obscure accounts of Hudson's last voyage. The Belcher Islands are shown on the Admiralty charts as two groups of small islets between 56° and 57° N. lat., and somewhat over 100 miles from the eastern shore of the bay. Now, according to Hessel Gerritz's statements, and his map said to have been copied from Hudson's own, Hudson sailed up the whole western shore to 60°, then meeting with "a wide sea, agitated by mighty tides from the north-west." Commentators have declined to accept the given latitude, and some (*e.g.* Mr. Miller Christy in his 'Voyages of Foxe and James') have thought the point mentioned to have been the northern extremity of James Bay, in 55°. But it now seems possible that Hudson sailed up the east side of the newly examined islands, in which case a latitude approaching 60° might perhaps have been reached before the open sea to the north-west was discovered.

The Growth of American Cities.—Some interesting comparisons between various types of American cities as regards the manner and intensity of their growth are drawn by Prof. Mark Jefferson in the *Bulletin* of the American Geographical Society for January of this year. The study brings out broadly the regional distribution of cities according to the nature of their growth, as (*a*) exuberant,

(*b*) vigorous, (*c*) halting, and it is shown how their fortunes in nearly all cases depend on their relation to their environment, and the service they render to the region in which they are placed. New York, of course, stands without peer, as the economic and commercial capital of English America, thanks above all to the Mohawk gap in the Appalachian upland. The curve of its growth, as of other cities where this has been specially rapid, is concave upward, denoting that the increase in each decade has been greater than in the one before. (This applies to the *geographical* city—the area of continuous settlement, which is likewise the unit adopted for other cities with overflows beyond their political limits.) Cities of *vigorous* growth are mainly those of the humid east, which show a generally steady increase from decade to decade, though with some check in the rate during the sixties and nineties of last century, due to the Civil War and (it would seem) to the panic of 1893. A similar check may be noted in the growth of the whole population of the United States. Cities of *exuberant* growth are those of the Pacific coast region, which have shown a simply astonishing increase since the great impetus to development of the region which followed the supply of adequate railway communication. Cities like Seattle and Los Angeles—1000 miles apart and with very different environments—show the same exuberance, and Canadian cities like Winnipeg and Vancouver fall in the same category. And the persistence of such rapidity of growth within the last two decades is remarkable. Thus, Los Angeles, with a population of 50,000 in 1890 and 102,000 in 1900, had risen to 319,000 in 1910. These cities have been centres from which the development of the whole region proceeded, suddenly thrown open, as it was, to the enterprise and resources of the east. The process cannot be maintained indefinitely, and San Francisco, with its earlier start in the race, has already lost its first exuberance. The writer even questions whether this stands in so vital a connection with the New Pacific as other cities, and whether the future great central city of California will not be Oakland across the bay. The *halting* cities are chiefly those of the rivers and great lakes, and even Pittsburg, the seat of a great modern steel industry, has suffered a check in the last two decades. Possibly the smaller vigour of this group is due to the stifling of competition, in the form of water carriage, by the railways. Political capitals like Washington and Albany show no very rapid growth.

AUSTRALASIA AND PACIFIC ISLANDS.

Loss of the Australian Fisheries Investigation Steamer "Endeavour."—We are indebted to Captain J. K. Davis for the following notes on the tragic fate of this vessel, which left Melbourne in November for Macquarie island to relieve the party at the meteorological station established there by Sir Douglas Mawson, and must, it is feared, be given up for lost, with Mr. H. C. Dannivig, Director of Fisheries to the Commonwealth Government, and his staff. The vessel left Macquarie island on her return voyage on December 3, and has not since been heard of, in spite of a thorough search by steamers sent by the Commonwealth and New Zealand Governments. The *Endeavour* (so named after Cook's famous vessel) was specially built in 1908 at the New South Wales dockyard for fishery investigation in the open ocean, on the lines of the *Michael Sars*. The vessel was very suitably equipped for her work, and had already done good service under Mr. Dannivig's direction in locating extensive trawling grounds within easy reach of Melbourne and Sydney. Her master, Captain G. W. C. Pim, was a Fellow of this Society, and had had experience of survey work among the South Sea islands. Biological investigations were constantly carried out, these having latterly been in the hands of Mr. C. T. Harrison, known for his excellent work with the Australian Antarctic Expedition.

New Ascent of the Fly River, New Guinea.—Some account is given in the *Times* of April 10 of a trip up the Fly River carried out in the summer of 1914 by Sir Rupert Clark, who has now returned to this country to take up a commission in the Army Service Corps. Sir Rupert was accompanied by two prospectors, whose object was to test the accuracy of rumours of gold on the upper Fly River, and by two other white men and thirty natives. The journey was made in a 30-feet oil launch, and the party had also a motor whale boat. Port Moresby was left on May 10, and the Fly was entered on May 16. On June 7 the party pitched a main camp at the junction of the Tully river, 568 miles up, and thence went forward 30 miles to the point where Sir W. Macgregor had been forced to abandon his boat. Hence Mount Donaldson was climbed, the height being given by aneroid as 2200 feet, but this must, of course, be regarded as approximate only. A slight further advance up the river was made to a point 630 miles from its mouth, the river here passing between high cliffs, but the travellers were unable to trace it to its source, as they had hoped to do. The country bordering these upper reaches was of the nature of heavy jungle with rising hills, but the march from the last camp was through extensive swamps. Colours of gold were seen, but not rich enough to make working profitable. The natives were sometimes threatening, but it was not necessary to fire a shot. Daru was reached on the return journey on July 4.

The Southern Ocean.—With reference to the name to be adopted officially for this ocean (*Journal*, April, p. 340), we are informed by the Colonial Office that the above designation has now been formally adopted by the Government of New Zealand, as well as by those of the Commonwealth of Australia and the Union of South Africa.

Dutch Exploration in Northern New Guinea.—We mentioned (January number, p. 81) a recent Dutch expedition to the basin of the Mamberamo river, during which a large feeder from the west, named the Rouffaer, had been explored by Lieut. Stroeve. The subsequent death of this explorer on Geelvink Bay was also recorded. A brief journal kept by Lieut. Stroeve during the exploration of the Rouffaer has since been printed in the January number of the *Tijdschrift* of the Netherlands Geographical Society, accompanied by the reduction of a chart of the river drawn by the traveller. It appears that he had made his way overland from the Rouffaer to Geelvink Bay, and it is much to be regretted that his notes of this important journey should have been lost through his tragic death. It is also mentioned that the Beraiware, the largest stream debouching on the north coast between the Mamberamo and the Wa Poga (Geelvink Bay) was examined by Lieut. Stroeve in March, 1914.

POLAR REGIONS.

Mr. Stefánsson's Expedition.—Grave anxiety is felt for the safety of Mr. Stefánsson and his two companions, who, it will be remembered, went north early last year from a point on the north coast of Alaska on a sledge expedition across the Beaufort Sea and have not been heard of since sending back the last of the supporting party in April (*Journal*, vol. **44**, p. 591). The Canadian Government has announced its intention of doing all that is possible to rescue the lost explorers, and three steamers now in the Arctic will set out in search of them during the present spring, as soon as the break-up of the ice renders this practicable.

HISTORICAL GEOGRAPHY.

Origin and Development of the Compass-rose.—This subject, on which a large amount of somewhat undiscriminating discussion has been lavished in the past, is dealt with in a masterly way by Prof. Silvanus Thompson in a paper read at the International Historical Congress in 1913, and since printed in the *Proceedings* of the British Academy, vol. **4** (1914). A reprint of the paper, which is

accompanied by excellent coloured illustrations of various types of compass-roses, has been kindly sent us by the author. The inquiry relates not only to actual cards used in the compass itself, but to the early sailing charts, of which a prominent feature was the covering of the whole surface with an interlacing network of lines corresponding to the thirty-two points of the compass, and taking their origin in a series of centres, often marked by elaborate "roses" similar to that of the compass-card itself. They are, in fact, often known as "compass" or "loxodromic" charts, the latter name denoting the probable use of the lines to indicate direct routes along the recognized direction of the winds.* The first section of the paper deals with the origin of the names of the winds among the nations of antiquity, and the ultimate development of the Italian eight-point wind-rose, which superseded the classical twelve-point rose as more fitted to meet nautical needs. The next traces the origin of the arrangement of the rose of thirty-two points, and brings out clearly the intimate connection between the compass-card and the sailing-chart; the two having evidently developed *pari passu*, as indicated, *e.g.*, by the similarity of colouring of the rhumbs in the two appliances. This parallel development must have had as its necessary preliminary the fastening of the movable card with its coloured rose upon the pivoted needle—a step which may quite possibly be credited to the unknown navigator of Amalfi (about 1300 A.D.), for whom the unfounded claim of the actual "invention" of the compass has often been made. According to Crescentio, the addition of the eight half-winds and the sixteen quarter-winds to the original eight was due to the people of Amalfi, and it is in any case certain that the compass with the pivoted card, marked with the thirty-two points, originated in Southern Italy at the end of the thirteenth century. The last section of the paper treats of the origin of the distinctive marks used on compass-cards—the initial letters of the principal winds; the star-symbol, black-dart, or fleur-de-lis for the north, and so on; and the different types to be distinguished according to the method of treatment. Although the fleur-de-lis is used to indicate the north in all modern compasses, Prof. Thompson is inclined to consider it as not, necessarily, an integral part of the compass-card, but to have been rather an embellishment of the rose on the sailing-charts. But in a postscript written after he had seen the work 'Der Compass,' brought out in 1911 by Herr Schück, of Hamburg (cf. *Journal*, vol. **40**, p. 347), he admits as worthy of consideration the latter's suggestion that the fleur-de-lis represents the form of the primitive floating compass—a lancet-shaped needle supported between two wooden floats. The paper bears evidence throughout of immense industry and acumen in the collection of the data, and gives copious references to the works of early writers bearing on the subject.

CORRESPONDENCE.

Cartographic Needs of Physical Geography.

Ordnance Survey Office, Southampton, March 22, 1915.

I DO not think that Mr. Carter's letter in the March number of the *Geographical Journal* should pass uncorrected. He talks of the "inferior printing, or shoddy paper, or absence of colour," of the Ordnance maps published at reduced rates

* It has been matter of discussion whether the lines were drawn before, or after, the substance of the map. The probability that the former was the case is strengthened by the existence, in the Society's collections, of an old parchment sheet, showing the lines only. Their colouring (black for the principal winds, green for the half-winds, and red for the quarter-winds) agrees with that most usually adopted in the sailing charts.

for schools. No one acquainted with the technical qualities of printing or paper would endorse Mr. Carter's complaint under those heads, and as to his complaint that maps in colour are not available for issue at cheap rates to schools, that only shows that he did not trouble to ascertain the facts of the case before he wrote. Maps in colour are available and have been available for some years.

You would remove any harm that may have been done by Mr. Carter's inaccurate remarks if you would print the attached table of prices, showing what maps can be obtained by schools at reduced prices. You will see that 200 copies of any sheet of the coloured edition of the 1-inch series of England and Wales can be obtained for 3*d.* per copy. I am not aware of any country where coloured official maps can be obtained by schools so cheaply.

C. F. CLOSE, Colonel,
Director-General Ordnance Survey.

	200 copies.			500 copies.			1000 copies.			5000 copies.		
ORDNANCE SURVEY MAPS.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
MAPS ON THE SCALE OF 1 INCH TO A MILE.												
"*A.*" *Outline edition.*												
Copies of sheet as published (18″ × 12″) ...	1	5	0	2	0	0	3	0	0	12	0	0
Copies of made-up sheets from two or more sheets as published, size up to 18″ × 12″	2	5	0	3	0	0	4	0	0	13	0	0
Copies of made-up sheets from two or more sheets as published, size up to 18″ × 24″	3	2	6	3	17	6	4	17	6	13	17	6
"*B.*" *Fully coloured edition with Hills* (England and Wales 27″ × 18″, Scotland 24″ × 18″).												
Copies of sheets as published (made-up sheets cannot be supplied)	2	10	0	4	0	0	7	3	0	32	0	0
MAPS ON THE SCALE OF 6 INCHES TO THE MILE.												
Copies of sheet as published (18″ × 12″)	1	5	0	2	0	0	3	0	0	12	0	0
Copies of made-up sheets from two or more sheets as published, size up to 18″ × 12″	2	5	0	3	0	0	4	0	0	13	0	0
Copies of made-up sheets from two or more sheets as published, size up to 18″ × 24″	3	2	0	3	17	6	4	17	6	13	17	6
MAPS ON THE SCALE OF 25 INCHES TO THE MILE.												
Copies of portion of sheet as published, not exceeding 25″ × 19″	1	10	0	2	5	0	3	5	0	12	5	0
Copies of whole sheet as published, size 25″ × 37½″	2	0	0	3	0	0	4	15	0	20	1	6
Copies of made-up sheet from two or more sheets as published, size 25″ × 19″ ...	3	2	6	3	17	6	4	17	6	13	17	6
Copies of made-up sheet from two or more sheets as published, size 25″ × 37½″ ...	4	0	0	5	0	0	6	15	0	22	2	6
GEOLOGICAL MAPS.												
Copies of sheet as published in Outline only for Hand Colouring, size up to 18″ × 12″ ...	2	4	0	3	8	0	5	2	6	20	17	6
Copies of sheet as published in Outline only for Hand Colouring, size up to 18″ × 24″ ...	2	8	6	3	18	0	6	5	0	26	17	6
Geological map of the British Islands: 25 miles to 1 inch.—Price 1*s.* coloured or 6*d.* uncoloured	In quantities of not less than 20 copies											
Geological map of Great Britain: 4 miles to 1 inch.—Price 1*s.* and 1*s.* 3*d.* per sheet, colour printed												
Geological map of Great Britain: 1 inch to 1 mile.—Price 9*d.* and 1*s.* 3*d.* per sheet, colour printed												

The Political Geography of Africa.

On page 283 of the *Geographical Journal* for April, 1915, Sir Harry Johnston is reported to have said in his lecture before the Society on February 27, "Belgium may exchange the inconvenient strip of Bangweulu territory and the right bank of the Semliki against better access to Lake Albert and the shores of Lake Kivu, the last named forcibly taken from the Congo State by Germany fifteen years ago." May I point out that this appears to have been spoken under a misapprehension? By an agreement now some years old, the eastern frontier of the Belgian Congo passes down the centre of Lake Albert, then along the Semliki, then along the Lamia, then to the highest point of Ruwenzori, then across Lake Edward, then up the Ishasha, then to the top of Mount Sabinio, then to a point near Ngoma, then down the middle of Lake Kivu in such a way as to leave the Kwichwe Islands to the Belgians. Maps have been published by the Governments concerned showing the frontier correctly. It is also correctly drawn in the excellent map attached to Major Jack's book 'On the Congo Frontier.'

In the interest of historical accuracy I must also point out that Lord Bryce's statement in his remarks made after the lecture, that "we largely owe our good slice of Ruwenzori" to the President's representations to the Foreign Office, may, taken by itself without further explanation, lead to some misapprehension and injustice. Those who worked for some years on the difficult negotiations which resulted in the settlement of the frontier in question were, however, aware of the present President's sympathetic interest in the matter, which was shown by an article in this *Journal* going in some detail into the physical considerations to be taken into account in any final settlement of the Uganda-Congo frontier.

C. F. Close.

Southampton, April 11, 1915.

Sir Harry Johnston writes:

"With regard to Colonel Close's observations, I must admit my oversight in not remembering that the arrangements made about five years ago at Brussels already admitted Belgium to the whole west coast of Lake Albert, and that consequently Great Britain has nothing further to concede in that direction; and moreover that, at the same time and place, Belgium regained for the Belgian Congo the western half of Lake Kivu, from which a Congo State garrison had been forcibly driven by the Germans in (I think) 1900. There are, however, other directions in which the protrusion of German East Africa has incommoded the tribal and other arrangements or developments of the Belgian Congo administration; and here, if we take possession of German East Africa, we might be able to offer modifications of frontier to the Belgian Government's advantage in return for equivalent rectifications of the British frontier elsewhere. But all such matters of readjustment must be mutually advantageous to be admissible; they are counsels of perfection which can well afford to be relegated to the years of peace which will follow the present struggle. Being asked, however, to discourse on the future of Africa—Africa after the war—I naturally alluded to frontier readjustments between the remaining African powers as events likely to take place, and requiring at our hands an ever-increasing application to physical and political geography, both in general and in detail. May I also add a correction on my own account. In my map illustrating Africa and Western Asia as they may appear—say—in 1917, Asia Minor remains coloured yellow, which may lead to confusion, in spite of the fact that in the colour index to the third map the colour yellow is assigned to Russia instead of to Germany, as in the first and second. On my original drawing the Asia Minor of the future was painted a neutral brown, so that I might not embarrass the Powers by designating its fate too clearly! But that fate will certainly not be German."

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1914–1915.

Eleventh Meeting, March 22, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*George B. Boyers; Lionel Archie Davey; Captain G. V. Dreyer, R.A.; S. Howland; Miss Gertrude Jackson; Frederick Henry Moore; Percy John Pack.*

The paper read was:—

"Spitsbergen in 1914." By Dr. W. S. Bruce and Dr. R. M. Rudmose-Brown.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Balkan Peninsula—Albania. **Baldacci.**

B.R.S.G. (*Rome*), *Ser. V.*, 3: 885-1910; 974-994.

Berat e il Tomor. By Antonio Baldacci. *Sketch-maps and Illustrations.*

Belgium. **Ensor.**

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Der versteinerte Wald zu Chemnitz. Von Leo Wehrli. (Neujahrsblatt herausgegeben vom Naturforschenden Gesellschaft in Zürich auf das Jahr 1915. 117 Stück.) Zürich: Beer & Cie., [1915]. Size 11½ × 9, pp. 18. *Illustrations.*

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Geologia dell' arcipelago di Malta. Alcune osservazioni su due note del Prof. C. de Stefani per Carmelo Rizzo.

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Russia—Finland—Hydrography. **Blomquist and Renquist.**
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On the Petrology of the Orijärvi Region in South-Western Finland. By Pentti Eskola. *Maps and Illustrations.*

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L'unité et les charactères ethnopsychiques des Jugoslaves. First part. By J. Cvijić. Nish, 1915. Size 12½ × 8, pp. 60. [In Servian.] *Map.*

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Distribution of Relative Humidity in England and Wales. By W. F. Stacey. *Maps.*

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The Place-names of England and Wales. By the Rev. James B. Johnston. London: John Murray, 1915. Size 9½ × 6, pp. vi. and 532. *Price* 15*s. net. Presented.*

United Kingdom—Rainfall. *Quart. J.R. Met. S.* **41** (1915): 1–44. **Mill and Salter.**

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This important memoir will be specially noticed.

United Kingdom—Scotland. **Day.**

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United Kingdom—Thames. **Smith and Dewey.**

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The High Terrace of the Thames: Report on Excavations made on behalf of the British Museum and H.M. Geological Survey in 1913. By Reginald A. Smith and Henry Dewey. *Illustrations.*

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Viaggio nell' Arabia di Nord-Est. By Barklay Raunkiaer.

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In the Lands of the Sun. Notes and memories of a tour in the East. By H.R.H. Prince William of Sweden. London: Eveleigh Nash, 1915. Size 9 × 5½, pp. xii. and 344. *Portrait and Illustrations. Price* 16*s. net. Presented.*

Central Asia—Filippi Expedition. **De Filippi.**

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La spedizione De Filippi nell' Asia Centrale. By Filippo de Filippi.

See reports in the *Journal* (vol. **43**, pp. 32, 672; **45**, p. 228).

French Indo-China—Red River. **Verdaguer.**

B. Economique Indochine, N.S. **17** (1914): 240–245.

Les crues du Fleuve Rouge (Déboisement et Inondations). Par A. Verdaguer.

Contests the views of M. Normandin (cf. *Journal*, April, p. 338), as to the slight effect of deforestation on the floods.

India—Assam. *J.R.S. Arts* **63** (1915): 289–303. **Dunbar.**

Tribes of the Brahmaputra valley. By Captain Sir George Duff Dunbar.

India—Burma—Earthquakes. **Brown.**

Mem. Geol. Survey India **42**, Pt. 1 (1914): ii. and 147.

The Burma Earthquakes of May, 1912. By J. Coggin Brown. *Map and Illustrations.*

India—Central Provinces. **Fermor.**
Mem. Geol. Survey India 41, Pt. 2 (1914): iii. and 148–245.
On the Geology and Coal Resources of Korea State, Central Provinces. By L. Leigh Fermor. *Maps and Illustrations.*

India—Himalayas. **Calciati**
B.R.S.G. (*Rome*), Ser. V. 3 (1914): 995–1014; 1076–1093.
Esplorazione delle valli Kondus e Hushee nel Karakoram sub-orientale. By Cesare Calciati. *Sketch-map and Illustrations.*
The writer was a member of the Piacenza expedition of 1913 to the Karakoram (see below).

India—Himalayas. **Piacenza.**
Esplorazione nei monti dell' Himalaya Occidentale. By Mario Piacenza. (Estr. 'Rivista Club Alpino Italiano,' vol. 33, N. 5, Anno 1914.) Turin, [1914]. Size 10 × 7, pp. 22. *Illustrations.*
On an Italian expedition in 1913 among the mountains of Kashmir.

India—Nepal. *J.R.S. Arts* 63 (1915): 237–247. **Elwes.**
Nepal. By Henry John Elwes.

India—Tinnevelly. *Records Botan. Survey of India* 6 (1914): 105–171. **Ramaswami.**
A Botanical Tour in the Tinnevelly Hills. By M. S. Ramaswami. *Map and Illustrations.*

Malay Archipelago—Java. *Asiatic Rev.* 6 (1915): 50–66. **Scheltema.**
In Java: the Valley of Death. By J. F. Scheltema.

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Aboriginal Siberia. A study in social anthropology. By M. A. Czaplicka. With a preface by R. R. Marett. Oxford: Clarendon Press, 1914. Size 9½ × 6, pp. xiv. and 374. *Sketch-maps and Illustrations. Price* 14*s. net. Presented.*

Siam—Rice. *B. Min. Affari Esteri* (1914): No. 18, pp. 12. **Bovo.**
La produzione l'industria e il commercio del riso nel Siam. Rapporto del Goffredo Bovo.

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Rerum Æthiopicarum scriptores occidentales inediti a sæculo xvi. ad xix., curante C. Beccari. Vol. 14: Relationes et epistolæ variorum, Pars Secunda, Liber unicus. Rome: C. de Luigi, 1914. Size 10½ × 7½, pp. xxxii. and 542. *Facsimiles. Price* 20*s.* 8*d.*

British East Africa—Economic. *J.R.S. Arts* 63 (1915): 209–220. **Leggett.**
The Economic Development of British East Africa and Uganda. By E. H. M. Leggett.

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Through Central Africa from East to West. By Cherry Kearton and James Barnes. London: Cassell & Co., 1915. Size 9½ × 7, pp. xviii. and 284. *Map and Illustrations. Price* 21*s. net. Presented.*

German East Africa—Economic. *B. Imperial I.* 12 (1914): 580–599. ——
The Economic Resources of the German Colonies.—1. German East Africa. *Sketch-map.*

Mozambique—Lourenço Marques. **Teixeira.**
Rep. S. African Assoc. Adv. Sc. 1913 (1914): 284–344.
Data for the study of the climate of Lourenço Marques. By A. de Almeida Teixeira. *Illustrations.* [In Portuguese and English.]

Somaliland—Mangrove swamps. **Béguinot.**
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Missione scientifica Stefanini-Paoli nella Somalia meridionale. Frutti e semi della formazione delle Mangrovie raccolti lungo la costa somala. By Augusto Béguinot. *Illustrations.*

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A historical geography of the British Dominions. Vol. 4. South Africa. Part II. History, to the Union of South Africa. By Sir Charles Lucas. Oxford: Clarendon Press, 1915. Size 7½ × 5, pp. viii. and 534. *Maps. Price* 6*s.* 6*d. Presented.*

South Africa—Swaziland. *T. Geol. S. South Africa* 17 (1915): 75–84. **Garrard.**

The Geology of the Swaziland Coal Field. By J. Jervis Garrard. *Sketch-map.*

Tripoli—Travel. *B.R.S.G.* (*Rome*), Ser. V., 3 (1914): 1155–1201. **Pasi.**

In Tripolitania colla carovana del Touring italiano. By Paolo Pasi. *Illustrations.*

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Canada—Ethnology. *Canada, Geol. Survey, Museum B.* 6 (1914): pp. 29. **Stefánsson.**

Prehistoric and Present Commerce among the Arctic Coast Eskimo. By V. Stefánsson. *Map.*

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Summary Report of the Geological Survey Department of Mines for the Calendar Year 1913. Ottawa, 1914. Size 10 × 6½, pp. viii. and 417. *Maps.*

Canada—Historical. *T.R.S. Canada*, Ser. III., 8 (1914): 183–192. **Burpee.**

Highways of the Fur Trade. By Laurence J. Burpee.

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The National Domain in Canada and its proper conservation. By Frank D. Adams. (Presidential Address.) *Map and Illustrations.*

Canada—Rocky Mountains. *Alpine J.* 28 (1914): 355–369. **Mumm.**

A trip up the Whirlpool River. By A. L. Mumm. *Illustrations.*

In the region of Mount Robson.

Canada—Vancouver Island—Historical. **Newcombe.**

The first circumnavigation of Vancouver Island. By Dr. C. F. Newcombe. Archives of British Columbia, Memoir No. 1. Victoria, B.C., Provincial Library, 1914. Size 10 × 6½, pp. 70. *Facsimiles. Presented.*

North America—Historical. **Hovgaard.**

The voyages of the Norsemen to America. By William Hovgaard. London: H. Milford, 1915. Size 10 × 6½, pp. xxii. and 304. *Map and Illustrations. Price* 17*s. net. Presented.*

United States—Immigration. **Ross.**

The Old World in the New. The significance of past and present immigration to the American people. By Dr. Edward Alsworth Ross. London: Fisher Unwin, 1914. Size 8½ × 5½, pp. 328. *Sketch-maps and Illustrations. Price* 10*s. net.*

United States—Texas—Historical. **McElroy.**

The winning of the Far West. A history of the regaining of Texas, of the Mexican War, and the Oregon question; and of the successive additions to the territory of the United States within the continent of America, 1829–1867. By Dr. Robert McNutt McElroy. London: Putnam's Sons, 1914. Size 9½ × 6, pp. x. and 384. *Maps and Illustrations. Price* 10*s.* 6*d. net. Presented.*

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Le provincie interne dell' Argentina. Rapporto del Tito Chiovenda.

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Commissão de Linhas Telegraphicas Estrategicas de Matto Grosso ao Amazonas. Relatorio apresentado á Directoria Geral dos Telegraphos e á Divisão Geral de Engenharia (G. 5) do Departamento da Guerra. Pelo Coronel Candido Mariano da Silva Rondon. 1° volume. Estudos e Reconhecimentos. Rio Janeiro, N.D. Size 12½ × 9, pp. 364. *Sketch-map and Illustrations.*

Brazil—Matto Grosso. **Comm. Linhas Telegraphicas (Rondon and others).**

Commissão de Linhas Telegraphicas Estrategicas de Matto Grosso ao Amazonas. Annexo I. Serviço Astronomico [2 parts]. Annexo II. Exploração do Rio

Jacy-Paraná, pelo Capt. Manoel Theophilo da Costa Pinheiro (pp. 82). Annexo III. Levantamento e Locação do trecho comprehendido entre os Rios Zolaharuiná (Burity) e Juruena. Pelo Emmanuel Silvestre do Amarante (pp. [50]). Annexo V. Historia Natural: Mineralogia e Geologia [2 parts]; Zoologia [4 parts]; Botanica [4 parts] with Atlas, part I.; Ethnographia, pelo coronel Candido da Silva Rondon (pp. 58). Annexo VI. Serviço Sanitario [2 parts]. Rio Janeiro, 1908–1914. Size 12½ × 9. *Maps, Diagrams, and Illustrations. Presented.*

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The Panama Canal, its Geographical Relations and Economic Uses. By F. T. Brentnall.

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Under the Southern Cross in South America. By William Buckman. New York: The Book Publishers' Press, 1914. Size 9½ × 6, pp. xviii. and 482. *Illustrations. Price* 10*s.* 6*d. Presented.*

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Australia—Anthropogeography. *Ymer*, 1914: 293–330. **Andersson.**

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A Study of the Influence of Volcanic Dust Veils on Climatic Variations. By Dr. Henryk Arctowski.

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The bearing of recent discoveries of early Tertiary shells, near Trinidad Island and in Brazil, on hypothetical land routes between South America and Africa. By C. J. Maury.

Kumatology. *Min. of P.I. Civil Engineers* 197 (1914): 233–242. **Gibson.**
The Formation of Standing Waves in an Open Stream. By A. H. Gibson. *Illustrations.*

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A Recording Current Meter for Deep Sea Work. By H. Pettersson. *Diagrams.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Economic—River control. **Corthell.**
Correct methods of creating and maintaining Channels at the mouths of Fluvial and Tidal Rivers, and at the Outlets of inclosed Tidal Areas. By Dr. Elmer L. Corthell. (Presented before Section D of the Amer. Assoc. for the Advancement of Science . . . 1914.) N.P., N.D. Size 9 × 6, pp. 12.

Economic—Tropical agriculture.
Proceedings of the Third International Congress of Tropical Agriculture. Held at the Imperial Institute, London, S.W., June 23 to 30, 1914. Including Abstracts of the Papers, supplied by the Authors and Reports of the Discussions. London: John Bale, Sons & Danielsson, 1914. Size 9½ × 6, pp. 407. *Price* 10*s. net.*

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Colquhoun. *United Empire, R. Colonial I.J.* 6 (N.S.) (1915): 99–108. **Colquhoun.**
Archibald Colquhoun: A Memoir. By Mrs. A. R. Colquhoun. *Portrait.*

Saussure. *B.R.S.G. (Rome), Ser. V.*, 3 (1914): 1259–1280. **Michieli.**
Gli studi geografici di Horace-Bénédict de Saussure. By Adriano Michieli. *Illustrations.*

GENERAL.

British Empire. **Lucas.**
The British Empire. Six lectures. By Sir Charles P. Lucas. London: Macmillan & Co., 1915. Size 7½ × 5, pp. 250. *Sketch-maps. Price* 2*s. net. Presented.*

British Empire—Text-book. **Herbertson and Thompson.**
The Oxford Geographies. A geography of the British Empire. By Prof. A. J. Herbertson and R. L. Thompson. 2nd edition. Oxford: Clarendon Press, 1915. Size 7½ × 5, pp. 256. *Sketch-maps. Price* 2*s.* 6*d. Presented.*

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Cambridge Handbooks for Teachers. General Editor, S. S. F. Fletcher. The teaching of geography. By B. C. Wallis. Cambridge: University Press, 1915. Size 8½ × 5½, pp. viii. and 222. *Sketch-maps, Diagrams and Illustrations. Price* 3*s.* 6*d. net. Presented.*

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By E. A. REEVES, *Map Curator*, R.G.S.

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Austria. **Galli.**
Pio Galli: Trentino e terre adiacenti. Scale 1: 200,000 or 1 inch to 3·15 stat. miles. Size 29 by 33 inches. Milan: Antonio Vallardi, [1915].

Shows railways, roads, and paths, and distinguishes their character by various symbols. Relief is indicated by brown shading. It is a useful general map of the southern Tyrol and neighbouring Italian Alps.

Austro-Italian Frontier. **De Agostini.**

La Regione Veneta e le Alpi Nostre dalle Fonti dell' Adige al Quarnaro. Carta etnico-linguistica pubblicata dall' Istituto Geografico De Agostini. Scale 1: 500,000 or 1 inch to 7·89 stat. miles. Size 25 by 27 inches. Novara: Istituto Geografico De Agostini, 1915.

This map extends from the southern Tyrol to a few miles south of the delta of the Po, and from Lago di Garda to Fiume. It shows, by means of colours, the distribution of predominant languages spoken, and in addition to the present political boundary of Italy gives, in dark brown, a line indicating what is considered the geographical boundary of the country.

British Isles—Salisbury Plain. **Bartholomew.**

The Survey Series of Touring Maps from the Ordnance Survey. By J. Bartholomew, F.R.G.S. Salisbury Plain District. Scale 1: 126,720 or 1 inch to 2 stat. miles. Size 26 by 30 inches. Edinburgh: John Bartholomew & Co., [1915]. *Price, mounted on cloth, 2s. net. Presented by the Publishers.*

This is a new edition. Relief is shown on the layer system in tints of green and brown at the following intervals in feet: 0 to 100, 100–200, 200–300, 300–400, 400–600, 600–800, and above 800.

British Isles—London. **E. Stanford, Ltd.**

A map showing proposed railways, tramways, and other schemes affecting London in connection with Bills where plans have been deposited in Parliament, Session 1914–15. Scale 1; 63,360 or 1 inch to 1 stat. mile. Size 20 by 19 inches. London: Edward Stanford, Ltd., 1915. *Price 2s.*

A new edition of a map which appears every year. The special information is clearly shown by colours and symbols on a black and white outline.

Europe. **Bacon.**

Bacon's New Picture Map of the Western War Area. Size 30 by 21 inches. London: G. W. Bacon & Co., Ltd., 1915. *Price 1s. net. Presented by the Publishers.*

A highly coloured sketch, more of the nature of a bird's-eye view than a map.

Europe. **Philip.**

Philips' Relief Model of Central Europe. Scale 1: 4,308,480 or 1 inch to 68 stat. miles. Size 9 by 16 inches. London: G. Philip & Son, Ltd., [1915]. *Price 4d. net. Presented by the Publishers.*

Although much smaller in scale, this is a great improvement as regards colouring on the Photo-Relief Model War Map previously published. It is reduced by photography from the same model as the other, but the relief is shown by shades of green and brown instead of black or very dark brown as before. In some parts the hill features are not so accurate as they might be, as for instance in the south of England, where there is no indication of the North and South Downs, but a confused mass of hills all over the district.

France. **Service Géographique de l'Armée, Paris.**

Carte des Chemins de Fer Français. Scale 1: 800,000 or 1 inch to 12·6 stat. miles. 4 sheets each 26 by 32 inches. Paris: Service Géographique de l'Armée, 1913.

Russian Empire. **Shokalsky.**

Carte Hypsometrique de l'Empire Russe. Essai de représentation du relief de l'Empire par J. de Schokalsky. Scale 1: 12,600,000 or 1 inch to 198·8 stat. miles. Size 18 by 27 inches. Petrograd: A. F. Marcks, [1915]. *Presented by General J. de Shokalsky.*

A map of the Russian Empire in Europe and Asia with portions of adjacent countries, with relief indicated by carefully selected tints of green and brown at the following contour intervals in metres: below sea-level, 0 to 200, 200–500, 500–1000, 1000–1500, 1500–2000, 2000–3000, 3000–4000, 4000–6000. No heights are given in figures on the map, but a table of some of the highest points of the empire is given as an inset. The scale upon which the map is drawn is somewhat small for such a vast area, especially in those districts that are at all properly surveyed, but the existing data vary considerably in reliability, and in some parts are necessarily very approximate. However, General de Shokalsky has evidently made good use of the material available, and with much care and skill produced a map that gives an

excellent idea of the general relief of the Russian Empire, and one that cannot fail to be of considerable service for general reference. The depths of water are shown in tints of blue increasing in intensity with the depth at contour intervals, in metres, as follows: 0 to 100, 100–200, 200–1000, 1000–2000. The names on the map are in Russian, but the title, table of altitude, and explanation of the colouring are in French.

Turkey. **Bacon.**

Map of the Dardanelles, Sea of Marmara, and Bosporus. Scale 1 : 443,520 or 1 inch to 7 stat. miles. Size 18 × 28 inches. London: G. W. Bacon & Co., Ltd., 1915. *Price 6d. Presented by the Publishers.*

A roughly executed map, showing roads, railways, ports and other information.

Turkey. **Johnston.**

War Map of the Dardanelles and Bosporus. Scale 1 : 370,240 or 1 inch to 9 stat. miles. Size 27 × 25 inches. Edinburgh and London: W. & A. K. Johnston, Ltd., [1915]. *Price 6d. net. Presented by the Publishers.*

A general map extending from Adrianople to the Black Sea, Bosporus, Sea of Marmora, and Dardanelles. Enlarged plans as insets are given of the Bosporus and Dardanelles forts; and there is also a small-scale general map of south-western Asia and north-eastern Africa.

Turkey. **E. Stanford, Ltd.**

The Dardanelles and the Troad. Scale 1 : 190,080 or 1 inch to 3 stat. miles. The Bosphorus and Constantinople. Scale 1 : 95,040 or 1 inch to 1·5 stat. miles. Two maps on one sheet, size 18 × 24 inches. London: Edward Stanford, Ltd., [1915]. *Price 3s.*

A new edition, with forts and batteries marked in red.

ASIA.

Japan. **Imperial Geological Survey of Japan.**

Topographical Map of Japan. Scale 1 : 200,000 or 1 inch to 3·1 stat. miles. Sheets: Mimmaya, Murakami. Tokyo: Imperial Geological Survey, 1914.

Each sheet includes 30′ of latitude and 1° of longitude. Water is in blue, and the land relief is well shown by dark brown contour-lines at intervals of 40 metres. The location of minerals and much other interesting detail is carefully indicated by symbols. The map is an excellent specimen of cartographical engraving.

Tibet. **Surveyor-General of India.**

Tibet and adjacent countries. Scale 1 : 2,500,000 or 1 inch to 39·457 stat. miles. Four sheets, each 17 by 23 inches. Published under the direction of Sir S. G. Burrard, K.C.S.I., R.E., F.R.S., Surveyor-General of India. Dehra Dun: Survey of India Offices, 1914. *Presented by the Surveyor-General of India.*

This map will be specially noticed in the *Geographical Journal.*

AFRICA.

Egyptian Sudan. **Survey Office, Khartoum.**

Africa. Scale 1 : 250,000 or 1 inch to 3·94 stat. miles. Anglo-Egyptian Sudan. Sheet 55-C, Kamlin. Size 18 by 27 inches. Compiled and zincographed at the Survey Office, Khartoum, 1914. *Price 10 P.T. each sheet. Presented by the Director of Surveys, Khartoum.*

This sheet extends from lat. 15° to 16° N., and from long. 33° to 34° 30′ E. A complete list of the route surveys and material used in the compilation is given in a note, and there is a commendably full reference to conventional signs and symbols employed. The sheet is in black and white only.

Eritrea. **Ministero delle Colonie, Rome.**

Carta schematica delle linee telegrafiche e telefoniche della Colonia Eritrea (Decembre 1914). Scale 1 : 1,500,000 or 1 inch to 23·6 stat. miles. Size 13 by 19 inches. Rome: Ministero delle Colonie, 1914. *Presented by the Ministro delle Colonie, Rome.*

Tripoli. **Ministero delle Colonie, Rome.**

Tripolitania: Servizio telegrafico e radiotelegrafico (Comunicazioni Elettriche ed Ottiche-Uffici Postali). Scale 1 : 1,500,000 or 1 inch to 23·6 stat. miles. Size 18 by 20 inches. Rome: Ministero delle Colonie, 1914. *Presented by the Ministero delle Colonie, Rome.*

Gives railways, telegraph and telephone lines and stations, wireless telegraphy stations, and other information connected with means of communication.

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1: 190,080 or 1 inch to 3 stat. miles. Sheets: 66, Medicine Hat, Alberta, 6th edit., August 1, 1914; 172, Fairford, Manitoba, 6th edit., June 1, 1914; 372, Minago, Manitoba, 1st edit., August 1, 1914; 422, Wekusko, Manitoba, 1st edit., August 1, 1914; 423, Sipiwesk, Manitoba, 1st edit., July 1, 1914.

AUSTRALASIA.

Victoria. **Geological Survey of Victoria.**

Geological Survey of Victoria. Scale 1: 31,680 or 2 inches to 1 stat. mile. Sheets: Talgarno; Wyeeboo. Melbourne: Geological Survey Office, 1915. *Presented by the Geological Survey of Victoria.*

Victoria. **Geological Survey of Victoria.**

Victoria, showing progress of Geological Survey. Compiled in the Geological Survey Office. Scale 1: 1,013,760 or 1 inch to 16 stat. miles. Size 24 by 33 inches. Melbourne: Geological Survey Office, 1913. *Presented by the Geological Survey of Victoria.*

Shows by various symbols in yellowish-brown detail surveys, quarter-sheets, goldfields, etc., published, and not yet published; rapid surveys, published and not yet published; sketch surveys published; sketch surveys, parish and county scales, unpublished; and areas not yet surveyed. The map accompanies the annual report of the Geological Survey for 1913.

WORLD.

World. **Philip.**

Philips' Pictorial Pocket Atlas and Gazetteer. 148 pages of maps, pictures, and statistical diagrams, with Gazetteer index of 18,000 names. Size 6 by 4 inches. London: George Philip & Son, Ltd., [1915]. *Price 1s. Presented by the Publishers.*

A small pocket atlas which appeared a few years ago, to which have now been added maps of the Western and Eastern war areas, three pages of military statistics, and other information connected with the war.

CHARTS.

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, April, 1915. London: Meteorological Office, 1915. *Price 6d. each. Presented by the Meteorological Office.*

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, March, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Central America. **U.S. Hydrographic Office.**

Pilot chart of the Central American Waters, March, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **Meteorological Office.**

Monthly Meteorological charts of the Indian Ocean, April, 1915. London: Meteorological Office, 1915. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, April, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, April, 1915. Washington: U.S. Hydrographic Office, 1915. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Mongolia. **Kent.**

Forty photographs of Mongolia, taken by A. S. Kent, 1914. *Presented by A. S. Kent, Esq.*

These are a very good set of photographs and extremely clear. They illustrate well the people and country. Some measure 6½ × 8½ inches, while others are 6½ × 4½ inches.

(1) Market place, Urga; (2 and 3) Temples, Urga; (4) Temple at Urga; (5) Mongol prison, Urga; (6) Boxes in which prisoners are kept, Urga; (7) Mongol soldiers, Urga; (8) Graves, Mai-mai-chêng, near Urga; (9) Official travelling cart, Urga; (10) Mongol types, women; (11) Mongol types, unmarried women; (12) Types, Mongol girls; (13) Mongol types, Urga, married women, showing head-dress; (14) Mongol types, men, officials; (15, 16, and 17) Ruins of tomb, seven days with camels from Urga; (18) Mongol well between Urga and Uliassutai; (19) Sain Shabi, between Urga and Uliassutai; (20) Sain Shabi; (21 and 22) Uliassutai; (23) Dolon dava, near Uliassutai; (24) Mongol relay station between Uliassutai and Kobdo; (25) River Kobdo, showing method of pulling dug-out across river; (26) River Kobdo, native dug-outs; (27) Main thoroughfare, Kobdo; (28) Ruins of Kobdo; (29) Sait Hural; (30) Fording Telgol; (31 and 32) Telgol, ferry made of water-reeds; (33) Mongol yurt; (34) Caravan; (35) Tibetan yak; (36) Mongol travelling tent; (37) Religious ceremony "Sawr," "burning a sin"; (38) Skulls and bones. This is a common sight, as the Mongols throw their dead to the dogs; (39) Praying-wheels and shrines with sacred inscriptions; (40) *Unnamed.*

Queensland.

Seven photographs of Queensland natives. *Presented by Captain Charles Slack.*

As may be judged from the titles, these form an interesting set. They measure 5¾ × 4¼ inches.

(1) King Yei-i-Nie, Cairns; (2) Queensland blacks in camp; (3) Queensland blacks and grass mimi; (4) Group of Queensland blacks; (5) Dillybag making; (6) Carrying piccaninny; (7) Tree climbing.

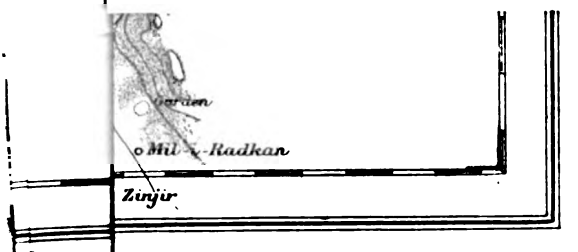
Tian Shan mountains. **Bury.**

Thirty-five photographs of the Tian Shan mountains, taken by Charles Howard Bury. *Presented by Charles Howard Bury, Esq.*

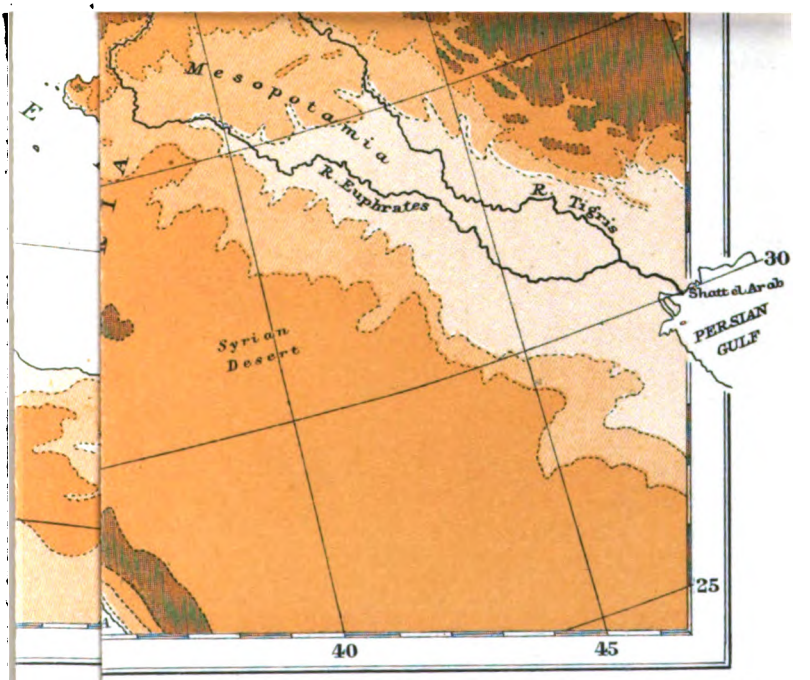
An excellent set of photographs taken during a recent shooting expedition. Sixteen measure 5 × 3 inches, seventeen 6½ × 4½ inches, while two are enlargements 11½ × 8¾ inches in size.

(1) Little Kustai; (2) *Picea Schrenkiana*, willow and mountain ash woods on northern slopes of Tian Shan; (3) Kazak yurts being set up; (4) Fir woods on northern slopes of Tian Shan, from 8,000–10,000 feet; (5) Alpes Ochak peak from the north, at a height of about 11,000 feet; (6) Sarytur Pass, 12,000 feet, on July 1; (7) Karagai Tash from the south; (8) Sources of the Koksu; (9) Su-Assu valley; (10) Su-Assu valley, middle Koksu, from about 10,000 feet; (11) Eastern Mustamas valley, August 7; (12) Western Mustamas valley, August 7; (13) Eastern Mustamas valley, 11,000 feet; (14) Western Mustamas valley, about 11,000 feet; (15) Western Mustamas valley in upper Koksu, height about 11,000 feet; (16) Alpes Ochak valley in lower Koksu; (17) Peaks between Mustamas and Kair Bulak valleys, from a height of about 12,500 feet; (18) Camp in Koksu valley (7000 feet), looking up Alpes Ochak valley; (19) Akbulak Lake, showing low level of water; (20) Akbulak Lake (height nearly 11,000 feet); (21) View from near Karagai Tash (11,000 feet) across Koksu valley to central chain and watershed of Tian Shan; (22) Curious growth in lower Sarytur (about 9000 feet); (23) Karagai Tash from edge of Yulduz plains; (24) Karagai Tash from the east; (25) Cantilever bridge over Tekes River; (26) Akbulak Lake; (27) view looking south across Akbulak Lake; (28) Akbulak Lake; (29) View in Akbulak valley (about 8000 feet); (30) Flowery meadows at 10,000 feet in Big Kustai; (31) Mustamas valley in upper Koksu (height about 10,000 feet); (32) Kair Bulak valley, upper Koksu; (33) View up Kair Bulak valley in upper Koksu. *Enlargements:* (34) Akbulak Lake and snowy peaks on central watershed of Tian Shan Mountains, from about 12,100 feet; (35) Akbulak pass from the north-east, taken from about 12,200 feet in September.

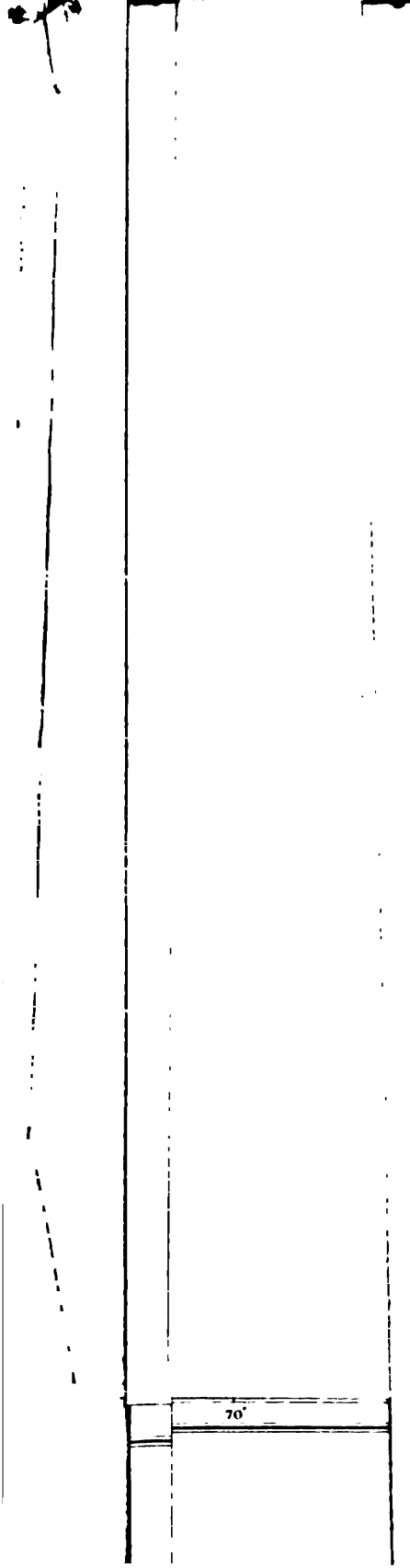
N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor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



PERSIA.
SYKES.



EUROPE
Vaughan Cornish.



The

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GEOGRAPHY OF THE WAR THEATRE IN THE NEAR EAST.*

By D. G. HOGARTH, M.A.

The most obvious geographical facts to be remarked about the present war with Turkey are the immense distances which divide the four areas of operation, and the extraordinary imperfection of their inter-communications. Taking the four as (1) North-Westernmost Asia Minor with South-Easternmost Thrace; (2) North-Easternmost Asia Minor; (3) Southernmost Syria; (4) Shatt el-Arab region, we note at a glance that each area lies, in round figures, about 1000 miles from all the rest. Since one of them, the first, includes the capital, it follows that on three fronts Turkey is fighting a thousand miles or more from the heart of her imperial life. This fact constitutes a disadvantage all the more serious, because, while the Ottoman Empire is singularly ill-equipped with an arterial system, it is more dependent on its heart than, perhaps, any other in the world. That is to say, it is the most centralized both by its theoretic scheme and in its practical working. Why, then, is the heart placed where it is—in one extremity of an area, which, though defective in population (under thirty to the square mile), is spatially among the half-dozen most extensive continuous territories on the globe, which are political units?

In part, Constantinople, as a capital, is a political survival. The Ottoman Empire began its history as a European Empire. Though the Osmanlis coalesced into a State first in Asia—in the extreme north-western corner be it remarked, and almost within sight of Constantinople—they turned their eyes and energies to Europe, transferred their centre of gravity at once to the Balkans, and had conquered an empire there long before they thought of one in Asia. They aimed at the succession to the heritage of Byzantium; and this, in the fourteenth and

* Royal Geographical Society, April 26, 1915. For list of maps see p. 471.

fifteenth centuries, had ceased to include any considerable territory in Asia. When they crowned their efforts by the capture of the Byzantine capital in 1453, this, naturally and inevitably, became their capital.

Later on, in the sixteenth and seventeenth centuries, after an Asiatic Empire, made up in the main of the fragments of the Seljukian and the Saracenic empires, had been added by the Osmanlis to their Byzantine heritage, the capital still proved to be in the most convenient position imaginable. If not quite in the centre geographically, it occupied a point of equipoise between very evenly balanced divisions. For the ratio of political and economic importance to spatial extent was much higher in the European part of the empire than the Asiatic; and, moreover, the Turks still hoped to increase their holding in the former.

Now all is changed. The European Empire has vanished bit by bit; the Asiatic alone remains maintaining a last outpost in Europe. Constantinople has become virtually a frontier city, situated on the fringe of an alien continent, in a remote angle of its empire.

Just, however, for the very reason that their empire began as a European one, as direct heir by conquest of the empire of Byzantium which the Osmanlis called the Empire of Rum (it was itself the heir of Rome), they cannot withdraw their capital to any more convenient geographical spot in what is left to them of empire. For with the prestige of Roman emperors they conquered that empire, and by the prestige of their continued occupation of Eastern Rome they have held it. A Turkish monarch retired to Brusa, Konia, Aleppo, or Baghdad would command no higher place in the imagination and tradition of Asia than once was commanded by the infant Osmanli state, by the Seljuk sultanate, by the Saracenic kingdom, or by the unreal empire of the Abbasids. He would be, in fact, just another Sultan in a continent where sultans swarm.

Nor even could this peril be neglected, would the Ottoman Turks themselves regard security in Asia as any sort of compensation for the loss of an uneasy seat in Europe. Their religion is Arabian, their speech of the Oxus, their social system Central Asiatic, and they owe most of their ideas of government to China and Persia. But these things do not outweigh the fact that they began their imperial existence in the most Europeanized part of Asia, by attaching to themselves the Europeanized peoples of the homelands of Byzantium, and with the single ambition not to be as Seljuks, but to take up the Roman lordship of Europe, and be Europeans. Their Asiatic origin and its inevitable consequences are a weight round their neck which they have been always wishful, but never capable, of detaching. They might have succeeded had they ever found any one to Europeanize their religion; but, unfortunately for them, the one people capable of that feat, the Greek, had already given itself to another Asiatic religion, and was committed to the result of its work, before ever Mohammed appeared in Arabia. Their failure mattered much less in the early centuries of Ottoman Empire, while Central and

Northern Europe had yet to develop consciousness of continental distinction, and were inferior in military and political organization to the Islamic powers of West Asia. But in these latter centuries, when the relation has come to be emphatically reversed, Turkey, standing almost where she was in the sixteenth century, finds, in the twentieth, her imperial capital in a strange world: for, by force of circumstances, not by design, she has become primarily an Asiatic power.

Moreover, it was with men of European birth and Christian origin that she won her empire, held it, and administered it. It is not too much to say that throughout her great imperial age, the sixteenth and early seventeenth centuries, no man of Turkish origin and Moslem birth, outside the royal family itself, was among the leaders of her army or imperial administration. Her generals and ruling officials had all been taken as children from Christian parents in Europe, made imperial slaves for life, and educated as Moslems in the arts of war and government with a thoroughness not dreamed of by Plato. Their offspring, because Moslem born, were barred from succession to the fathers' functions equally with all men of the Turkish race, and had to be content with either religious or non-official life, while new Christian and European children were being recruited, converted, and trained to succeed to the military and civil power. It was one of the most extraordinary systems in all history, and it, and no other, was responsible for the institution of an Ottoman Empire in two continents.

Bit by bit, however, in the seventeenth century it began to break down. Europe grew too strong to allow recruiting of children beyond the strict frontiers of the Ottoman territories which had been drained of their Christian manhood, and the vast body of the Moslem-born, resenting exclusion from the profits and glory of the ruling class, dared to assert itself and gradually obtained the place of power. The Empire declined at an ever-increasing rate as its ruling *personnel* became more and more Asiatic. Men of Albanian, Vlach, Greek, or Slavonic blood on the male side, and a constant infusion of Caucasian vigour from the female side, have delayed the decadence; but it has been continuous and has quickened in the last two generations, which have seen uncontaminated Asiatics—Syrians, Arabs, Kurds—preferred to high office in ever increasing numbers. But despite all this, the desire and ambition of the Turk remains what it was—to be Turkish European and recognized as such, in spite of the Asiatic clog. That is the aim of the Committee of Union and Progress, and the lead in the attempt to realize it has fallen, appropriately enough, in these latter days to Enver, who is reported to be in part Slav.

This is, I know, not strictly geography; but I offer it to explain on the one hand a geographical fact which has great influence on the actual political and military situation, and, on the other, the recent action of the Turks in joining the Teutonic alliance, rather than either our group or no European group at all. Passionately desiring, while remaining Turks

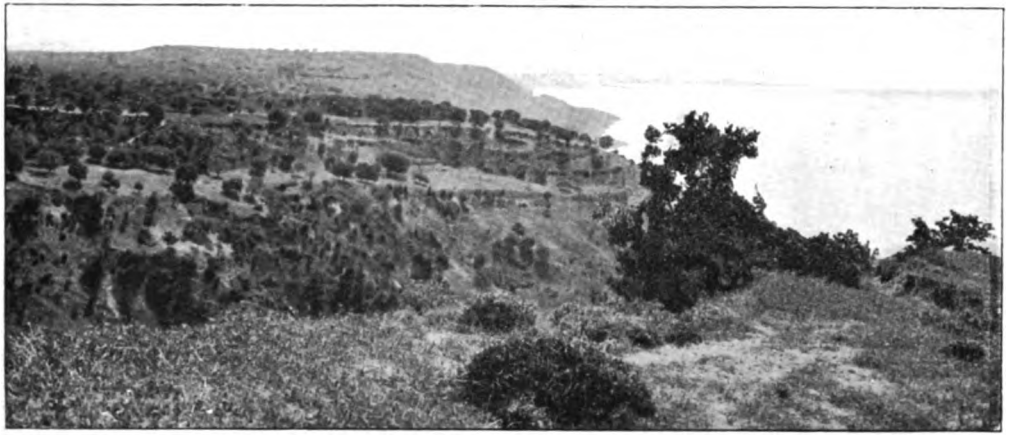
and sovereign, to be accepted into the European comity, they have realized that from the German federation alone they can hope for sympathy and help in their desire, and that the moment of German necessity is the moment to make a supreme effort to obtain it. They do not feel themselves an oriental power, desirous to lead Asia against Europe, or Islam against Christendom, but occidentals, ready to ally themselves with whomsoever of the Christian nations is the most likely to accept them into the comity of Europe. With this paramount object they have entered on the present struggle, cost what it may.

(1) That the Turks have been able to retain their frontier capital in another continent than that in which nine-tenths of their empire lie is due to certain political considerations, but, first and last, to the peculiar geographical environment of Constantinople. Here we have a city situated on the southern extremity of a peninsula, whose landward part is all rough hill country, rising northwards to an isthmus, and there falling steeply almost to sea-level again. A continuous wall of broken shaggy slopes faces Europe, approaching at either end so nearly to sea (at the southern end, to a marine lagoon) that it can hardly be turned without command of that element. This wall, of course, carries the now famous Lines of Chatalja. Its strength has been increased by deliberate policy, which has converted the lands both behind and before into almost uninhabited forest.

A further geographical fact must be noticed. At the northern extremity of this wall the hill-system bends up the coast-line, while southward it develops its highest and most broken relief towards the Black Sea. This high level continues right to the mouth of the Bosphorus, falls steep-to, and again springs up steeply on the further Asiatic shore. That fact will, perhaps, explain why no attempt has ever yet been made to rush Constantinople by landing forces on her Black Sea coast. I need not insist further on the strength of the Chatalja Lines. No one has forgotten how they stopped the victorious Bulgarian army, though defended by only the broken remnants of the first-line army and by emergency levies of second-line troops. They were passed, of course, by the Russians in the Ottoman debacle of 1878; but the forcing of them against any determined defence, and without command of the sea, must always be terribly costly.

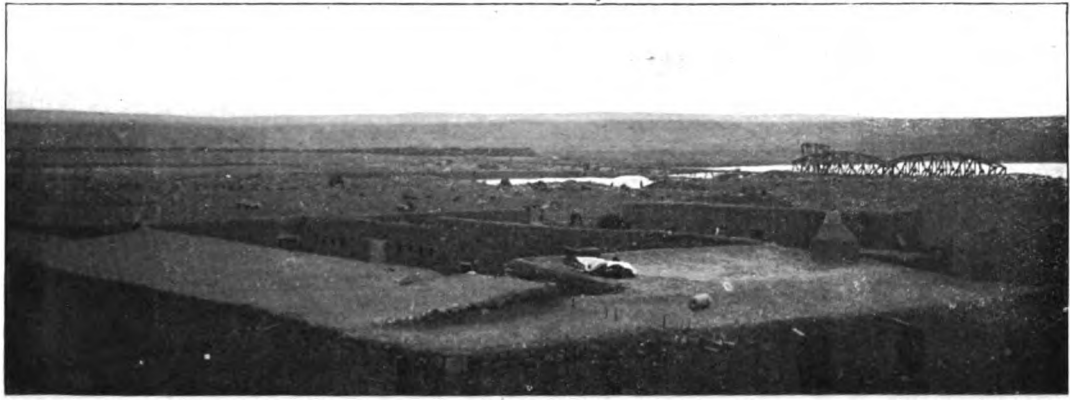
The unique geographical difficulties of the sea-approaches are even more notorious. Whether you attack from the Black Sea or the Mediterranean, a narrow channel must be threaded, in the one case nearly 20 miles long, in the other nearly 50. The shorter channel has been made more difficult by nature, the longer more difficult by military art. The course of the Bosphorus is the more tortuous of the two, and its shores are higher on the average, and steeper. It is, in fact, a chain of blind defiles, which have never been forced in modern times, and the single natural condition which still makes attack through them easier than through the Dardanelles

DARDANELLES: THE NARROWS FROM ERENKEUI.



DARDANELLES: ASIATIC SHORE NEAR ERENKEUI.

TYPICAL CHALK COUNTRY IN THE NORTH DESERT OF SINAI.



EUPHRATES RAILWAY BRIDGE IN SPRING, 1914, WITH TWO SPANS IN POSITION, SEEN FROM THE WEST WALL OF CARCHEMISH. BRITISH MUSEUM'S EXCAVATION HOUSE IN THE FOREGROUND.

is the generally favourable direction of the main current. We have reason to know that this has acquired new importance in our day of floating mines.

As for the Dardanelles, its best-known geographical peculiarities are the main current varying in strength according to the width of the passage and the season, but always setting from north-east, and the plague of etesian north-east winds. These have not the same importance now that they had before the invention of steam. But they are not by any means without importance as we have learned within the last few weeks; for it is they that in concert render so effective the defence of the Dardanelles by mines, while the boisterous climatic conditions, caused by the draught from the steppes and the Black Sea being drawn south-westwards and concentrated between the high relief on either hand, have hampered seriously our naval operations. The shore lines of the Dardanelles are, in contrast to those of the Bosphorus, remarkably straight and little indented on either side, and their general direction remains uniform throughout, except for the famous rectangular kink at the Narrows. But the contrary coasts differ considerably in other respects. The Asiatic is, throughout, easy and open, while the European is steep-to, high and rugged for the first half of the passage from the west, offering no good landing-place provided with easy road into the interior of the peninsula till the upper end of the Narrows is reached. All the western end of the Gallipoli peninsula, indeed, is of broken, hilly character, which combines with lack of water and consequent lack of population and roads to render it an unfavourable area for military operations. No general, if he had the choice, would land a considerable force upon it at any spot below the Narrows. On the Asiatic side landing is everywhere easy, and the littoral is open up to the point where the Marmora begins to spread out its waters, closely framed by hills on the south. But, of course, one must reckon with the main hinterland of Asia Minor behind this littoral. It rises soon into the mountainous groups of Ida and the Mysian Olympus, and, from it, if left in hostile hands, a force landed on the Trojan coast would run risks not to be feared on the Gallipoli peninsula.

The command of this *hinterland*, the north-western corner of Asia Minor, one supposed to be the ulterior object of the operations which were begun in the Gulf of Smyrna a good many weeks ago. But whether such, indeed, was and is their object, I know no more than the most ignorant person present, and I will only say this on the matter from a geographical point of view. There is a direct route from Smyrna by way of Manisa and Soma to the Sea of Marmora. Its easiest line is now traversed by a railway, debouching at Panderma immediately to the east of the Cyzicene peninsula. It is obvious that whoever holds this line, about 210 miles in length, can turn the Asiatic defence of the Dardanelles. To hold it securely, however, would probably entail holding also all the land to west of it. This would be a big operation. This corner of Asia Minor, as a whole, though mountainous in its north-western parts, is

easily penetrated, well inhabited, well watered and fertile. Its western coast is largely in the hands of Greeks (even after the measures taken a year ago to chase them out of the Phokia and Menemen district), and the interior in the hands of an agricultural population which includes many settlements of refugees from the lost Balkan provinces of Turkey. In any case, unless this corner of Asia Minor is held, a layman finds it difficult to believe that the Asiatic shore of the Dardanelles can be secured; or, further, that without a firm hold of the latter, as well as of the Gallipoli peninsula, a fleet can either force a passage to the Marmora, or safeguard its communications when that is accomplished.

The Dardanelles have only once been passed in modern times against active opposition. That was in 1807 in the days of sailing ships. Our fleet then arrived off Constantinople, but in so battered a condition as to be practically powerless to achieve its ultimate object. If the difficulties of beating up against current and wind will not trouble our present attacking fleet, relatively greater difficulties confront it in the waterway from the power and mobility of modern fortress artillery and the dangers from fixed and floating mines and torpedoes launched from tubes ashore. The importance, therefore, of land forces, sufficient to deal with 200,000 good soldiers under German leaders, cannot be over-estimated.

(2) So much for the first and principal theatre of the war. The second lies roughly 1000 miles to the east, and its lines of communication with the first are so lengthy, arduous and ill-equipped that one wonders if the Ottoman armies, which are now operating in the highland region north-east, east and south-east of Erzerum, do, in fact, receive any effective support from the capital of the Empire. It must be remembered, however, that the Turks have more than once maintained a stout struggle for a considerable time against Russia in this same remote region, though never with final success, and that their communications have never been better than they are to-day.

They are, however, very bad at their best. By land, the railway goes no farther than Angora, from which point it is about 500 miles march to Erzerum. The road is a highway of very ancient commerce, which follows the main direction of the relief of northern Asia Minor and meets no very serious difficulties. But it is so long and toilsome that, in times of peace, the sea route to Trebizond has been preferred, since it shortens the land journey to less than 200 miles. These 200 miles, however, are very hard work. The road crosses three main ridges of the Pontic Alps, rising each time over 5000 feet to fall again, and once up to a maximum height of over 8000 feet. Snow-bound nearly half the year, and notorious for the icy gales which sweep its passes, this road is as arduous a line of communication as could well be conceived. It is more than twenty years since I traversed it, but I have not forgotten! How far conditions in the Black Sea at present permit of any steamer service being maintained between Constantinople and Trebizond I do not know.

Erzerum itself lies in a wide upland plain through which the infant Euphrates flows. Elevated over 6000 feet above sea-level, it endures a nine months' winter and is famed as the "Siberia of Turkey." Thence, to the actual scenes of fighting, intervene further stretches of about 100 miles. Lofty passes through the Alpine group, of which Ararat is the culmination, a region of sub-arctic winter climate, with scant population and supplies, where active operations are hardly possible except in late spring, summer and early autumn, have to be crossed. But these passes are in Turkish territory, the frontier having been drawn not on the main water-parting, but some distance east of it. Thus the Ottoman forces were able to penetrate at the first some distance into the lower country on the Russian side, in both parts of this area of operations. I do not know any part of this region at first hand, and am not competent to enlighten you on these operations; but I have an impression that their general object was rather to divert and occupy Russian attention, than to threaten serious invasion. The northern Ottoman column following the Aras valley has pushed into and raided the plateau between Olti and Kars, with an ostensible objective in Kars itself, which commands the Tiflis road. Diverging to the left towards the Black Sea east of the Lazi Alps, they have, apparently, also made demonstrations towards Batum. The southern forces did the same for the plains of Erivan and Echmiadzin and the Persian district of Khoi, from which Russian communications with Tabriz can be threatened. The sudden and now half-forgotten dash forward along this line, which resulted in a momentary occupation of Tabriz itself, probably had a political rather than a military object.

(3) Between the second and third areas the wild mountain land of Kurdistan intervenes and no line of communication at all worth consideration exists. We must hark back to the first area and set out afresh. The communications of the capital with both the remaining areas of war, the third (Sinaitic), and the fourth (Shatt el-Arab), are easier than with the second. The Baghdad railway serves as a trunk line towards both as far as Aleppo; but it is not a continuous line. There are two serious interruptions of the track, where it meets first the Taurus, second the Amanus mountains. Neither of these ranges has yet been pierced. In the first several of the necessary tunnels have not even been begun; and all traffic between rail-head on the north slope and rail-head on the south slope must pass by road over a crest 8000 feet high. A finely engineered and constructed *chaussée*, practicable for the transport of artillery, serves as the link, and can be traversed by light mounted parties in about 10 hours.

The railway serves again in Cilicia, but breaks off once more at the foot of Mount Amanus, which it reaches at two points, near Osmanieh by the main line, and at Alexandretta by a branch. The tunnel, which is to traverse this range, has been driven more than half through; but, for

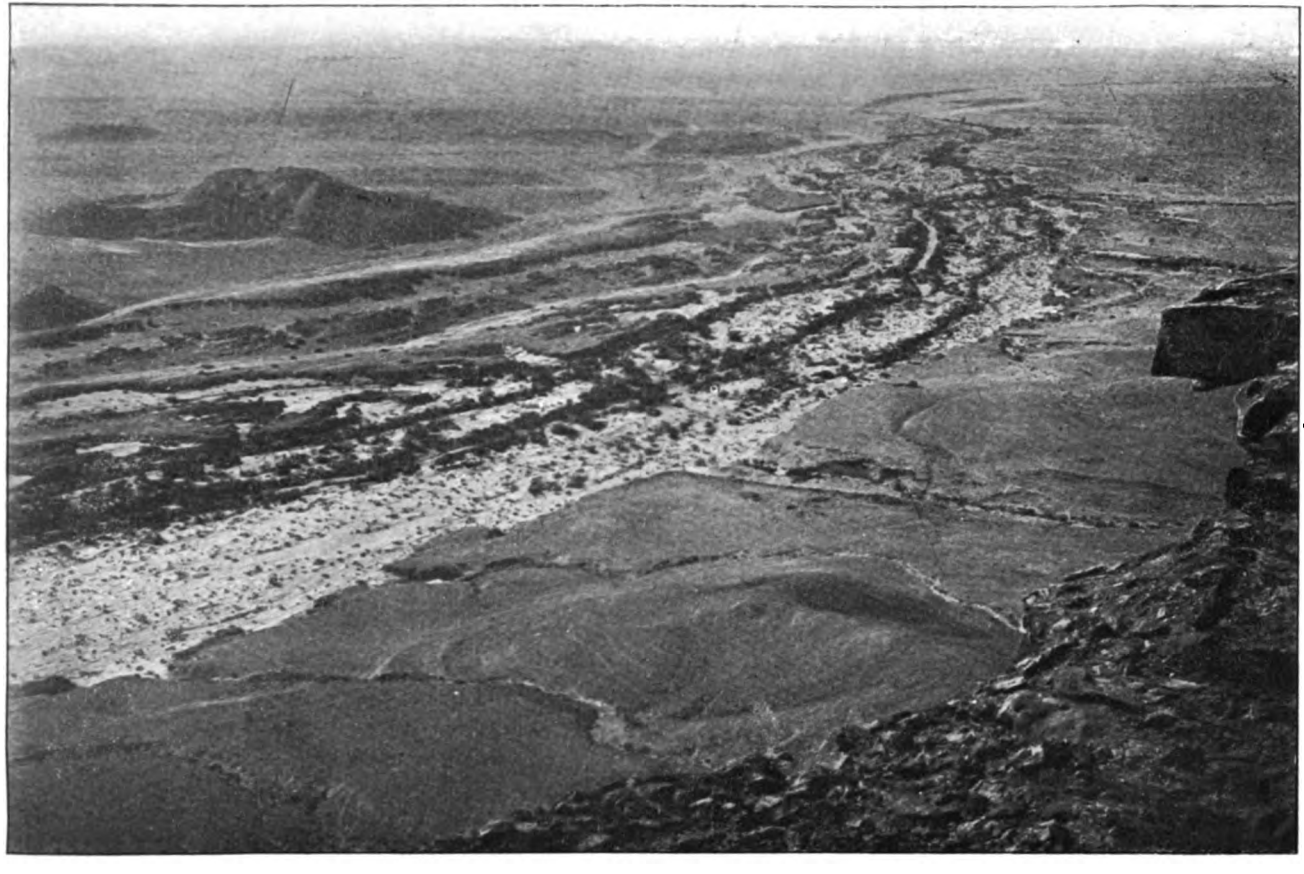
purposes of actual communication, is, of course, as useless as if not begun. Nor can it be completed within any likely term of this war; for the borers have struck two of the hardest known rocks, quartz and porphyry, in the heart of the mountain, and their daily progress at best has, for a long time, been measured by inches. Road traction, therefore, has had to be resorted to once more, chiefly by the Hassan Beyli track which the German engineers have improved into a fine *chaussée*, to meet their Syrian rail-head above Raju; but also by the better known Beilan road from Alexandretta, which does not, however, hit the Syrian section of the Baghdad railway until more than half of the way inland to Aleppo has been traversed. By both of these roads the Turks have been forwarding men, stores and munitions, and hauling big guns. An Englishman who saw them dealing with the latter on the Hassan Beyli road reports that, under German direction, they were doing their work remarkably well.

From Aleppo, or rather from Muslamieh, a village some ten miles to the north of the city, the main line bears away north-eastwards for the Euphrates. A branch, however, connects with the French-built railway which runs south from Aleppo to Damascus and on without break of rails (though with variation of gauge from Rayak) to the Hejaz line. By this a base can be reached at Maan within 200 miles of the Suez Canal; but these 200 miles lie almost entirely through desert which, at first, is of a very hilly character.

The campaign in the third area is not being prosecuted by the Turks with much energy as yet for various reasons. They cannot spare troops from the first two areas, and the army of 50,000 men or so which they have collected and kept in Syria is drawn largely from their Arab-speaking subjects, who fight half-heartedly, if they fight at all, in any Ottoman quarrel. Syria is disaffected from one end to the other, and the Turks fear for their line of communication. I need, therefore, deal only summarily with the geographical conditions of the actual ground over which Ottoman armies must advance to strike at Cairo.

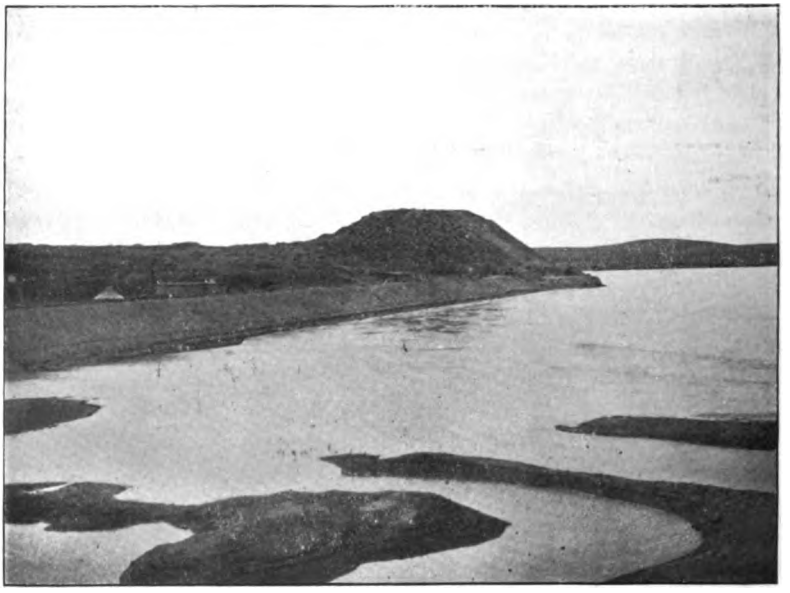
The Desert Belt between Palestine and Egypt, though a formidable obstacle, is not prohibitive, and least so in the interval between the late autumn rains (November), and the following June. During this time there is usually abundant, though brackish, water to be found at little depth along the first two-thirds of the course of the coast road, and sufficient, though at greater depths, along inland tracks. After a wet autumn and early winter, such as have occurred this season, the supply is enough for considerable forces.

(*a*) The coast track from Gaza *viâ* el-Arish is not a desert road except for the last third of its course, when it has left the littoral and struck south of the saline marshes to Kantara on the Canal. It is level throughout, and even near el-Arish, where the main track runs awhile along the beach, parallel progress is possible, and water can be got, in sandy palm groves which extend some dozen miles inland. Since the sea does



THE OLD ROAD FROM HEBRON TO EGYPT, THE DARB EL-SHUR, WHERE IT TURNS WEST UNDER JEBEL MUSHRAG, NEAR MUWEILLEH.

BASRA CREEK.



FROM THE EUPHRATES BRIDGE LOOKING NORTH. THE BAGHDAD RAILWAY REVETMENT, BELOW THE CITADEL OF CARCHEMISH, AT LOW WATER.

not admit of any boat not of light draught approaching within some miles of the beach, an army could pass along out of reach of any but the largest modern naval guns. Since, however, the track is soft in its central stretch, and can be cut quickly by landing parties from the sea, it has not commended itself to the Turks. They seem to have used the desert tracks for all their raids up to date.

(*b*) Desert tracks supplied with rare watering-places run from Beersheba, Hebron, and Maan, uniting at Muweilleh or Nakhl, and making for the canal at Kantara, or points south of it. The tracks from Maan, where the Hejaz railway serves the base, have rather too hilly a country to cross in their eastern part for rails to be laid along them quickly or cheaply; but rails could be laid from Beersheba easily enough, and between Kantara and the southern end of the Bitter Lakes access to the canal is open. Near Suez it is more difficult but not impossible. The Desert of Zin, through which all these paths pass, is a rolling limestone country, in great part chalk and flint, naked of any vegetation at all, except desert scrub after rain, and containing hardly any oases, and these mere wady-bottoms. By using Syrian levies, accustomed to traverse desert and steppe country, the Turks have succeeded, however, in advancing over these tracks, but, so far, with small forces only, and few guns. Nor have the troops on arrival within striking distance been, apparently, in good fighting trim. In short, unless a railway can be laid over about two-thirds of the way, it is probable that the immemorial difficulties of desert transit will restrict attacks by these paths to mere skirmishing raids.

Although, as has been truly said, the north Sinaitic desert has never saved Egypt from attack, the front of Egypt itself is harder to force now than it has been before. In the first place, the great moat of the Suez canal defends it from sea to sea; in the second, the Egyptian system of railways gives great advantage to the defence of the one narrow gate by which alone the eastern Delta can be readily penetrated. This is the gate forced by Sir Garnet Wolseley in 1882 at Tell el-Kebir. To the south lies broken sandy desert without any water; to the north marshland, intersected by old canals and arms of the Nile, and soon passing into vast stretches of sea-lagoon, which are all the more impassable for being shallow. An army which had come through the Wilderness of Zin and passed the Canal, would still have very serious difficulties to overcome if the Delta were held against it in force.

(4) Between this area and the fourth, the Shatt el-Arab, stretches the Nefud of North Arabia, and desert conditions are prolonged so far north of this by the Syrian Hamad that no body of troops of any size could be passed from one area to the other, except by way of Aleppo, where, a short time ago, we left the direct line of communication between the fourth area and the capital. Picking up the Baghdad railway at Muslamieh, we proceeded north-east to the Euphrates at Djerabis. The great river has to be crossed on a steel bridge of many spans. I do not know

whether all these are yet in place.* They were to have been so by February last, but certain damage which was done by last year's spring flood, and the disturbance of labour by the outbreak of the war, may have delayed completion. In any case, however, trains can pass slowly over the wooden bridge completed two years ago to further the construction of the other. On the farther side the rails had been laid to Tell Abiad, in the neighbourhood of Harran, and the line was open for traffic by the beginning of last summer; and thence, as far as Ras el-Ain, the earthwork had also been done. I have heard that the rails have since been laid on this last section. If so, half Mesopotamia can now be crossed by the locomotive.

Thus the road-traction as far as Mosul is limited to less than 200 miles over easy, hard desert. From that point the Tigris waterway can be used, by raft as far as Tekrit or Baghdad, and by steamer or large sailing boat thence to a base within much less than a hundred miles of the scenes of operations at Kurna, at Ahwaz, and near Basra. Long, broken, and toilsome as this route of communication is, the Turks have brought up a good deal of heavy artillery by it, and, by one way or another, have managed to collect and supply an army of more than 50,000 regular troops, swelled by a considerable but varying auxiliary force of Kurd and Arab irregulars.

There are some special geographical difficulties governing our operations in this area. We are confined to the immediate neighbourhood of the great waterways of the Shatt el-Arab and the Karun, in a deltaic region. Their shallow valleys are flooded at this time of year by the melting of mountain snows, while at short distances on either hand, desert or marsh conditions prevail. Both the deserts and the marshes are ranged or inhabited by powerful tribes. Our communications, therefore, have to be our main solicitude, and while the floods last, they must be very difficult to safeguard. The tribes on the left bank of the Shatt and up the lower course of the Karun are, like all marsh Arabs, of ill repute. The great and warlike Muntefik tribe on the right bank demands very decisive success on our part all along the line before throwing in its lot with our occupation.

Add to these difficulties a soft mud bar at the mouth of the Shatt, which does not admit, without great difficulty, warships of greater draught than light gunboats; the fact that steamers cannot ascend the Karun above the rock bar of Ahwaz; the pestilential climate of a deltaic region, situated in the hottest part of the globe; the winding, sand-embanked character of the lower Tigris; the choked state of the lower Euphrates; and the marshy nature of the land which extends between their channels for a considerable distance above their confluence. The conditions are certainly not favourable to active

* Since the above was in type, the bridge has been reported complete.

operations beyond the points already attained by our forces, so long as a decisive blow has not been struck at the heart of the Ottoman empire and the defending forces are adequately supplied. Least of all should an advance on Baghdad, which lies nearly 600 miles by river from the Persian Gulf, be expected.

Such is a summary statement of the geographical conditions under which Turkey is now waging war. When one remembers that she is barred from all her own waters, except those between the Dardanelles and the Bosphorus, and has to maintain all communications by thousand-mile land routes, very imperfectly served by either railways or military roads, one cannot but wonder both at her hardihood in undertaking war and the degree of efficiency with which she has prosecuted it so far. Her economic condition is one of sheer bankruptcy; she cannot repair in her arsenals and navy-yards a tenth of her waste, and something like half her not large population cannot or must not, for one reason or another, be used to fight her battles. *E pur si muove!* It has often been said that the thing in which a Turk is least behind the standard of his time is the art of making war, and the one condition in which he feels at home is a state of war. He is giving the world rather a striking illustration of the truth of both assertions at the present moment.

The PRESIDENT (before the paper): I am not going through the form of introducing Mr. Hogarth to this audience. We all know him and remember the admirable lecture he gave us on the Balkan Peninsula and the distribution of its peoples only a year ago. We know Mr. Hogarth as an archæologist, an explorer, and an author. He has described himself in the title of one of his books as 'A Wandering Scholar,' in another as 'An Antiquarian' who has met with accidents. I hope we may hear of some of these accidents in his paper to-night, but his main purpose will be to describe the geographical conditions which are likely to affect the war which is now raging and the peace that may follow it. I will ask Mr. Hogarth to read his paper.

Sir EDWIN PEARS (after the paper): It is probable that I am the last man in the present audience who was in Constantinople; I left it on December 9. In reference to what we have heard from Mr. Hogarth in his very valuable and delightfully delivered lecture about the behaviour of the Turks towards British subjects and the treatment of their property, my experience entirely agrees with his. Two days ago I received a letter by "underground post" from Constantinople in which my correspondent said: "As to your house at Prinkipo," in which my library is, and which contains a number of objects that are valuable to me, "I am happy to inform you that not a thing has been touched; it has been carefully respected by the Turks." My only fear is lest the Germans should disturb it. There has been no complaint whatever of the conduct of the Turks to any British subject in Constantinople itself. That they have behaved well is the simple truth which I gather from letters and from at least a hundred refugees known to me in London or its neighbourhood. Amongst other capacities the Turk has a long memory for benefits received. He remembers we fought for Turkey during the Crimean war, though he cannot understand how it is we have allied ourselves with the Russians. The same testimony comes also from Smyrna. We, who are British subjects and who have resided in Turkey, have no fear for the conduct of the Turks. I have,

therefore, pleasure in testifying to the correctness of what Mr. Hogarth has said on this point.

I want to express the satisfaction with which I have listened to Mr. Hogarth's admirable lecture. I do not agree on two or three minor points which do not affect the body of his argument. For example, he made the statement that I have seen over and over again in the London newspapers, that the current is always running from north-east to south-west both in the Bosphorus and the Dardanelles. This is incorrect. I myself could give you many instances from my own experience in illustration. On one occasion I had to go from Constantinople to a village halfway up the Bosphorus. I found that a south wind was blowing, and as soon as we got into mid-stream, the caiqueji made himself comfortable, and our boat flew up the Bosphorus at the rate of 4 or 5 miles an hour—directly in the opposite direction from that which we have been told by newspapers that the current always flows. The same thing happens, though at not so great a speed, in the Dardanelles itself. I know every mile of the Dardanelles from personal experience. It has been my lot as a lawyer for forty years out there to have to deal with certainly not less than from seventy to one hundred collisions or strandings in the Dardanelles or immediate neighbourhood, so that you would have some difficulty in puzzling me as to the depth of water and topography of the hills in these straits or in the Bosphorus. But I repeat this is only a slight mistake that does not affect the substance of the paper. When Mr. Hogarth spoke of the bad roads leading along the central tableland (always bear in mind that the centre of Asia Minor is a tableland rising from 2500 feet on the west up to 6200 at Erzerum), and when he recalled the difficulties of the roads beyond the last station on the railway at Angora, and spoke about their being practically impassable, I can only add that I found it so last June. I had gone up in that month to deliver the Commencement Address of the Marsovan College. When I had accomplished that part of my task, I proposed to make the return journey from Marsovan to Angora, but I was told that I could not possibly reach Angora under a fortnight—a distance not more than 120 miles. There is just one other remark. I know something of the history of Turkey, and I can hardly admit that the Turks from the first fixed on the north-west corner of Asia Minor. I remember that you have the Seljukian Turks in the tenth century; that in the eleventh century they were in full force when the First Crusade commenced; that the first obstacle which they encountered was at Nicæa, the "City of the Creed," which was then (in 1096) in the possession of the Seljuks; and that these Turks had been a powerful nation around Konia for a century earlier at least. The idea of the Ottoman Turks two centuries later was to absorb the smaller groups who were in the country. They accomplished this task, and then they gradually extended themselves to the north drawn by the magnet of the fame of ancient Rome. I can only say that like everybody here, we all hope that the Dardanelles is soon going to be forced. It is a very tough job, but we all believe it is going to be done. I think I may say, in conclusion, that I do not consider the Turk regards his possible departure from Constantinople in quite the same light as has been represented by our lecturer. They discussed four weeks ago the question where the archives should be carried to in case the Dardanelles were forced. The three places suggested were Brusa, Eskischeir, and Adrianople, Eskischeir being at the head of the ascent to the tableland and upwards of 2000 feet above the sea-level. Enver Pasha, who may be regarded as the strong man in the military party, the one who conspired with the Germans to rush Turkey into the war, was favourable to going to Adrianople, but he met with a unanimous refusal on the part of the other ministers, because the belief of every Turk is that as they came from Asia to Asia they will return. I myself think it is quite possible that the place from whence they came may really

be said to be the plains around Konia. The history of Turkey suggests a reversal of the process of their conquest. The year 1683 may be taken as the zenith of Turkish conquest. Up to that time the Turkish Empire had been steadily growing. Remember what a big empire it was. The Turks had not merely been occupied with the north-west corner of Asia Minor. They had Egypt; every other country on the north shore of Africa; the whole of the south of Russia; nearly the whole of what is now Austria. If you were to make a series of maps beginning with one in 1683, and let each one be thirty years later, you would find a steady diminution of territory down to the present time, and I think many in this room will live to see Turkey left out of Europe altogether. In that case I do not think Turkey will be very much disappointed. She will take it easily, and I do not believe there are many, even of the Young Turkey Party, who have ideal aspirations which centre about Constantinople itself. We have all enjoyed a charming lecture, and, if it were not out of place, it would be pleasant to dwell upon its lucidity, comprehensiveness, and firm grasp of the subject.

Sir Henry Babington Smith: Mr. Hogarth's interesting paper offered many points of absorbing interest, but the impression that is most strongly left upon my mind is the extraordinary difficulty of carrying on a war in four theatres, three of them divided from the centre by an enormous distance, without command of the sea. Mr. Hogarth pointed out the huge difficulties attending the supply, from Constantinople, of an army near the Suez Canal. On the other hand, the power which has the command of the sea chooses Egypt as a convenient base for the attack upon the Dardanelles—precisely the same distance in the reverse direction.

Whatever may be the decision in the three remote theatres of war, there can be no doubt that the capital operation is that in the central theatre which touches Constantinople. That is the district with which I have most personal familiarity. Mr. Hogarth did not touch on the question of the cartography of Turkey, to which he has himself contributed a good deal. But there is one interesting point as regards the cartography of the country immediately around Constantinople. There is a good map of that particular bit of country, produced from his own personal surveys by General von der Goltz in the late eighties and early nineties, when he was attached to the Turkish army. In his preface von der Goltz describes the difficulties under which he had carried out his surveys. He says he had to do it on Fridays and Sundays, and under some opposition from the Turkish authorities themselves; but he was continually driven forward "by the thought of what the world would say if some day or other there should be fighting in the neighbourhood of Constantinople, and if the want should then be felt of a thoroughly good map for the use of the garrison of Constantinople, while at the same time it could be said that an officer of the Prussian General Staff had been attached to that garrison for a period of ten years." Von der Goltz is now in command of the first Turkish army, and his map will no doubt be of use to the garrison—and to their assailants—if there should be fighting in the immediate neighbourhood of Constantinople.

Whether there will be fighting there depends upon many things, and I imagine on one factor in particular—whether a landing is effected from the north on the coasts near the Bosphorus. Mr. Hogarth treated that operation as a very difficult one, and indeed rather out of the question, partly because it had never been attempted before. But the conditions are not the same as in previous times, and if it be the case that the Russians have now command of the Black Sea, it would not be very surprising to find that operation attempted. Mr. Hogarth regarded the lie of the country as offering very great obstacles to a landing. I rather doubt if that is the case. The coast consists of low cliffs with a sandy beach, hard and good

going. It very much resembles in its general features the coast of Norfolk in the neighbourhood of Cromer and Sheringham: there are cliffs varying in height, with a sandy beach, harder than the Norfolk beach, below them. I remember riding along it some years ago almost exactly at this time of year, in a strong bitter north wind, with showers of hail and sleet all the time. It was not very inviting then, but from the point of view of landing I doubt if it offers very serious difficulties. It is true that the watershed of the country between that and the Marmora lies very close to the Black Sea, and therefore the ascent is somewhat more rapid on that side. But the height is not great; the hills rise in some parts to as much as 800 feet, but, generally speaking, not above 500, and in many places the slopes are not steep. It is rough, scrubby country, but a force that had once effected its landing and made good its position would not be met with very serious obstacles in the way of hills to surmount. As regards the Bosphorus, it is perhaps the case that the military preparations for resisting penetration there are not so formidable as in the Dardanelles; but the fortifications are strong all the same, and although they are confined to the northern third or possibly half of the Bosphorus, still they would present a formidable obstacle to a purely naval attack.

On the wider questions dealt with it is too late now for me to speak, even if I were competent to do so; but I would venture not entirely to agree with Mr. Hogarth as regards the motive which has led the Turks to throw in their lot with Germany and Austria rather than with the Triple Entente. The desire to be recognized as part of the European comity of nations may be one motive which weighs with them to some extent; but I think there were more solid motives of what they consider to be the interest of the Turkish Empire which weighed with them in taking that decision, so far as it was a voluntary decision.

The PRESIDENT: At this relatively late hour I must not invite any more of our Fellows to take part in this discussion, and I shall confine myself to one or two points only before asking Mr. Hogarth to reply to the questions that have been raised.

In the first place, we speak of the way in which Turkey has turned. Mr. Hogarth reminded us of the fact that the Turks have, at no time, succeeded in governing themselves; they have rather gone to others, like the Italian cities which took a governor from outside. They have found their governors among alien races, in Greeks, Armenians, and latterly Jews. May it not be the fact that the average Turk throughout Turkey still retains that affection for England and that disposition to receive an Englishman with greater hospitality than any other foreigner which he certainly had fifty years ago, and I believe has had up to the last few years? It appears to me, that in discussing the conduct of Turkey at the present moment, we should separate the Turkish nation and the governing classes. With regard to the four scenes of operations, the only region I know, and that mainly from a bird's-eye view, is the Armenian region. That country, though always a difficult country, is one the difficulty of which is enormously increased by winter. In the summer and autumn months, when the snow is melted off the hills, I do not think that Armenia would prove an exceptionally difficult country to campaign in. The ridges are high, but the plains between them are also 5000 to 6000 feet above sea-level, and the passes dividing these plains involve ascents of 2000 or 3000 feet, or often less. I have overlooked this region from the slopes of Ararat. One sees thence mountains lying about in great isolated blocks, with plains lying between them. I should imagine that, if the Russians can put sufficient forces in the field, they may win a considerable amount of territory there before next autumn.

Perhaps the most important, in some respects, of all the regions dealt with

to-night, was Mesopotamia. It raises the most difficult problems. The division of Persia, which was made a few years ago, was made with a very natural caution on our part, but it has left, as caution often does, a situation full of difficulties. Russia took half Persia under her protection; we, afraid probably of adding to the burdens of India, took a little corner, and left two-thirds of the other half to remain a sort of debateable or No-man's Land. What will be done with this region when peace comes is likely to be a difficult question. It cannot permanently remain a No-man's Land (we get a considerable amount of oil for our Navy from it), while there are, no doubt, great objections to throwing upon India the extra burden of a province at the head of the Persian Gulf. I have heard a suggestion that we should reconstitute two ancient Turkish Governments. We might have a Sultan of Baghdad, reigning under our protection, and a Sultan in Asia Minor. Lastly, what we have heard of the Baghdad railroad shows how far-reaching German policy was; how through the alliance with Turkey Germany hoped to stretch a great belt, to place a barrier right across the two continents, and thus separate the Western Powers from India, and hold Russia back from the Mediterranean. I will not keep the Meeting any longer, but will ask Mr. Hogarth to reply to any questions that he wishes to answer. At the same time, I must thank him on your behalf for the very great deal of information he has given us in his extremely lucid and compendious lecture.

Mr. HOGARTH: I must thank you for the patience with which you have listened to a rather rapid discourse ranging over several widely separated areas. The summary nature of the treatment imposed upon me by the subject must be my excuse for the unqualified statement about the currents in the Bosphorus and Dardanelles, to which Sir E. Pears has taken exception. I was not unaware either of the existence of eddies setting back against the main streams on both banks, or of the temporary effect of occasional south winds. But if one is to make a short general statement about the currents, it must be, I submit, the one I have made. I did not say—or did not mean to say—that the Angora-Erzerum road was "impassable," but only that it was very long and toilsome. With regard to Sir H. B. Smith's objection to my views about the difficulties of attacking Constantinople from the coast north of the Bosphorus, I admit that the actual shore presents no great impediment; but if he admits, for his part, that the watershed rises steeply at a short distance behind it to heights of 500 to 800 feet, he seems to me to support my main contention; for, if this war has taught us anything, it has taught us that quite small hills, if stoutly defended, are still terrible obstacles. How long have the moderate heights of the Carpathians and the Vosges been in dispute? The more general questions about the origin of the Ottoman State and the present aims of those in power in Turkey, I will not try to argue further at this hour. I do not read the history of the relations of the Seljuks and the Osmanlis quite as Sir E. Pears does; nor do I think that, whatever be the readiness of the "man in the street" at Constantinople to retire to Asia, his view is shared by Enver Pasha. But these are matters rather of opinion, and I recognize to the full the right of such authorities as Sir E. Pears and Sir H. B. Smith to differ from the views I hold.*

* The following maps may be referred to:—

Turkey in Asia as a whole.—R.G.S. Map of East Turkey in Asia, scale 1 : 2,000,000, 1912, and R. Kiepert, *Karte von Kleinasien*, scale 1 : 400,000, 1901–1914. *Dardanelles and Bosphorus.*—Admiralty Charts Nos. 2429 and 1198. War Office Map of Turkey, scale 1 : 250,000, Constantinople and Gallipoli sheets. *Armenian War Area.*—Lynch and Oswald's Map, scale 1 : 1,000,000 (Stanford), 1901, revised 1915. *Persian Gulf.*—Survey of India, Southern Asia Series, scale 1 : 2,000,000, Southern Persia sheet.

GEOGRAPHY OF BRITISH FISHERIES.*

By Professor J. STANLEY GARDINER, F.R.S.†

FISHING, next to agriculture, is the greatest of British industries, judged by the number of men engaged, the amount of capital invested, and the importance of the product to the food of the people. It is an industry which has its risks, but it breeds a race of healthy men. The forces of nature teach self-reliance, and it is this quality which causes fishermen to be the least fostered class of the nation, yet perhaps the most valuable. The fishing community is little recruited from outside, and it can never be adequately replaced. It is prolific, and three-quarters of its excess population enter the navy and merchant service. Its men possess an hereditary instinct for the sea, and the war is surely demonstrating the fact that the value of such men is as great even in this age of mechanics as in the times of Drake and Nelson.

The wholesale value of fish landed in our ports is about 15 million pounds for about 25 million cwts. To this must be added upwards of 2½ million cwts. imports of fresh fish and about 1,400,000 cwts. of canned and cured fish, largely canned sardines, salmon, and lobsters. Further, many foreign fishing boats habitually discharge their cargoes in our ports, particularly at Aberdeen. About 1½ million cwts. of fresh fish are exported, together with 9½ million cwts. of cured or salted herring, cod, mackerel, pilchards, and haddocks. The number of first-class steam fishing boats is upwards of 3000, and of all first and second class fishing boats about 10,000; to these must be added a vast number of small longshore craft and boats employed in the various shellfish industries. The total number of whole-time fishermen is upwards of 125,000, while there are as many half-timers. Taking the whole industry, fishermen, curers, distributing agents, etc., it may be estimated that it gives support to one-twentieth of the population, while the capital sum directly invested must be about 200 million pounds.

The industry is pursued in both fresh and salt waters. Salmon and eels are caught in fresh waters, but they are of little value in the food of the people; they are interesting on account of their long migrations, the salmon being a fresh-water fish which fattens in the sea, and the eel a salt-water fish which fattens in fresh water. Rather landsmen than fishermen, to some degree redeemed by their summer yachting, are the purveyors of oysters, cockles, mussels, and periwinkles, luxuries suitable to all classes since the days of Rome. Of these oysters are cultivated to only a slight degree compared with the almost illimitable possibilities of our numerous creeks and estuaries, but the rest are merely collected

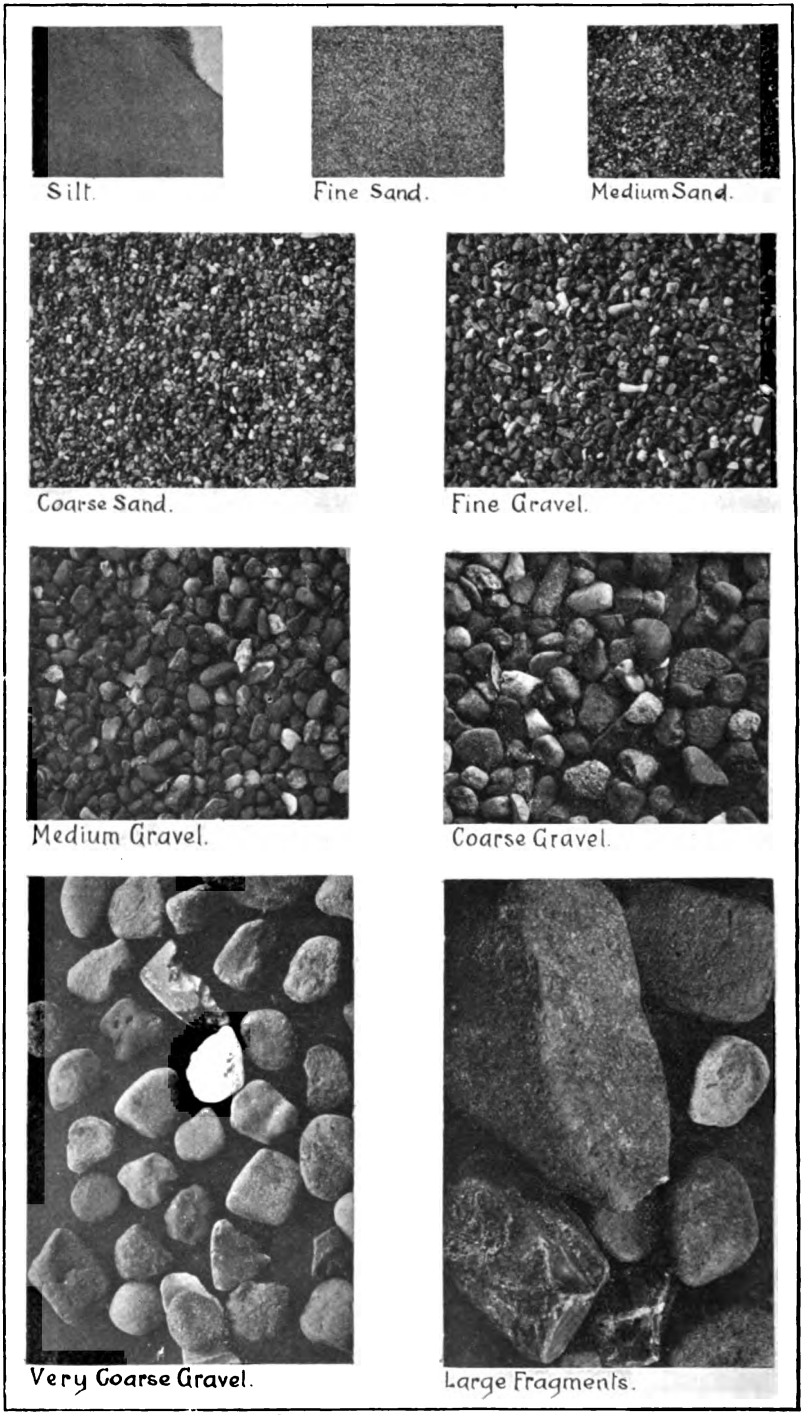
* Royal Geographical Society, March 8, 1915. Map, p. 552.

† I have to thank the Board of Agriculture and Fisheries for the photos of the bottom deposits of the North Sea; Prof. W. A. Herdman for those of the floating life of the sea; and Mr. I. S. Doeg for those of Aberdeen.

HERRING BOATS, ABERDEEN.

ABERDEEN FISH MARKET.

ABERDEEN FISH WHARF.



FEATURES OF THE BOTTOM DEPOSITS OF THE NORTH SEA, × 2/3.

where they have happened to grow. Lobstermen and crabbers daily put down their pots, at times shooting their seines or drift nets, when shoals of herring, mackerel, or pilchards appear in their bays. Then come the "longshoremen," true fishermen, sailing small craft, using trawls, seines, and drift nets, never going far from our coasts, seldom out of sight of land, but at times undertaking voyages of 100 miles or more in the search for particular fish, for which there are local dealers. These men, the small-holders of the fishing community, owners of their own boats and gear, are of great social importance, but the food value of the fish caught by them and all these classes is so inconsiderable that they must be neglected here.

The deep-sea industry as it now exists alone concerns us; its evolution not at all. It requires good harbourage, abundant docks, and large markets, with excellent communications. It is a considerable factor, in most the chief, in such ports as Aberdeen, Grimsby, Hull, Yarmouth, Lowestoft, Milford, Fleetwood, and North Shields, the first five and Billingsgate each with landings of over a million hundredweights a year. The reasons for the development of these ports and for the great concentrations therein implied are purely geographical, proximity or convenient access to particular fishing grounds and to markets, application of steam, and the opening up of new fishing grounds.

TABLE OF FISHING GROUNDS.*

No.	Regions.	Area in square miles.	Scotch and English demersal fish in cwts., 1913.	All countries. All fish in cwts., 1910.	Principal demersal fish by weight.
I.	White Sea ...	128,917	148,539	762,193	Plaice, cod, haddock.
II.	Coast of Norway	29,648	6,119	8,289,888	Cod, coalfish, haddock.
IV.	North Sea ...	129,804	5,413,222	21,942,160	Haddock, cod, plaice.
V.	North of Scotland	18,096	1,119,643	2,483,208	Cod, coalfish, haddock.
VI.	West of Scotland	82,099			
VII.	Iceland	36,608	3,169,153	4,185,218	Cod, haddock, halibut.
VIII.	Faroes	4,949		690,461	Cod, haddock, coalfish
IX.	Rockall	3,430	56,496	94,846	Cod, skate, halibut.
X.	West of Ireland	9,066	148,833	88,672	Hake, haddock, ling.
XI.	South of Ireland	50,416	623,194	1,354,518	Hake, skate, megrim.
XII.	Irish Sea ...	15,743	225,934		
XIII.	Bristol Channel	8,613	118,757	1,220,740	Skate, plaice, whiting.
XIV.	English Channel	25,238	193,242		
XV.	West of France	25,422	14,505	45,043	Hake, skate, sole.
XVI.	North of Spain ...	5,464			
XVII.	Coast of Portugal	9,997	55,340	79,588	Hake, skate, sole.
XVIII.	Coast of Morocco	10,499			
	Mixed grounds ...		273,046	274,093	

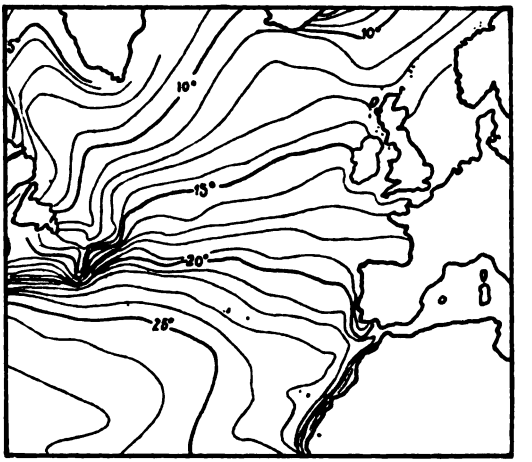
* This table is founded on the English, Scotch, and International returns. France and Portugal are not included. French returns show about 2½ million cwts. from the same regions, and the Portuguese fishery is worth about £1,300,000 annually, half being for sardines; tunny and anchovies appear in these returns. There are no Spanish returns. The numbers I., II., etc., refer to the map on p. 552.

Fishing a century ago was almost a coastal industry, while now it is pursued from the White Sea (Barents Sea) and Iceland to beyond Mogador, through over 3500 miles and 45 degrees of latitude. It covers all grounds of the continental shelf of Western Europe and Iceland even down to 300 fathoms; toll is also taken from all neighbouring banks which rise to within the 100-fathom line, the South Faröe, Rockall, and Porcupine. The grounds, as divided for statistical purposes, and their extent, together with our catch of bottom-living (demersal) fish from each, and the total catch of all countries, including all fish, are given in the preceding table. Off Spain, Portugal, and Morocco they form narrow fringes to the land, and the existence of our fisheries there *depends on* 3 miles being retained as the limit of territorial waters. The Baltic Sea is not fished by us, and the Norwegian coasts but little, while from the rest of the ground our trawlers take the chief toll of demersal fish.

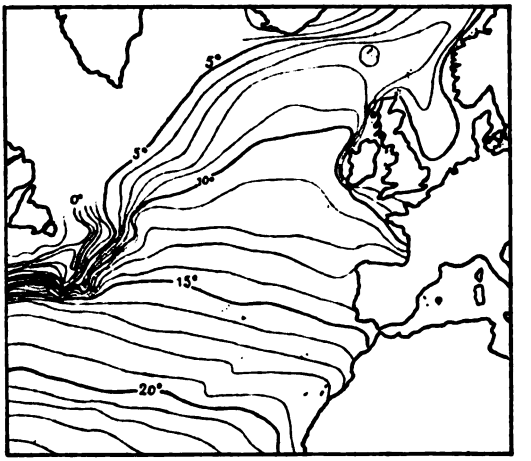
This is as much as need be said here as to the topography, which is excellently shown in the Admiralty charts. What more especially concerns us are the habits of the fishes, their growth and reproduction, in so far as they are affected by the physical conditions of the waters in which they live. As to man correlation with environment is now possible, since we know his physiology, his habits, and his food. Of fish we know little—some of their movements and what is actually found in the stomachs of caught specimens; in addition, most food fishes pass through in development a whole series of forms, each of which as much requires its special environment and food as the tadpole of a frog. It is, however, this correlation of habits with physical conditions that is essentially the geography of living animals; not that topographical distribution (too often termed "geographical distribution") which depends on the geological periods in the evolutions of different species and on our knowledge of subsequent changes in topography. Not only have the adult fish to be considered, but also their eggs, their larval stages, and the eggs, young and adults of all the lower animals and plants on which they feed —a truly herculean task.

It is obvious that there must be great diversity in the hydrography of such widespread fishing-grounds, some of which are oceanic and others partly enclosed seas. All are affected by the Gulf Stream, the perpetual contention of which with the East Greenland current and with Arctic ice needs no description. It induces currents in the partly enclosed waters round our coasts, of which those in the North Sea swirl down its west side, cross by the south, and thence pass in front of Holland to the Skagerrack. These currents merit particular attention, for the eggs and (or) young of practically all our food fishes are passively distributed by their agencies. Fish spawn at regular seasons and generally in the same neighbourhoods year after year, and it is necessary that their young should be widely and evenly spread over grounds suitable for their further growth. Those which fail to reach, or are carried beyond, such

grounds perish, while insufficient dispersal must mean the destruction of vast numbers by starvation. Currents fluctuate considerably from year to year, and undoubtedly the success or failure of any year's brood largely depends on these fluctuations, though this is probably less the case in the relatively homogeneous North Sea than in any other region.



SURFACE TEMPERATURE, NORTH ATLANTIC OCEAN, AUGUST.

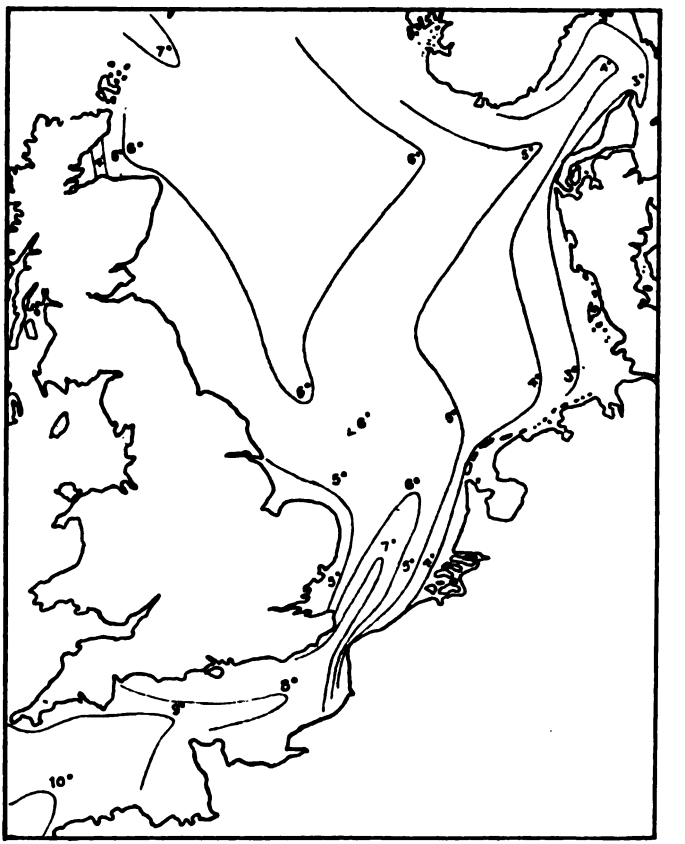


SURFACE TEMPERATURE, NORTH ATLANTIC OCEAN, FEBRUARY.

Fortunately each topographically separated area has its own spawning grounds, and unfavourable conditions in one generally mean favourable conditions in another. Thus statistics may show no alterations of total catch in the year when the young should reach maturity, though fish from other areas have not by migration filled up the vacant grounds.

Adult fish are not carried by currents, and, indeed, when resting or feeding, tend to move against their direction of flow, such movements producing better respiration and meeting the stream of food.

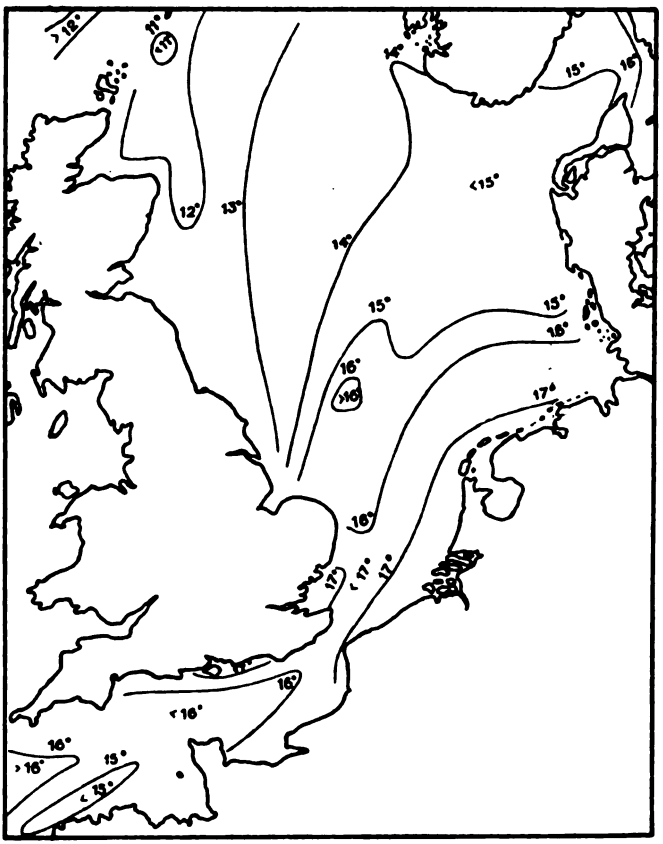
Currents mean changes in the temperature and salinity of the sea-water, and their real movements are best ascertained practically by the thermometer and chemical analysis. In deep seas salinity as a rule increases and temperature decreases with increase of depth, but in



SURFACE TEMPERATURE, NORTH SEA, FEBRUARY.

our comparatively shallow fishing-grounds there is much mixing. In the Irish Sea and in the North Sea south of the Dogger Bank, each fed from two directions, it is so thorough that a constant salinity is found from the surface to the bottom, the saline Atlantic and the brackish coastal waters completely blending. Elsewhere, as in the Channel and the northern part of the North Sea, the Atlantic flow can be followed at some seasons by temperature and salinity observations, while at others large isolated masses of Atlantic water may remain distinct for many months; in the Channel the main flow inwards is of French coastal

water reinforced at times from the Bristol Channel. Actually the isotherm of 10° C. in September extends from Newfoundland to Iceland and the Barents Sea, while in March it commonly passes to the south-west of the British Isles and thence to New York with a northern extension between. Surface isohalines show tailing off from 37 °/₀₀ * off the Canary Islands to 33 °/₀₀ in the Barents Sea, and these also vary

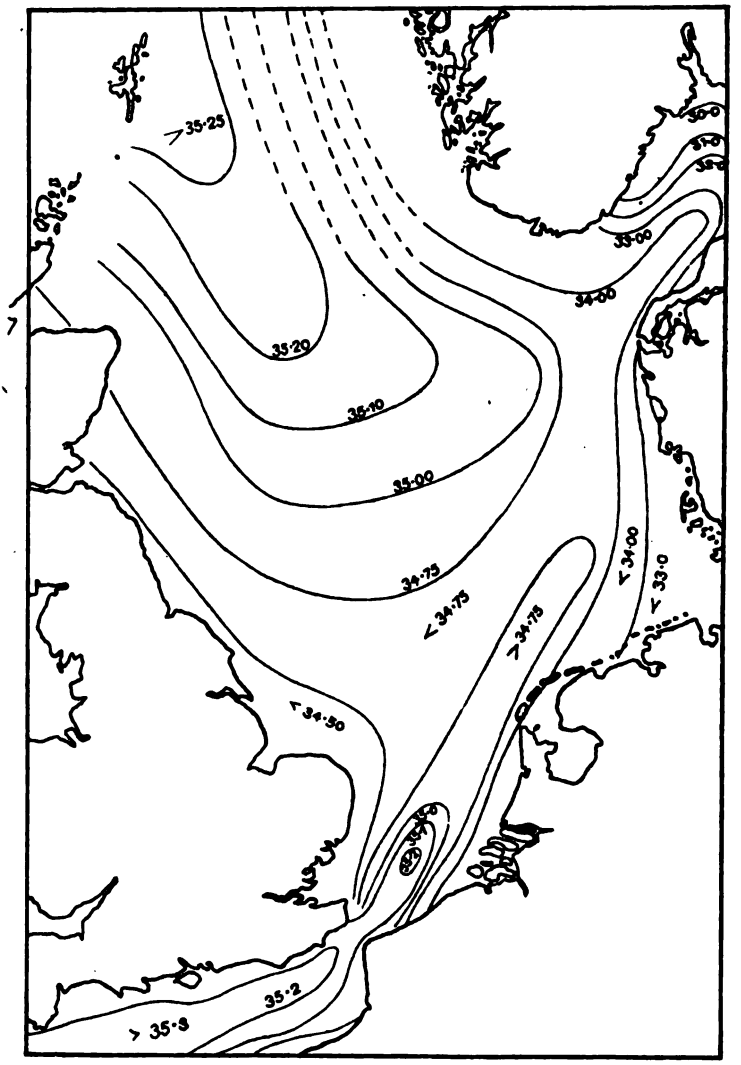


SURFACE TEMPERATURE, NORTH SEA, AUGUST.

seasonally; small changes even of 0·1 °/₀₀ are important. They show a real ebb and flow of the boundaries of two regions, the Atlantic and Arctic, characterized respectively by warm saline and cold brackish waters. A further subdivision of the Atlantic is into ocean and coastal regions, the former characterized by its relative uniformity and the latter by its great seasonal changes, high summer and low winter temperatures, and its lessened and varying salinities due to greater rainfall and land drainage.

* Viz. 37 parts per thousand, or 3·7 per cent.

The West European fishing ground is further complicated in that the channel is the boundary between two provinces of littoral distribution, the boreal and Mediterranean. Their line of separation about follows the

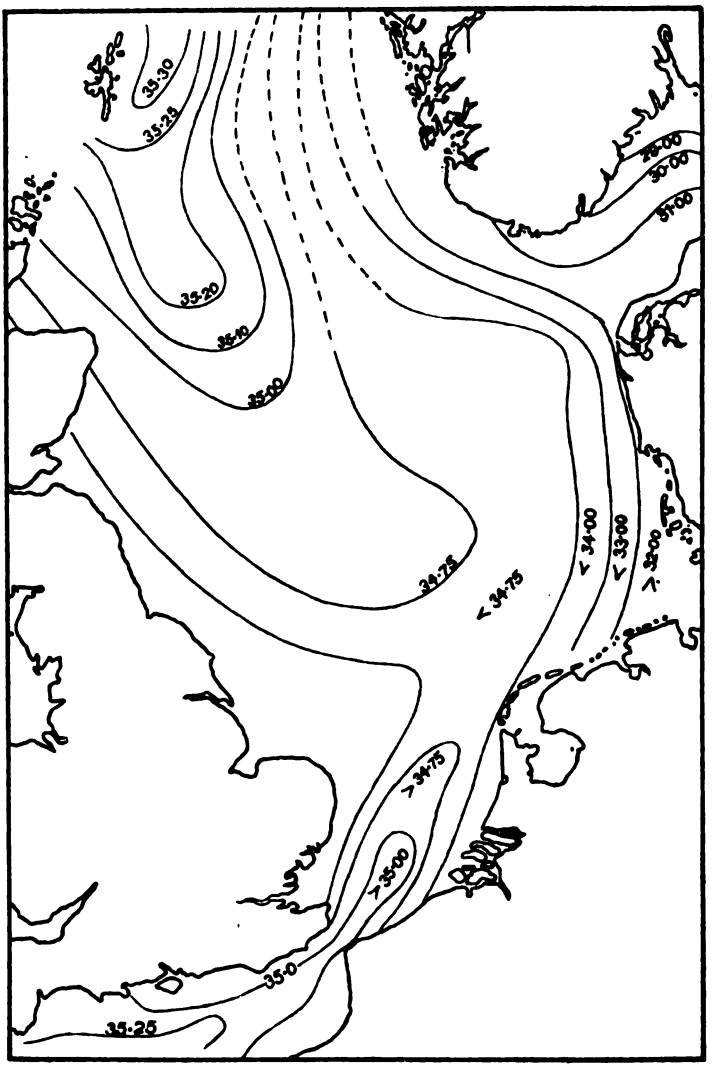


SURFACE SALINITY, NORTH SEA, FEBRUARY, 1903-07.

(*After Thompson.*)

ridge connecting Scotland with Iceland, roughly the mean isotherm 10° C. Judging by their animals and plants, they must have been separated by land at no distant date. The Scotland-Iceland ridge now only forms a barrier for the deep-sea animals of the temperate Atlantic and northern Atlantic, which may appropriately be termed the Norwegian Sea. The

upper waters of the latter have been completely changed by the periodic inflow of the Gulf Stream, which has introduced a vast number of "Mediterranean" littoral forms, so that in its southern parts, particularly



SURFACE SALINITY, NORTH SEA, AUGUST, 1903–07.

(*After Thompson.*)

the North Sea, they form the bulk of the population. The real distinction between the two provinces can, of course, only be seen by comparison of detailed lists of their animals and plants, but the fishes roughly follow the division. Thus of demersal species the hake, sole, bream, gurnard,

and skate are clearly southern, while the cod, haddock, plaice, and lemon sole are northern. Of less coastal species, brill and turbot are southern, while certainly halibut and probably ling are northern, though the latter has spread as far south as Morocco. Of pelagic fishes the herring and sprat are northern, the anchovy and pilchard, which is the mature stage of the *true* sardine, southern. Mainly oceanic and a true southern type is the mackerel, and in the same category, but purely oceanic, are the tunny and bonito, not yet fished by us, but the former caught extensively by our southern neighbours. All these are relatively shallow-water forms, while the real home of the eel is the deep sea beyond the Azores.

There is no doubt that our fishing grounds have a peculiar richness of their own, the enormous annual catch not being due solely to the great extent of shallow water. Adult fish feed for the most part on small living animals, which in their younger stages of growth are as dependent as fish themselves on suitable physical conditions for their development. They in their turn feed on others, but all ultimately depend on plant life for their food. The considerable quantity of organic remains from the land undoubtedly adds materially to the richness of the West European shelf, but attached seaweeds are of small moment, not growing extensively below 25 fathoms. In the ocean floating plants are all-important, minute unicellular organisms living in incredible numbers in the upper layers of the water, in suitable conditions daily multiplying themselves, giving a fertility to the sea many times that of the best soil. Their quantity is less in tropical and Arctic regions, greatest in temperate, and it is to the environment of our fishing areas favouring them that the abundance and good condition of our fish are largely to be ascribed.

The cycle of life of such pelagic plants in the open ocean is simple, complicated only by fluctuations in sunshine, rainfall, and other meteorological conditions. In coastal waters, especially where broad shelves extend out from the land, such fluctuations are more considerable, and often enormous seasonal changes in temperature and salinity have to be added. Instead of the same species of plants all the year round, and in consequence of the smaller animals which feed upon them, there may be a whole series of species, each suitable to some particular phase of seasonal change. There may thus be a much greater variety in the number of species, but not at any moment. Form succeeds form, the old forms disappearing, perhaps passing into resting stages upon the bottom, until suitable physical conditions bring them once more into active life. It is a matter of doubt, but it seems possible that this very destruction and recreation adds still further to the total food of our seas. It, however, has its dangers. The small larvæ of our food fishes depend almost exclusively on these minute plants, and unless the physical conditions, when they hatch, are also suitable for their particular plant foods, they may all perish. Fortunately, it is generally a question whether the temperature is high enough or not, and the lower the temperature the

longer time the eggs take to hatch, so that unsuitable fluctuations of minor moment tend to be obliterated. Ultimately it is a matter of the hydrographical conditions, but the study of the changes in all pelagic life is essential for the understanding of the means by which these act for good and evil, and also gives information supplemental to that obtained by physical means.

No mention has been made of the bacteria of the sea, of which there have been estimated to be about 600 millions in a cubic yard of sea-water. The bulk are concerned in the destruction of organic matter and the setting free of its simple salts; remembering the mode of plant nutrition, they are hence not destructive to the total food. Nitrogen is required by plants in the form of nitrates and ammonium salts. In the sea, as on land, there are bacteria which form and destroy these, the latter dominant in tropical waters. Some of the nitrogen compounds come from the land, which adds largely to the available phosphorus equally necessary. Soluble silicic acid is also essential to many unicellular plants (diatoms), and this too is a land product. Finally, the slightly greater alkalinity of coastal waters would seem to be favourable to abundant life. Indeed, I fancy that the primary cause of the peculiar richness of our seas will be found to be the especially abundant and rich supply of the above products by drainage from the land.

The nature of the bottom necessarily concerns demersal fish, and also such pelagic fish as lay their eggs upon the bottom. The latter require a hard bottom with some current, so that the eggs get well aerated and are not silted over. To the former it is mainly a question of the suitability of the ground to the animals upon which they feed. Sedentary animals generally require stone. The lug worm is almost the only animal in mud, but there are a whole series of worms belonging to sands of different grades. The same is true of molluscs, starfishes, some crustaceans, and other forms. The southern part of the North sea has been charted by Mr. J. O. Borley into areas of different textures of bottom, ranging from stone through various grades of gravel and sand to mud. Each texture is shown to be the centre of a biological association of animals. Statistics of catch indicate the preferences of each fish, but the area charted is too restricted to allow of bold correlations. Mud or silt is the least prolific texture; where it deposits, there must be complete stillness, little circulation of gases in the water, the decaying organic matter forming a thin soup over the bottom in which plaice would appear to be almost smothered. The quantity of organic matter in the bottom layer is everywhere considerable, but there must be movement for its constituents to be leached out as required. The cod family possesses in the cod, haddock, hake, ling, coalfish, and whiting a few species of such remarkable adaptability to different grounds that they are of vast economic importance. The cod and the haddock, the two most important species, prefer respectively rocky and sandy grounds. In

contrast to these there are a large number of fish of many families which hide away, isolated, in rock and weed, none of great value. Then there are the inhabitants of the sandy ground, on which they rest invisible to their enemies. They include the halibut, turbot, brill, plaice, lemon sole, witch, dab, flounder, and true sole, all belonging to one family of more or less laterally flattened species, and the skate a dorsi-ventrally flattened shark. They are the most prized of our fish on account of the firmness and fatness of their flesh.

It would scarcely be expected that tides would produce much effect, direct or indirect, on fisheries. They probably aid in mixing coastal and oceanic waters, and their currents sweep clean the bottom of the Scotland-Iceland ridge. As an example of the strange directions into which fishery research leads its devotees, it is interesting to note that Pettersson has shown that the average maximal value of the tide-generating forces undergo variations in periods of 4½, 9 (?18), 88, and about 1800 years. He suggests that these periodical changes may be reflected in changed climatic conditions and in changed hydrographical phenomena, stronger currents, higher temperatures, and so on. Animals being peculiarly sensitive to the medium in which they live, the effect on fisheries might be very great. Thus, at the above maximal periods, the greatly increased eruption of salt water into the very brackish Baltic might well revive its rich mediæval herring fisheries. Probably tidal also are certain vertical movements of 50 fathoms or so in the intermediate waters of the Færoe-Shetland channel, submarine waves.

A few examples from our food-fishes will perhaps best illustrate the all-important connection there is between the life-histories of marine animals and the physics of the sea. The plaice and cod are chosen to represent two families of demersal fish, the herring coastal pelagic forms, the mackerel as belonging to the temperate Atlantic, and the eel, a peculiar deep-sea breeder, its life-history now practically determined after a quarter of a century of keen struggle by dozens of workers. In no sense do the life-histories of these fish represent those of other fish, even of the same families. Each fish has its own spawning ground, its optimal depth, salinity, and temperature, its own wanderings, and its own peculiar development.

The plaice is the most important trawled fish of the southern part of the North Sea, a drainage basin for some of the densest areas of population in the world. It is a much-fished area, and for many years fishermen have said that it has been falling off as a plaice ground, this being ascribed to overfishing and the destruction of undersized fish, both being causes which might be remedied by international legislation. It is this suggestion that has put the plaice in the forefront of international investigations, with which the names of Masterman and Heincke are most honourably connected. The result of their work has been the estimate that there are 1500 million plaice of over 12 cms. in the North

Sea; of these a third are caught annually, 200 millions being put on the market, and 300 millions being destroyed in the process of catching.*

The plaice is a bottom feeder and lives on molluscs, worms, some crustaceans, and starfishes, being a dweller on sandy ground, where these are most abundant. It collects in definite spawning areas, the chief of which is off our coast between Dover and Cromer, others of little importance being off Flamborough Head and in the Moray Firth. Spawning is at its maximum in February, the spawners being four years old and upwards; the eggs and subsequent larvæ are pelagic, and thus at the mercy of the currents and surface drift. The suitability of these is important for the keeping up of the stock, as the latest larval stage has to fall on the bottom in a few feet of water of not less salinity than 17 $^{\circ}/_{\infty}$. Thence the young plaice gradually extend into deeper water, *the size and age of the plaice in any part of the North sea being directly proportional to the distance of the locality from the coast and its depth.* This law is not true for the Dogger Bank, which, being covered by several fathoms of water, is unsuitable to the first bottom stages, and, being surrounded by relatively deep water, can only be reached by the largest fish, for whom it forms an excellent feeding ground. The above law, indeed, may seem only an expression of the topography of the North Sea, but Borley considers that the size of the plaice present is due to the suitability of grounds of different depths to the nourishment of plaice of different sizes, deeper waters providing the nourishment suitable to larger fish. The Dutch coast is the great plaice-nursery, and the density of young fish there is out of all proportion to the amount of food. Statistics of catch show that rough, stony, and muddy silt areas are much poorer than sand areas of the same depths. After spawning there is a dispersal of the spent fish, these often extensive wanderings being feeding migrations. Then there is a rest period in the winter, almost a hibernation on top of the sand, before the next spawning migration commences.

The plaice has its southern limit at the British Isles, isotherm 10° C. To the north there are extensive fisheries at Iceland and in the Barents Sea. Spawning takes place to the south-west of Iceland, and the larvæ are carried to the north coast, to return when mature to the ground where they were spawned. In the Barents Sea there is similar movement from west to east and east to west, in each case the breeding migration being to warmer water. In cold regions growth is much slowed, a fish of 40 cms. from the North Sea being six years old and from Barents Sea about eighteen. The latter agrees rather closely with the growth of the Baltic fish coming from an area of low salinity, and some observations suggest that growth can be retarded either by cold or by low salinity. This size and age, too, are about the limits for the Baltic, whereas fish of 70 cms. and fifty years of age have been caught in Barents Sea.

* This estimate of Heincke's will probably have to be revised after further consideration of the English statistics.

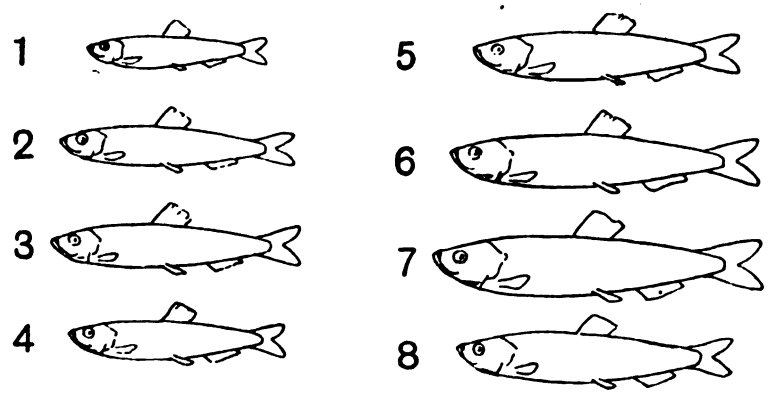
The plaice in Barents Sea, after spawning, follow the eastern spread of the warmer and more saline Atlantic water, and catches have frequently been obtained from such water flowing as undercurrent under the colder and much fresher Arctic water. Pettersson has shown how the flat fishes follow the seasonal invasion of the Baltic by undercurrents of Atlantic water. In the spring, which is hydrographically midwinter, there is an immigration into the Kattegat of ten northern fishes, and in the late autumn one of eighteen southern fishes, these two immigrations being correlated with cold and warm undercurrents. Plaice lay each about a quarter of a million eggs of about 0·07 inch in diameter, rather pitted and corrugated on the outside. These float close to the surface in the North Sea, but have been found confined to this Baltic undercurrent, which has a temperature of 5° to 6° C. higher than the layers of water above and below. This is probably a correlation with viscosity rather than specific gravity, the decrease in which from the bottom to the surface is relatively small, while viscosity increases by about 2% for each fall in temperature of 1° C. This is a factor which has as yet been little considered as aiding in the flotation of eggs and larvæ, but it is probably of importance; practically its entire dependence is on temperature.

The cod is the dominant demersal fish on all northern grounds, extending west of the Atlantic to the Newfoundland banks, where there is an immense fishery; to the south it is replaced by the hake. It prefers a rocky bottom, but is found over the sandy grounds, though here among round fishes the haddock has first place. Spawning takes place on the offshore banks of Norway, of the Færoes, and of South Iceland at a depth of about 50 fathoms. Spawn is also shed at a lesser depth round Ireland and Scotland and in the North Sea, but there are no immense spawning shoals as in other localities. This distribution at the spawning season, February to April, indicates a correlation with temperature areas of about 6° C. After spawning the fish spread over the banks in every direction, and marked fish have been known to cover a distance of 300 miles in five to six weeks. Many spent fish in shoals pass up round the north of Norway to the eastern ice, and in suitable season to Spitsbergen and Novaya Zemlya, subsequently returning for their next spawning.

The eggs and larvæ of the cod, like those of the plaice, are passively distributed by the currents round the north of Iceland and over Barents Sea, local stocks being left in the bays and fjords. They grow up experiencing temperatures of 0° to 7° C., salinities of 36 $^{o}/_{oo}$ to 20 $^{o}/_{oo}$, or even less, and depths of 0 to 200 fathoms. They join the spent fish from Norway in the pursuit of the capelan, a real Arctic fish, which follows the retreating ice, and when seven or eight years old accompany them to the west, their first spawning migration, being now about 2 feet long.

The herring is economically most important of all fish, being fished all round our coasts to Iceland and Norway, forming half of the total

value of fish from the North Sea. The sequence of its appearance on the East Coast from the Færoes in spring to East Anglia in late autumn is a matter of common knowledge. Essentially it is a coastal fish, not wandering far over the Atlantic, and breeding in coastal areas in March and April and in the late summer. The fishing is by drift nets, stake nets, shore and purse seines, all nets into the meshes of which the herrings drive their heads, and by trawls (less than 5 per cent. of those landed in East Coast ports) dragged at 4 to 6 knots a little off the bottom. The herring shuns the light, rising and falling vertically in the water by night and day, so that the first method is mainly pursued at night and the second only in the daytime. It differs from the plaice and cod in that it is not a bottom feeder, but depends on the floating and swimming life of the upper waters, which it at times filters out by what are known as its gill-rakers, and at other times actively pursues, selecting



RATES OF GROWTH OF HERRING.
1, WHITE SEA;
2, LYSEFJORD, NORWAY;
3, ZUYDER ZEE;
4, EAST COAST OF SWEDEN;

EIGHT FISH OF EQUAL AGE (FOUR YEARS) FROM
5, WEST PART OF NORTH SEA;
6, ATLANTIC OCEAN;
7, ICELAND;
8, WEST COAST OF NORWAY (SPRING HERRING).

(*After Hjort.*)

particular organisms. Its movements are food migrations, and the study of these leads to the correlation of the food animals with floating plants, and so to the hydrographic conditions of the sea-water on which these depend.

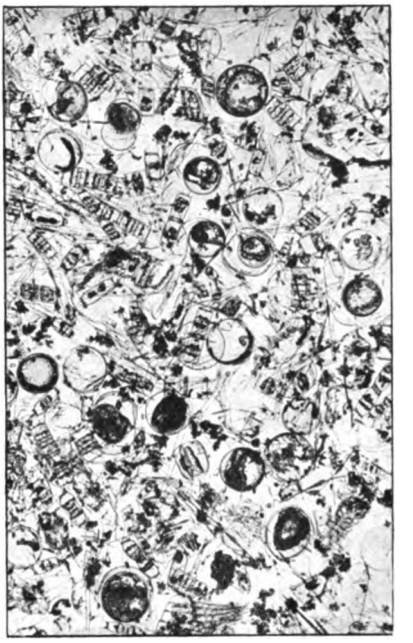
A more direct connection with the physical conections of the sea is seen in the composition of the herring-breeding shoals, the individual fish of which can be analyzed for age by the rings in their scales. A baby herring has precisely the same number of scales as a mature herring, and the scales persist throughout life. Growth takes place in the period of maximum abundance of food, from April to September. It is represented on the scales by a broad transparent ring, while the period from October to March, which exhibits no increase in the size of the fish, has six months' solid scale matter concentrated into a narrow, sharply defined

opaque ring. The breadth of the summer ring clearly indicates the amount of growth, and this depends on the abundance of the right kind of food. The differences in rates of growth are obvious, the increase of weight of a herring from an open coast being at least twice as great as one taken from closed water, such as the White Sea, Baltic, or Zuyder Sea, which of course are less saline and have greater annual ranges of temperature. Differences are also visible in favour of areas which directly abut on the Atlantic, the Iceland and our western fish being of especially remarkable size.

By the study of the breadths of the summer rings in scales, the areas where herrings spent their previous lives may be ascertained. A breeding shoal of mature fish, all of about the same size, may thus be analyzed, not only for the ages of its individuals (expressed usually by the year in which they were born), but also for the places in which they were reared. Most individuals of a shoal are from the same area, but there are invariably a few stragglers. A few are three years old, most only becoming mature at four or five years, in unfavourable regions taking six to ten years. The spawn is laid on hard rough ground, attached to the bottom, and development proceeds in accordance with the temperature, at about 3° C. the hatch taking place in forty days, and at 12° C. in eight days. The young for only a relatively short period are at the mercy of the currents, and their further growth depends on the areas to which they are carried; in our estuaries they are found with young sprat as whitebait. Real migration only commences on the close approach to their first breeding season, when they seek out suitable rough grounds for depositing their eggs.

Hjort, to whom we owe so much of our knowledge of herring, has pointed out the great importance to the Norwegian fishery of the 1904 class, viz. the brood of 1904, its dominance in the marketed fish since that year. In 1908 it represented 35 °/₀ of the catch, 77 °/₀ in 1910, and 65 °/₀ in 1913. It has made the Norwegian fishery in these years remarkably successful, but its position is now being challenged by the 1908 and 1909 classes, which were excellent. The 1904 class is now passing, but it may be predicted that the 1908 and 1909 broods will ensure a successful fishery for several years. Hjort also showed the excellence of the 1903 and 1904 cod classes, the age determined as for herrings by scales. Yet these years were amongst the poorest in amount of spawn, so that this clearly is not the cause of their dominance. They were, however, remarkably late years for spawning, and the young of both the cod and herring met with an abundant supply of the minute floating plants on which they feed; the temperature at which the fish eggs hatched was higher than usual, a circumstance favourable to the pelagic plants. The currents, too, on account of the lateness of the brood, were more determined, and there would thus have been an avoidance of that great mortality which usually is found, at least in eggs and larvæ, where cold and warm currents meet.

FLOATING PLANTS, MAINLY CERATIUM.



DIATOMS AND A FEW FISH EGGS.

NOCTILUCA, THE CHIEF PHOSPHORESCENT ORGANISM.

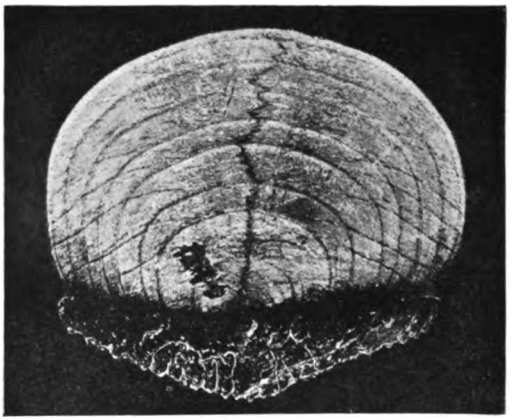
LARVÆ OF CRUSTACEANS AND DIATOMS.

FLOATING LIFE OF THE SEA.

(Greatly magnified.)

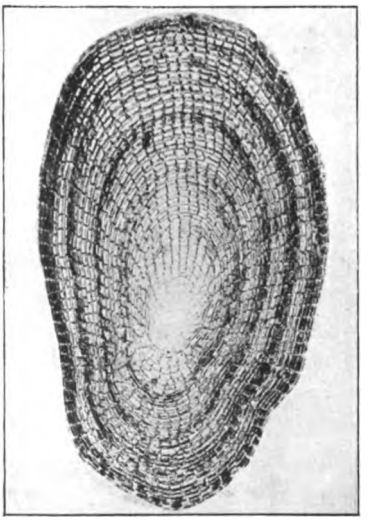
OTOLITHS OF MATURE FEMALE PLAICE.

Upper row—Otoliths of plaice from West Bay (English Channel); Lower row—Otoliths of plaice taken in the region of the Leman Banks (North Sea).



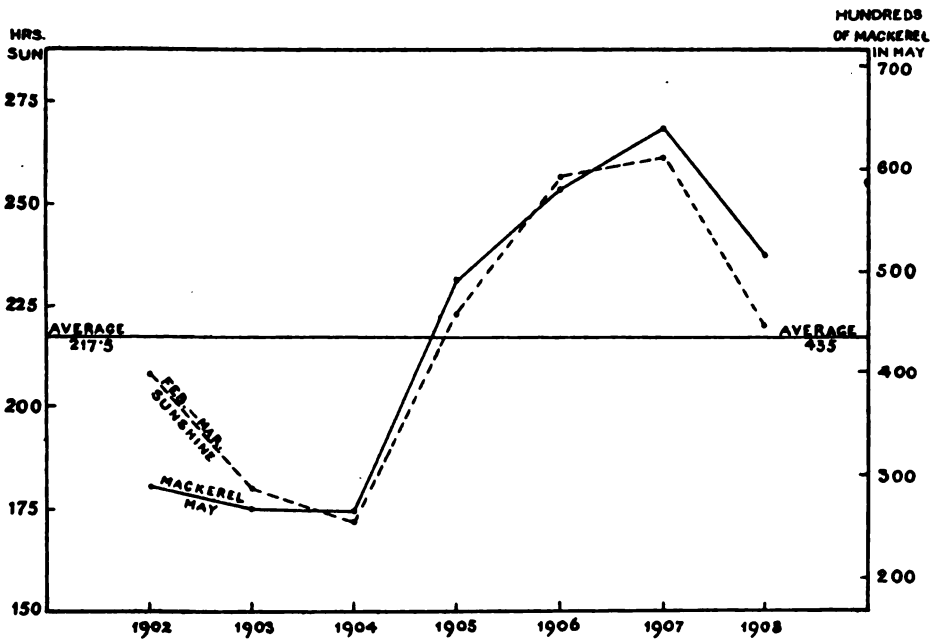
HERRING SCALE WITH EIGHT WINTER RINGS INSIDE THE EDGE.

(*Lea, Phot.*)



SCALE OF COD WITH FIVE WINTER RINGS.

The mackerel has points of resemblance to the herring, and is caught by the same means. It has three varieties: a West European, ranging from the Canary Islands to Norway, but cut off from Iceland; a Mediterranean form extending into the Black Sea; and an American form appearing from Cape Hatteras to the St. Lawrence.* It spawns on the Atlantic coasts everywhere in May and June. Whence the spawning shoals come is not known, but from their simultaneous appearance and maturity of genital organs we may deduce that they have all been living in regions with similar hydrographical conditions. This view is supported by the



CORRELATION OF SUNSHINE IN FEBRUARY AND MARCH, WITH CATCH OF MACKEREL IN MAY.

(*After Allen.*)

earlier breeding of the Mediterranean form, which lives in water which earlier becomes warm.

Besides the breeding migration there are the seasonal migrations of the young fish, as shown by their shoals appearing off Cornwall in January, Sussex in March, and Suffolk in May. Their appearances are rather irregular, as they travel on the surface, in midwater, or near the bottom. Probably they keep to the Atlantic water coming in as an undercurrent and carrying their food, their sudden appearances near the surface here

* Nilsson considers that there is a fourth variety from Swedish waters. He also points out that the distribution of eggs is mainly a question of salinity, which must be not less than 26 $^{o}/_{oo}$.

and there being due rather to the upwelling of this than to the influence of light. In any case, the success of the Channel and North Sea fishery seems to be correlated with an extensive inflow of warm saline water. Other shoals enter the North Sea round presumably the north of Scotland. The floating eggs of the mackerel are dispersed over all areas of our banks where the adults are found. After spawning the shoals break up, a general dispersal, the food now being principally the young of other fishes. In November and December all disappear, and no one knows whither they go. Remembering how intensively the shallower waters near the land are fished over, it seems certain they spread far into the Atlantic, and, considering their shape and form, it is probable that they become as truly pelagic as the tunny and bonito.

In the spring the mackerel feeds largely on midwater crustaceans, particularly copepods, and these feed on diatoms, which are dependent on the assimilation of their chlorophyll. It occurred to Dr. Allen, in the course of purely scientific researches on the culture of these plants, in which he discovered the great importance to be attached to the intensity of the light, that special abundance of copepods in May would have had to be preceded by abundance of sunshine producing rich cultures of diatoms in earlier months, and that this might be reflected in the catch of mackerel. He compared the data from three steam drifters fishing off Cornwall with the sunshine, with the remarkable correlation seen in the figure which he has permitted me to reproduce. Proof of such correlation is yet far distant, but we must regard as hopeful the suggestion of physical data, by which "drifters" might be informed months beforehand of the probabilities of the fishery for the year. Hydrographical changes are of slow progress, and in our areas can be foretold many weeks beforehand by observations in the Atlantic. The mackerel, having regard to its long absences from our waters, its regular breeding appearances, the regular migrations of its young fish, and its possibly illimitable numbers over the deep sea, would seem to be a most hopeful case where the study of hydrographical conditions should lead to important economic developments.

The freshwater eel is found in *all* European waters, and in most countries it is a valued luxury, being regularly fished in fresh and brackish waters by traps of different sorts. In autumn the best and fattest are obtained as they wend their way downstream to the sea, having put on a silvery dress in contrast to the yellow of those that remain. Their further history was quite unknown until recent years; but now it has become clear that they migrate gradually seaward to some depth over 500 fathoms, where their generative products are shed into the water to fertilize each other. The ova, the number of which must be vastly greater than that of any other fish, are exceedingly small, and it is necessary that an animal capable of fending for itself should be formed as quickly as possible. This stage has been identified with very

thin, transparent, ribbon-like fish without fins, about 7 cms. long, to which the name *Leptocephalus* has long been given. It is caught in fine silk nets down to several hundred fathoms, but in greatest abundance at 50 fathoms. It is found far out in the Atlantic in May, but nowhere north of the Scotland-Iceland line, and over no water of less depth than 500 fathoms, the temperature at this depth being about 7° C., and having a salinity of 35·2 $^{o}/_{oo}$. It is for this reason that it is considered that the migration must be to a depth of over 500 fathoms; but it may be at two, three, or more times this depth where the mature fish spawn. This indeed is probable, for there must be a whole series of changes from the minute egg to the relatively large *Leptocephalus*. We know nothing of them, and by inference we are led to believe that they are passed through floating in water of over 500 fathoms. The differences in the physical conditions between the Thames and 500 fathoms off the west of Ireland are, however, sufficiently remarkable to kill any other kind of animal of which we at present have cognisance.

The *Leptocephalus* is of nearly the same specific gravity as the Atlantic water in which it lives. It can swim a little, but it remains for the most part suspended in the water, thus being subject to the Gulf Stream. It may live to some degree on the minute plant life of the water, but it eats little. While being swept to the coasts, it rearranges its body, ceasing to be a ribbon and becoming a little round eel with fins, 6 or 7 cms. long, now known as an "elver." In November these are found on the Atlantic coasts of Europe, round by the west of the British Isles to Iceland. They begin to ascend into the fresh waters of different countries, probably in accordance with their temperatures. Some are swept up the Channel, and some cross between Scotland and Iceland. A few appear off Denmark in the following March, and two months later they enter the Baltic, which their parents left twenty months before on their long breeding migration. Economically these facts are made use of, for Danish waters never carry as many eels as they can, and millions of elvers are annually imported to stock them. However, the interest to us is in the peculiar correlation of the young stages to physical conditions quite different to those in which the parent feeds and grows, and in the complete dependence of the eel-fishery of Western Europe on the regular flow of Atlantic water to its shores.

After this consideration of these few instances, it will be abundantly clear that the lives of our fish are mainly governed by the conditions of the medium in which they live. These conditions, which are beyond human control, act by their fluctuations in producing good and bad years, and by their periodicity in producing successions of good and bad years. The destructive forces of nature become of proportionately less importance with the increasing age of different fish; in their greatest intensity they can conceivably only be partially overcome by closing off especially favourable areas for the youngest fish in every region, but

as yet we do not know any practical means of reservation of such areas.

Man's action in the North Sea has become such as to destroy the balance of nature, acting as it does principally on the mature fish, lessening their number, and so the amount of spawn to produce the next generation. It can be controlled, but only by international agreement, for which there must be a foundation of incontestable evidence. The collection and dissemination of meteorological data is managed for West Europe by a central body, and in 1902 the "Conseil permanent international pour l'Exploration de la Mer" came into existence, England, Scotland, Belgium, Holland, Germany, Russia, Denmark, Sweden, and Norway being members, France, United States, and Ireland coming in later. The conferences of the representatives of these countries have been both amicable and highly profitable in the investigations of the economic problems of fisheries, depending as these do on immense and fundamental scientific problems.

It is clear now that the plaice stock of the North Sea is being so seriously depleted by man, that a plaice fishery in that region may well be in a few years a thing of the past. This can be largely remedied by putting a size limit on the plaice sold, so that fishing in Nature's nurseries is not profitable. Six inches has been the limit recently proposed as least interfering in the first year with the fisheries of different countries, there being little or no subsequent loss, but a limit of 9 or 10 inches is really required. In the excellent years which are bound to follow the present closure of the North Sea to trawlers, such a size limit would not be felt, and is therefore a matter of practical politics. In any case, it is to be hoped that, in the economy which must be exercised in all European countries after the war closes, be they belligerent or neutral, this valuable International Institute for the investigation of our fishery regions may be maintained. Any international agreement is useless unless all neighbouring countries are signatories, and this matter of the food of a vast number of the human race of many countries is too important to be the play of political forces, a fact which should be first recognized by France, Germany, and Britain, as being great business nations with large populations and vast fishery interests. Furthermore, in the extension of such international institutions lies the best hope of permanent peace.

LITERATURE.

A. GENERAL.—The annual and scientific reports of the English, Scotch, and Irish Fishery Boards; the publications of the Conseil permanent international pour l'Exploration de la Mer, including 'Rapports et Procès-verbaux,' 'Bulletin Trimestriel (Hydrographique, Planktonique),' etc., 'Bulletin Statistique,' and 'Publications de Circonstance;' also 'Mémoire sur les Travaux pendant les années 1902-1912,' August, 1913; *Journal of the Marine Biological Association*, periodical;

annual report of the Lancashire and Western Fisheries District; see also 'The Depths of the Ocean,' by Sir John Murray and Dr. Johan Hjort, 1912, and 'Conditions of Life in the Sea,' by James Johnstone, 1908.

B. SPECIAL.—1. *Hydrography:* D. J. Matthews, 'North Sea Fishery Investigations, Southern Area,' Cd. 5546, 1911; D'A. W. Thompson, 'Idem., Northern Area,' Cd. 4893, 1909; other Bluebooks by same authors and publications of Conseil permanent, in particular those by Otto Pettersson, B. Helland Hansen and Martin Knudsen; also Hans Pettersson, 'Long Periodical Variations of Tide-generating Force,' Pub. de Circonstance, No. 65. 2. *Plaice:* Friedrich Heincke, 'Rapports,' etc., Oct. 1913, and A. T. Masterman, 'Rapports,' etc., several reports, also Bluebook in press. 3. *Cod and Herring:* Johan Hjort, 'Rapports,' etc., 1914, and several publications by other authors in same series. 4. *Mackerel:* E. Ehrenbaum, 'Rapports,' etc., 1914; E. J. Allen, *Journ. Marine Biol. Ass.*, vol. 8, p. 394, 1910; D. Nilsson, Pub. de Circonstance, No. 69, distributed April, 1915. 5. *Eel:* Johs. Schmidt, 'Rapports,' etc., 1906 and 1914.

The PRESIDENT (before the lecture): Prof. Stanley Gardiner, who is going to lecture to us to-night on Sea Fisheries, is an old friend of the Society. He is now Professor of Zoology and Comparative Anatomy at Cambridge. For the last twenty years he has been doing oceanographical work of different kinds in the Pacific Ocean, the Indian Ocean, the Maldive and Laccadive Islands, and elsewhere, and the results of these travels he has brought back to the Society, from which he received the Murchison Award. Prof. Gardiner is now a member of the Government Advisory Committee on Sea Fisheries. This has led him to investigate the very important question of the distribution of fishes, and some of the results of his more recent work he will communicate to us to-night.

Lord LUCAS (after the lecture): I have long known Prof. Gardiner by reputation as having been one of the keenest and most learned of the students of this great science, and as having been one of the men who stands out among the many scientists to whom we at the Board of Agriculture and Fisheries owe a great debt of gratitude for the way in which he has put his great knowledge and his time and services at our disposal. I am very glad to be here to-night to express our thanks to Prof. Gardiner. We have had a great deal of work from him on the Advisory Committee on Fisheries Research, and since the war broke out Prof. Gardiner has been studying on our behalf a number of fisheries questions arising out of it. I am sure every one who has heard his lecture to-night will agree we could not have had better assistance, we could not have chosen a better or more skilful scientist to help us in these matters, and we owe a great deal to him for the work he has done. May I be permitted, also, to express my pleasure to-night that the Royal Geographical Society has interested itself in the question of the fishing industry of this country? The figures with which Prof. Gardiner opened his lecture to-night show what a gigantic industry it is—an industry which employs 125,000 men, in which there is invested a sum which he estimates at £200,000,000, is indeed a large industry; but from the very nature of it, except those few people who happen to come into contact with it at the ports where it is carried out, the country as a whole has very little knowledge about it. All they know, as a rule, is that the price of fish varies from day to day. Bad weather produces bad fishing, and seasonal conditions generally affect the supply. Sometimes, for instance, for no reason that we know of positively, we learn that the herring fishing has been a failure, because the herrings have chosen not to follow their usual route. We know nothing, or next to nothing, about the conditions of hardship under which this industry is followed. The photograph we saw to-night of those men fishing in the Barents Sea is probably

something perfectly novel to most people. The fact that all the year round we have trawlers going to that most dangerous and most difficult of seas and catching fish under conditions of the greatest hardship is unknown to the majority of people in this country, and I should like to express our gratitude to you for the line you have taken in allowing a good deal of to-night to be devoted to a discussion of this great industry. I think the thing that is bound to strike one most in listening to Prof. Gardiner's lecture is the importance of the discoveries made by means of scientific investigations with regard to the habits and movements and the growth of fish. One cannot help feeling that the time will not be very far off when we shall have something like a really exact knowledge of the development of fish. As he tells us, you have good seasons for fish and bad seasons for fish. The two industries with which I am particularly connected at the present moment, agriculture and fisheries, seem to me to have a good deal in common. Both are dependent to a great extent upon the weather; both are dependent upon the conditions of any particular year, and as our knowledge of these things increases, so we shall begin to estimate with greater certainty the catch of fish that is going to be brought to these shores every day, and so we may hope to secure the permanence of the supply of fish for the markets, not only of this country, but the markets of the world. At the end of his remarks Prof. Gardiner mentioned the scientific investigations which have been carried on for a number of years by—to give it its right name—the International Council for the Exploration of the Sea. It is one of those international bodies which by its very nature and composition is apt to move rather slowly. It has representatives on it of almost all the Western Powers of Europe and the United States, and unfortunately, of course, the war has upset it as it has upset many other things. I am glad, however, that although its operations are for this year seriously curtailed, it is only in a state of suspended animation, and we hope that with the advent of peace the Council will be able to resume its work with all its old vigour. I am convinced that the work which is being done by that body, the systematic exploration of all the problems of the sea, is the one thing that is going to bring us conclusive results on all these problems. The share that this country has taken in the work has been, at any rate on one side of it, satisfactory from our point of view. I think we can say that the British representatives have supplied a great deal of initiative, have undoubtedly done a great deal to co-ordinate the work, and have contributed the greater part of the statistical work which is so necessary on a subject of this kind; but of the other side of the work, the work which is a necessary corollary to that, namely the work of the sea investigations, I am sorry to say we have not perhaps borne a pre-eminently great share. I am afraid England at the present time is the only country which has not got a properly equipped fishery research vessel of her own, and I can only say I sincerely hope I shall continue in my present office long enough to see that evil remedied. I do not think any reference to the subject of the fishing industry would be complete without some mention of what is being done at the present time by the fishermen of this country. Of all those who are assisting the country at the present moment with their services there is no class whose doings fall so heavily under the ban of the censor as does the work which is being done by our fishermen at the present time. But I am perfectly convinced, when the time comes, when the seal of secrecy can be removed, and when the doings of our fishermen, assisting the Admiralty as they have done, volunteering in large numbers for the navy, supplying a great part of our mercantile marine, as they habitually do, when the whole of their works have been brought to the notice of this country, I am sure we shall realize that the fishing industry is second to none, first of all as an industry of economic importance, and secondly as breeding the most virile class of men this island can produce.

Sir Norval W. Helme: I have the honour to-night of seconding the vote of

thanks that has been proposed by Lord Lucas. I do so with particular pleasure because I had the opportunity of serving with Prof. Gardiner some years ago on a Parliamentary Committee, when the question was referred as to whether the Government should continue its grant to the International Committee for the purpose of the scientific study of the life and conditions of the fisheries in the North Sea. The matter of food supply has engaged the attention of the people of this country for many years, because of the great increase of population we have had during the last century, and the needs to provide good and wholesome food for the people. During the last few years arrangements have been made by which local authorities around the coast might become responsible for the oversight of the fisheries along the shores of the country, and so it is that the two departments, national and local, stand out as part of a great interest for supplying the people of this country with the food that is so good, namely, those that fish in the wider seas, and those that fish in the territorial waters around our shores. There is, unfortunately, a great feeling of competition between the inshore fishermen and those who trawl in the larger ships, and at the present moment we find that whilst the one is extending and has already attained the enormous proportions that have been mentioned by the lecturer, the supplies got by the inshore fishermen have been gradually becoming less, and so it is that the Government appointed a Departmental Committee which met last year to consider what could be done for the benefit of the inshore fisheries. Looking at the question as a whole, I would point out, in the presence of Lord Lucas, that the report of the committee on which Prof. Gardiner served has been upon the shelves of the department for some seven years since that report was made, and comparatively nothing has been done. At the present time, when we are having an income tax of 2*s.* 6*d.* in the pound, and other terrible consequences of the war upon us, we can quite excuse a Government Department for not hurrying up some recommendations which involve expenditure of money, but we do require legislation, and, as the report suggested, there should be concentration at headquarters in the oversight of the management of our fisheries. Owing to the arrangement by which the affairs of England, Scotland, and Ireland are administered separately financially, the different countries spend different amounts of money obtained from different sources in support of their fishing industries, and what was recommended by that committee I think is worthy of special consideration at the present time, because if we had a united council, I think we should have greater unity in carrying out the great measures that might affect the fishing around our shores. There is no doubt if the scientific study is supported by the Government we shall have greater advantages in the future. Locally, in the north of England, if I may venture to give one illustration, the Lancashire and Western Sea Fisheries Committee have invested money and provided a vessel of their own, to do what the Government has hitherto not attempted, to undertake the scientific study of waters around our shores, and it is by this work Prof. Herdman has given great help in directing the scientific efforts of the local sea fisheries committee, and great good has been done. In addition to the fishes of which Prof. Gardiner has spoken to-night, there is the great shellfish industry, and that requires careful support, and it was a matter of interest to have put before us when that committee took evidence (Prof. Gardiner will remember the evidence). It was shown that by the investment of a little money and effort on the part of those connected with the mussel fishery it produced enormous advantage, because owing to the fact that in the seaweed attached to the rocks on the seashore there are thousands of small mussels which only require transplanting and having more room given them in which they could grow, the increase in the size of the fish was enormous, so that a tremendous addition was made to the

available food supply. I have only ventured to allude to these points, but of course I recognize it is an opportunity we do not always get to bring a little pressure to bear upon the head of a Government Department when we are meeting outside the Houses of Parliament—in the presence of the Geographical Society—and I do think we may, at any rate, press the Government to consider further some suggestions that have been made. Prof. Gardiner alluded to the fact that out of 500 millions of plaice that are gathered only 200 millions are available for food, 300 millions are killed and wasted because of the method that is adopted in the taking of the fish. We must have a law passed to prevent the taking of immature fish. If we could have that, I think it would tend to allow the increase of the fish to be continued at an increased ratio, because the destruction of so many of these young fish naturally affects the home supply available.

Prof. E. W. MacBride: I have much pleasure in supporting the motion of thanks to the lecturer for his most interesting lecture. It was also a very great pleasure to hear Lord Lucas, who discoursed so eloquently upon the subject of the necessity of scientific investigations in matters relating to fish, and I think, as a practical zoologist, the question immediately arises, the condition of the fisheries being what the lecturer Prof. Stanley Gardiner has indicated, how can they be helped by scientific people? It seems to me the scientific zoologists might try to do three things: First, they might try to help the fishermen to find the fish, and I suppose that is one of the main objects of the investigations which have been so heartily commended by Lord Lucas, because we know that fish in different years pursue different courses. We know that sometimes when the mackerel come up the Channel they strike the coast in one place and sometimes in another, and the fishermen sometimes suffer a complete loss through ignorance of where to look for the fish. If we were able to tell them where they would be likely to get the fish such loss would be avoided. Secondly, they might endeavour to prevent the depletion of fisheries by over-fishing. I was shocked to hear the rate at which the plaice fishery was being worked. I had not got any idea that we were approaching so near the limits of our supply. The fishery for halibut on the other side of the Atlantic —on the western side—was pursued by large fishing boats on the coasts of the eastern states of the Union. They fished out the halibut banks so completely that it no longer paid them to work there. They then paid their attentions to the Pacific coast, and actually invaded the inlets of British Columbia, and shipped the fish a 3000-miles journey by land and sold them in the New England States. The fishery, therefore, off the eastern coasts of the United States was almost depleted, and what has happened there might happen here. Thirdly, they might examine whether, in any way, it would be possible to increase the stock of fish artificially. I think what Prof. Gardiner has shown us to-night will convince most people of the utter futility of attempting to increase the stock of fish by the artificial hatching of eggs, and then letting the fish-fry escape into the sea. When one thinks of all the millions of fish eggs found over the enormous area occupied by the fisheries, one would realize the futility of trying to increase the stock of fish by throwing two or three million eggs a year from some local spot into the sea. I feel greatly encouraged by the kind and sympathetic way in which this motion for a vote of thanks has been proposed by the head of the Board of Agriculture and Fisheries.

Mr. H. G. Maurice: I am not quite sure whether it is in order, under ordinary circumstances, for an administrative officer to speak in the presence of his President [Lord Lucas], but I have my President's kind permission. I am going first, if I may, to refer to those counsels of perfection which Sir Norval Helme has been giving us. He has suggested to us we should have a united authority for fisheries, and by a

united authority I know he means an authority which is responsible for England, Scotland, and Ireland. Well, I admit that that is a counsel of perfection, but I would remind you of two things. The first is, that we have recently passed a Home Rule Bill, and the second, that Scotland is very tenacious of its own authority and rights —as also is the Lancashire and Western Sea Fisheries Committee—and I suggest that the first result that would ensue from the constitution of that united authority would be a number of broken heads. We have seen it discussed in various connections, and I am afraid the united authority is as far off as ever it was. There is no reason why we should have no vessel of our own; Sir Norval Helme has told you that we have done nothing. That is an over-statement of the case. The President of the Board has said that we have not got a ship of our own. In so saying he stated no more and no less than the precise truth. We are not the owners of a ship, but I look forward to the time when we are able to bring the necessary pressure to bear on the Treasury to enable us to get that ship. Meanwhile, we have been hiring ships and doing a very large amount of sea-research work, and, standing here to represent the administrative side of the Board of Fisheries, I cannot allow the challenge to pass or admit that we do not do a great deal. Sir Norval Helme referred also to the question of immature fish, and expressed the horror we all feel at the amount of waste which takes place. He said we must have legislation to stop it. One of the objects of our scientific investigations is to find out how you can achieve that. Up to the present nobody has been able, so far as I am aware, to devise a trawl net which will enable you to take the mature fish without destroying a large proportion of immature. I know a great many experts are in favour of legislation to regulate the size of the mesh, so that it will allow immature fish to slip through, but, speaking with all deference in the presence of experts, I believe I am right in saying, that the mesh which will let through, we will say, the immature plaice, or the bulk of the immature plaice, will also let go the mature sole, because the sole is rather remarkable —he can compress himself into a narrow space without inconvenience to himself, and he will escape though of marketable size, while the plaice you wish to liberate may even remain in the net. So much for those points. I wish now to refer to one point which Prof. McBride made. He referred to the futility of attempting to increase the stock of fish by hatchers, and releasing a quantity of fry in the very vast area of water with which we have to deal. I am not going to enter into a discussion of scientific problems, but there is one point which we have thought may be worth considering seriously, and that is the extraordinary growth of plaice transported from the nursery grounds to the Dogger Bank. If we could only devise some means by which the plaice which were transplanted could be protected internationally, that is to say, if we could prevent one group of fishing vessels coming in and (if I may use a colloquialism) scooping the lot while the others were waiting for them to grow, I do think an experiment of that kind would be worth trying. So far, however, we have not been able to see our way to arrange such an experiment on lines satisfactory to all nations concerned. There are experts here whom you will be wishing to hear who can speak to you about the scientific details, and I as an administrative officer am always very anxious to steer clear as far as I can of the controversial lines of fishery science, but I want to emphasize the three points Prof. McBride has already put before us. We want to find out, if we can, to what extent it is necessary to protect fisheries, and having discovered that much, how they can be protected. That is object number one. The next question is, whether we can see our way to foster the development of fisheries—that is, to increase the abundance and improve the quality of the fish. That is an extremely problematical question. The third is what I may describe as the motto of the International Council, the rational exploitation of the sea—that is to secure the greatest possible catch without

detriment to the stock of fish on the grounds. All of those problems depend upon those physical geographical conditions which Prof. Gardiner has put before us this evening, and it is the study of that physical geography of the fisheries which is the groundwork, backed by statistics, of all our fishery investigations, and I think Prof. Gardiner was intentionally leading up throughout his lecture to the few words he said at the conclusion about the International Council for the Exploration of the Sea. The geography of the fisheries is a geography of physical conditions of environment, but there is also the topography to be taken into account. The physical conditions vary very largely with the topography, and the area we have to cover to get to the root of the matter is so wide that unless we can have the assistance of our fishing neighbours, we cannot possibly hope to cover it, to acquire that mass of information, and to sift that mass of information, which is necessary to lead us to true conclusions. I, personally, was extremely glad, and you appeared to appreciate the importance of the statement, when Lord Lucas said this evening that he looked forward to the time when under his Presidency we should be better equipped than we are at present for the purpose of these international investigations in which we have so important an interest.

Mr. F. Grant Ogilvie: One word I think is worth saying. I wish to offer congratulations upon a feature of this lecture that has not been referred to, but ought not to pass unnoticed. I thoroughly endorse all that has been said already as to the lecture itself; I wish, however, to draw attention to the audience. I think there is something absolutely novel and very satisfactory in the presentation of a lecture on this subject to such an audience. It is a well-known fact that in this country the national assistance to scientific investigation never gets very much in front of popular knowledge. Accordingly, until people at large get to know a little more about the sea, get to realize a little more fully that the sea is not merely a lucky bag —the prevailing notion is of this sort—and get to have some idea that the sea is worth investigating, we shall not have any real backing for the call for the support of scientific investigations. I hope there will be many opportunities for such popular illustrations of the leading lines of investigation as we have had to-night, and I am sure that an advance of the kind could not have had a better start than it has had this evening.

The President: Unless there is any other Fellow who particularly wishes to address the Meeting, I think the time has come when I ought to wind up the discussion by proposing the vote of thanks, in which I am sure we shall all cordially join, to Prof. Stanley Gardiner for the very instructive and interesting lecture he has given us. I am in the position of one of those who most needed instruction, for I knew nothing of fisheries except their products after the catch has come to dry land. I have looked with interest at the varied spoil of the sea ranged on the quays of Whitby, under the sheds by the Rialto in Venice, and, best of all, beside the long lanes of that wonderful place, the fish-market of Tokio. The display of fish to be seen there is, perhaps, the largest and the fish the strangest that one sees anywhere. Next to ourselves the Japanese are probably the greatest fishermen in the world, I have no doubt their practice as fishermen is one of the reasons of their naval efficiency. Of the close and delicate accuracy of Japanese representations of fishes every one familiar with their national art is well aware. What has struck me is the difference in the fishes of the different seas and oceans, how the fish-stalls emphasize the effect of environment on the development of fishes. I am sure this is a subject open to the investigations of many students—how all these fishes arrive at the weird forms in which we see them.

We have talked about the distribution of fishes; here again I must confess that my knowledge of their distribution is confined to that which takes place after they

are caught. But there are some picturesque incidents connected with it which have come to my knowledge in different ways. One I had from Mr. Spotswood Green, who has just retired from a high post connected with the Irish Fisheries. He told me that the Japanese war injured the fishermen on the west coast of Ireland because it reduced the demand at Petrograd, where the best lobsters were always sent. Again, in the north of Norway one may often get a good glass of port. This is due to the fact that the Norwegian boats which go down with cargoes of salt fish to Portugal before the Lenten fast, come back with port wine as ballast. Another incident of the same kind was told me by an eminent antiquary, who assured me that while digging up a Roman camp near Worcester, the shells of west coast oysters were found in the soldiers' quarters, but in the officers' quarters they were those of Colchester natives; an incidental proof of the excellence of the Roman roads in Britain.

We have not only to thank the lecturer to-night, but also to thank Lord Lucas, his fellow-officials, and the other speakers who have carried on a discussion which has been eminently practical, and may, I hope, have some permanent results in leading to these improvements in our provisions for fishermen and fisheries which have been foreshadowed. We offer our most hearty thanks to you, Prof. Gardiner, for the trouble you have taken in order to give us your lecture and to illustrate it so admirably.

SUESS'S CLASSIFICATION OF EURASIAN MOUNTAINS.*

By Professor J. W. GREGORY, D.Sc., F.R.S.

I. Current Classification of the Eurasian Mountain Systems. II. Prof. Suess's Classification. 1. The Primitive Nucleus. 2. The Altaid Zone. (*a*) The name Altaid; (*b*) The western Altaids; (*c*) The posthumous Altaids; (*d*) The eastern Altaids. 3. The Marginal Arcs of Eurasia. III. Discussion of the Classification. 1. The Value of the Foundation in Mountain Classification. 2. The Correlation of Europe and Asia. 3. The Relations of the Mountains of North-Eastern Siberia.

I. Current Classification of the Eurasian Mountain Systems.

The traditional view of the arrangement of the mountains of Eurasia represents the Continent as traversed from the Pyrenees to Java in the south-east and to Bering Strait in the north-east by a connected series of mountain chains, which includes the Pyrenees, Alps, Carpathians, and Balkan Mountains in Europe, the Caucasus, the chief mountains of Persia and Afghanistan, the Himalaya and various adjacent chains, the western mountains of Burma, and the disrupted chain represented by the islands along the south-western coast of Sumatra. The main mountain line of this series enters Asia from Europe with a southerly trend. It almost at once turns northward; and it is significant that the Caspian depression occurs at the angle formed by this sudden change in course. The northerly trend of the Asiatic lines is occasionally interrupted; but in eastern Asia it is well marked by the convergence of the eastern chains

* Royal Geographical Society, March 4, 1915

through the Yablonoi and Khingan Mountains into the single chain of the Stanovoi mountains in the north-eastern corner of Asia. South-eastern Asia is represented as based upon a divergent fan-shaped series of mountain lines projecting from Central Asia into Malaysia and southern China.

It was also generally accepted that the mountain loops which lie to the south of the great mountain backbone of Eurasia are offshoots from it. These loops are, first, that which surrounds the western basin of the Mediterranean, including the Balearic Isles, the mountains of south-eastern Spain, the Atlas, and the Apennines; second, the loop composed of the Dinaric Alps, Crete, Cyprus, and the Taurus; and third, the mountain arc of southern Persia, Baluchistan, and eastern Afghanistan. The mountains of the main band and its southern loops have various features in common. They consist of chains which are narrow in proportion to their length. Their crests usually rise in bold lofty peaks, and they are traversed by deep mountain gorges. The mountains are due to folds caused by compression, which generally acted in a meridional direction. In Europe the upper part of the crust has been thrust from south to north, but in parts of Asia the upper movement has been from north to south. The geological strike of the chains is generally parallel to their geographical trend.

To the north of this mountain backbone is a wide mountainous belt which as a rule does not present Alpine forms and has not been materially affected by modern folding. The valleys are usually wide and open. The grain of the country is often transverse to the trend of the mountains. These highlands have the features of an old topography, and they are geologically old. They may be of little importance as biological divides, and have often only a secondary influence on climate.

The northern mountain belt is represented in Europe by Brittany, the central plateau of France, the Black forest, the isolated hills which rise through the German plain, and the Valdai hills of Russia. In Asia their most important representatives are the lofty uplands of southern Siberia, northern Mongolia, and Manchuria; and from their northern foot the plains of Siberia descend to the Arctic Ocean, though some of the western parts drain to the Black Sea and the Caspian.

The striking differences between these southern Alpine Mountains and the older northern highlands may be appreciated by comparison of the Pyrenees with the moors of Brittany, of the Alps with the Harz Mountains, of the Carpathians with the Valdai hills, of the Caucasus with the Urals or the hilly steppes of the Khirgiz, and of the Himalaya with the Yablonoi Mountains.

Between the northern highlands and the younger mountain land to the south the level of Central Asia is often low, and it has in places even sagged below sea-level.

The mountainous belt to the north of the main mountain backbone of Asia has been classified on two main lines, according to whether the two mountain series are regarded as similar or dissimilar in type. The first

line of classification is based on the fact that some of the highland plateaus have been repeatedly folded along lines running approximately east and west; thus, to the north of the Himalaya there is a regular gridiron of parallel folds. This folded band links the southern mountain line to the highlands, of which the mountainous northern edge is sometimes so high that the summits are snow-clad, and the marginal valleys are so deep and intricate that the country has an Alpine topography. Hence the northern border ranges like the southern chains have been described as Alpine. If the term Alp be used in its original sense for a mountain pasture, these mountains may be justly called Alpine; but they are not Alpine in internal structure. Prince Kropotkin has repeatedly called attention to the important fact that many of the Asiatic mountains are not due to modern folds, but are only the faces of plateaus. He therefore calls them border ranges. In his "Orography of Central Asia," * he demonstrates this important truth; but he possibly goes too far when he represents the highlands of Central Asia as bounded on all sides by mountains of the same character, for he thus interprets the southern mountain chains as homologous to the borders of the northern highlands.

The second line of classification is based on the view that there is a fundamental difference between the southern chains and the northern highlands. This view is well expressed, *e.g.*, in Sir Thomas Holdich's article on Asia in the last edition of the "Encyclopædia Britannica," 1910 (vol. 2, p. 735). According to this classification, the Alpine-Himalayan line is limited to the southern edge of the great mountain belt and to the various divergent chains into which it divides in eastern Asia. Both lines of classification agree in regarding the mountains as crowded together in the Alps, Armenia, and the Pamir, into complex groups, for which may be conveniently adopted the old-established term of "Mountain knots." †

In 1901, the late Prof. Suess advanced ‡ a new scheme of the relations of the Eurasian mountains. This classification had the authority of his unequalled knowledge of Eurasian geology and the special advantage of his careful study of the extensive work of the Russian explorers in north central Asia; their researches, owing to publication in Russian, and the inaccessibility of much of the literature, have been often overlooked.

Prof. Suess's classification has not been much discussed. There has been a tendency on the one hand to adopt it from respect to his high authority. It has, on the other hand, been still more widely ignored. It may therefore be useful to raise the question as to how far the new classification is useful and is likely to be adopted.

The exposition of Suess's views is attended by one great difficulty. They grew during the progress of his book, and it is not always evident

* *Geogr. Journal*, vol. 23, 1904, pp. 176–207, 381–361, maps, p. 280.

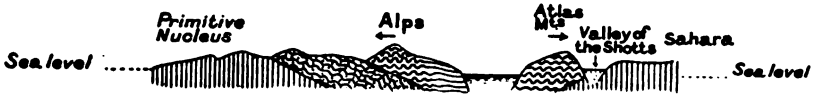
† This term dates at least from 1834. See, *e.g.*, 'Penny Encyclopædia,' vol. 2, 1834, p. 465.

‡ 'Antlitz der Erde,' vol. 3, part 1.

whether apparent inconsistencies are due to changes of opinion, or to the reader attaching undue weight to statements which were intended merely as reservations due to imperfect knowledge or as qualifications necessary to allow for local exceptions. At the risk, therefore, of some misinterpretation of his views, his classification of the Eurasian mountains seems to me essentially as follows :—

II. Prof. Suess's Classification.

Suess represented all Asia, except the peninsulas of Arabia and India, with part of Assam, and all Europe with the exception of the north-western coast of Norway and of the British Isles north of a line connecting the mouths of the Shannon and the Thames, as belonging to one geographical unit—the Asiatic edifice. This unit he extended westward



I. Diagrammatic Section across Europe

II. Diagrammatic Section across Asia

Primitive Nucleus to north and Archean Plateaus to south

Altaids

Alpids

across the Atlantic to include Newfoundland and the Atlantic coasts of Canada and the United States, and also extended eastwards across the Pacific to include Alaska and the eastern part of the western mountains of Canada.

The Eurasian part of this Asiatic edifice Suess regarded as formed of three constituents, which extend across the Old World from the Atlantic to the Pacific. The northern constituent is the ancient mass which formed the nucleus of Eurasia. The middle constituent is the broad zone of mountains which Suess calls the Altaids. The third constituent consists of the marginal chains, which are due to folding of comparatively recent geological age; the most important of these are the southern marginal chains which lie to the south of the Altaids, from the Balkans to Malaysia; of the eastern marginal chains the most important is the arc of Japan.

1. *The Primitive Nucleus.*—Prof. Suess called the northern mass "Der Alte Scheitel," * which has been translated in the Oxford edition as

* The French translation uses "Le Falte Primitif."

"the Ancient Vertex." The term "vertex" implies a point or extreme summit, and, as was suggested in 1909, is not a very suitable term for an area which extends from Japan to Scandinavia. The term "vertex" is said to be based on the same word as "vortex." It is defined in the 'Encyclopædic Dictionary' (1899, vol. 7, p. 435) as "A turning-point; the principal or highest point; the top, the summit, the apex." The definition in the 'Century Dictionary' (vol. 8, 1889, p. 6736) is the same, except for the omission of "turning-point," and the insertion of "crown." That the vertex is essentially a point is shown by its use for the vertex of an angle, for the zenith, and in mathematics for the point of a figure most distant from the centre. Suess's "Scheitel," however, included northern Eurasia. Suess probably used the term with the meaning it has in Scheitelfläche, the surface of a plateau; and he therefore applied it to that vast area of ancient rocks which formed the primitive mass of Eurasia. As the continent grew by the addition of successive southern zones to the original mass, Suess's meaning would appear to be more clearly conveyed by the word "nucleus."* The 'New English Dictionary' (vol. 6, 1908) includes amongst its definitions of nucleus "a central part or thing around which other parts or things are grouped, collected or compacted; that which forms the centre or kernel of some aggregate or mass." Mr. Bailey Willis† has already used nucleus as the equivalent of Scheitel.

The primitive nucleus of Asia includes on its southern side a series of marginal folds of Palæozoic rocks which are concave to the north, while it encloses a large foundered area—the amphitheatre of Irkutsk. Attention was first prominently directed to these arcs by Cherski, who called them the Baikal, Sayan, and Altai arcs. The Baikal arc is recognized as the oldest, for it consists of Archean rocks which had, like the southern Highlands of Scotland, been crumpled into mountains by powerful pressure from south to north in pre-Cambrian times. Obruchev recognized the Baikal arc as part of the ancient belt which extended from the Sea of Okhotsk to the Altai, and separated two very different areas. To the north is the Siberian area, where Cambrian and Silurian rocks are predominant, and folds and fractures are weak; to the south is the Manchurian-Mongolian area, which is composed predominantly of Archean and plutonic rocks, and has been greatly disturbed by folds and vertical movements along fractures.

To the west of the Baikal arc are the mountains which Cherski called

* It might be objected from the commoner biological use of the word "nucleus" that it is essentially a small particle, and thus open to the same objection on point of size as applies to vertex; but the term "nucleus" was used in English for large masses long before its adoption in biology; it was apparently first used in English for the nucleus of a comet. In Latin it meant the kernel of a nut, so that the nucleus may be the larger part of a body. It is, moreover, thus used in biology, as for the nucleus or visceral mass of an Ascidian.

† Bailey Willis, 'Research in China,' vol. 2, 1907, p. 118.

his Sayan arc. Obruchev preferred to call it the Uigurian mass, after its aboriginal inhabitants. Suess pointed out that the Sayan arc is composed of two different elements. The eastern Sayans are western members of the Baikal arc; the western Sayans, which he has called the Minusinsk Scheitel,* are due to younger movements than the Baikalian, though they are of pre-Devonian age.

2. *The Altaid Zone.*—West again of the Minusinsk Sub-Nucleus is the third of Cherski's arcs, that of the Altai, to which Suess has attached special importance. He called it the youngest or Altaid Nucleus (Scheitel). To the south of it are a series of fold mountains of Upper Palæozoic age. These mountains Suess called the Altaids, and they and their fellows form, in his classification, the most important mountain element in the structure of Eurasia. Suess's Altaids do not correspond exactly with Cherski's Altai arc, which is Suess's Altaid Nucleus and the centre around which the Altaid folds were arranged. Suess's Altaids form the whole middle zone of Eurasia.

(*a*) *The name Altaid.*—The term Altaid is not altogether appropriate, for it is based not upon the main chain of the Altai Mountains, but upon their continuation in the Altai mining district of Siberia.

The term Altai is now applied to two dissimilar groups of mountains, the Mongolian Altaids and the Russian Altaids. The members of these groups are essentially different in composition, age, and structure. The Altai mountains of Mongolia form the great mountain line, 600 miles long, which is the southern face of the Archean plateau above the basin of the upper Irtish. The mountains of this line are the typical Altai mountains. Kropotkin, in the 'Encyclopædia Britannica' (11th ed. vol. 1, 1910, p. 758), calls them "the Altai proper," and says they are known also as the Ektagh, Mongolian Altai, Great Altai, and Southern Altai.

The Russian Altai consists of an area of mountainous country composed mainly of folded Palæozoic rocks, and it appears to have been originally adopted there as the name of a mining district. The name Altai is accepted for this district by various British authorities.† Some maps, on the contrary, such as those in Stieler's Hand-Atlas (1913, No. 57), and the map in Baedeker's Russia, do not use the term Altai for the Russian area, and limit it to Mongolia.

The Altai Mountains of Mongolia belong, however, to the Primitive

* Suess's Baikal, Minusinsk, and Altaid Scheitel as sections of the greater Scheitel may be called sub-nuclei.

† *E.g.* Keith Johnston's Royal Atlas, 1894, includes it on plate 28, and on plate 29, Central Asia, the term Altai is not used for the Russian Altai, the chief member of which is marked as the Korgonsk range, and the Mongolian Altai is marked as the Bolshoi (or Great) Altai range. Fullarton's 'Gazetteer of the World,' vol. 1, 1856, p. 186, remarks: "In fact, the name Altai should be restricted to the great range which, running from south-west to north-east, separates Zungaria from Mongolia."

Nucleus. Hence the typical Altai Mountains, which Kropotkin calls "the Altaids proper," are not Altaids in Suess's terminology.

(*b*) *The Western Altaids.*—Asia, south of this Altaid Sub-nucleus, according to Suess, is traversed by a succession of Altaid waves, which include the Tian-shan, Bei-shan, the Lun-shan, Nun-shan, and central Kuen-lun mountains. To the west of the Tian-shan the Altaids are continued, according to Suess, along two lines. The more southern line runs from the Pamir through the Hindu Kush,* and the Caucasus; it crosses southern Russia, and includes the hills of southern Germany, Belgium, central and north-western France, north-eastern and eastern Spain, and Portugal. The more northerly line passes through the mountains on each side of Lake Balkash, and through the Kirghiz steppes toward the Urals.†

(*c*) *The Posthumous Altaids.*—In northern Africa some of the mountains of the north-western Sahara and part of the High Atlas are interpreted by Suess as Altaids; but between them and southern France and Germany, all the land, except parts of Corsica and Sardinia and the western part of the Spanish peninsula, belongs to Suess's class of Posthumous Altaids, of which the most important are the Alpine mountains, or Alpids. The Altaids of Europe Suess classified into two groups, the Altaids proper, due to Upper Carboniferous folding, and the Posthumous Altaids, or Alpids, due to Kainozoic folding.

Suess attributed the Alps, Apennines, Carpathians, Balkans, the mountains of eastern Spain, and the Atlas, as all formed in areas which had sunk inside the Altaid zone. These sunken areas lay in an Altaid framework, and were then buckled into mountain chains by its contraction. According to Suess, therefore, the mountains of the Alpine systems were due to the older mountain framework acting as a great pressure-frame, and not to a meridional shrinkage of the whole Eurasian mass.

(*d*) *The Eastern Altaids.*—The Altaids expand in width eastward. The Kuen-lun chains pass north-eastward through the Ala-shan and In-shan into northern China. In central China the Altaids are represented by the Tsin-ling-shan, which continue easterly from the Kuen-luns and end along a line that Richthofen regarded as the continuation of the Khingan fracture. Further to the south-east the Altaids are represented by mountain ranges which trend south-eastward through south-western China, Siam, and Annam, and by various mountain chains in the

* The Elburz mountains, originally included on this line, were transferred by Suess ('Antlitz,' 1901, vol. 3, part 1, p. 365) to the southern marginal chains, as part of the arc of Iran.

† As to the true position of the Urals, Suess recognizes some doubt. He noticed various features which suggest that they are the continuation of the Tian-shan system, but he finally adopted the conclusion that they are abnormal folds on the primitive nucleus. They are not strictly marginal, as the Russian platform of western Russia is part of the primitive nucleus.

Philippines, Borneo, and other western islands of the Malay archipelago; and from these the Altaids extend as far east as Timor.

The northern margin of the north-eastern Altaids is not clearly separated from the Primitive Nucleus, which in Transbaikalia includes a pre-Altaid tableland of lower Palæozoic rocks. This Palæozoic border of the Primitive Nucleus merges with the Altaids in the Ala-shan north-west of the Ordos, and in the adjacent parts of western China.

3. *The Marginal Arcs of Eurasia.*—According to Suess the third essential element in the mountains of Asia consists of the marginal arcs. They include a series along the eastern coast, such as the mountains of Japan, and the southern arcs, of which the most important is that of the Himalaya. The southern series is represented further east by the western mountains of Burma, and the disrupted mountain chain that once passed to the west and south of Sumatra. To the west the marginal arcs are represented by the arc of Iran in Baluchistan and Persia. Further west the marginal arcs are continued by the Pontic-Dinaric arc of Asia Minor, of the western Balkan peninsula, Cyprus, Crete, and the Gargano and Otranto promontories of eastern Italy. This arc is separated at its western end from the Alps by the Carnic mountains, which, according to Suess, are independent both of the Alps and of the Dinarics, and are older than both of them.*

III. Discussion of the Classification.

1. *The Value of the Foundation in Mountain Classification.*—Suess's classification has several recommendations. It separates the Himalayan line from the northern highlands, such as the Sayans, and from the north-eastern chains such as the Yablonoi and Stanovoi mountains; and so different are they in structure and geographical character that this separation seems thoroughly justified.

It should, however, be remembered that the formation of the outer face of some of the Asiatic highlands was at approximately the same date as the elevation of the southern fold mountains of Asia, and this agreement in age should not be overlooked owing to their structural differences. The age factor in mountains is of great importance, as mountains are rapidly lowered by denudation. The probabilities are great that all mountains which rise 15,000 feet above sea-level, or many thousands of feet above the adjacent country, are of comparatively recent geological age. For if such high lands are extensive in area they are gradually lowered by isostasy, and if they are narrow mountain chains they are cut down by denudation.

A geographical classification of mountains should unite those in which

* Suess's arguments for the separation of the Alps from the Dinarids are that the latter are marginal, Asiatic in character, and due to southward thrusts.

the relief is similar * owing to their being of approximately the same age and to their having similar structure. It should discriminate between fold mountains of different ages, between long plateau scarps and chains of fold mountains, and between fold mountains, dissected plateaus, and wide areas of rolling downs.

The essential geographical feature in a mountain system is its existing relief and not the early history of its materials. A building may be Gothic in style whether it be built of stone originally hewn for it or for some pre-Gothic edifice.

The first serious objection to Suess's classification rests on the excessive importance it attaches to early earth-movements which affected the foundations of the mountain areas. On this ground it unites such areas as Brittany and the Caucasus, which have different geographical characters, while it separates areas which are of similar geographical characters, such as the Pyrenees and the Caucasus. The foundations of most great modern mountain systems contain faults and folds due to very ancient earth-movements. The Alps, for example, contain traces of pre-Kainozoic disturbances, and though these may modify the course of the later foldings, they do not affect them fundamentally, and the earlier movements have only a minor influence upon the present topography. The old movements are of great importance in the geological history of the Alps, but they have only a secondary influence on their geography.

On the same ground Suess separated England south of the Thames and Severn, which he included in the Asiatic edifice, from the rest of Britain. This separation is based upon the old Caledonian movements which affected northern Britain, but have left no direct effect on the present topography. In analogy with the view that the Alps are posthumous Altaids, the British geographical features, which agree in direction with the Caledonian lines, might be regarded as posthumous Caledonids; but this course seems undesirable since, although some of the newer movements were parallel to the older lines, the two sets were due to different causes.

Suess's classification does not serve ordinary geographical purposes, for it links together elements which are different in their topography and in their geographical influences, political, climatic, and biological; while it separates elements which have similar geographical influence. A classification of mountains which represents the Alps as closer akin to the hills of Brittany than to the Himalaya, and makes the Dinaric mountains and the hills of Crete the European equivalents of the Himalaya, is obviously not intended as a guide in the comparison of existing earth forms.

The older scheme seems to me essentially correct in its reference of the

* This similarity must be interpreted with allowance for the strength of the rocks, their unequal resistance to folding and denudation, local variations in the intensity of folding, and the nature of the denuding agencies. Hence arise such differences in relief as those between the Pyrenees and Apennines, between the Alps and Atlas, and even between neighbouring sections of the same mountain chain.

Alps, Dinaric mountains,* and Himalaya, to the same class. The Alps, the Pyrenees, the Carpathians, the Dinaric arc, the southern mountains of Asia Minor, the Caucasus, the Himalaya, the western mountains of Burma, and some of the southern chains of the Malay archipelago, have several important features in common. They were all elevated in the same epoch of crustal folding which culminated in the Middle Kainozoic. They were all due to great crustal compression, and were therefore all formed by close folding combined with overthrusting.

The direction from which the thrusts came at any particular locality depended on local conditions, and is of secondary taxonomic importance; so also is the fact whether the newer and older foldings happened to coincide as in the Pyrenees or the Caucasus, or whether they were transverse as in the Carpathians. According to this view, Suess's Altaids belong to two distinct groups. Some, such as the Caucasus, belong to the Alpine-Himalayan system, for though they are on the site of Altaid mountains, their geographical importance is due to the Kainozoic earth-movements. Others, such as the Hercynian mountains of Europe, have not been renewed by recent folding; and it seems to me that Suess's class of Altaid mountains should be limited to those in which the present topography is not due to Kainozoic earth-movements.

2. *The Correlation of Europe and Asia.*—Objection may be taken to Suess's correlation of the geographical elements in Asia and Europe, and to his view that the Himalaya correspond in Europe with the Dinaric mountains and not with the Alps.

Suess's correlation of the two geographical units in the eastern and western sections of the Old World may be summarized in the following table:—

Element.	In Europe and Africa.	In Asia.
Northern highlands ...	Primitive nucleus	Primitive nucleus
Altaid zone	Mountains of Brittany, central France, southern Germany, etc.	Caucasus, Tian-shan, Kuen-lun, etc.
Basins of Altaid zone ...	Mediterranean	Mongolian Lake valley and Pre-Tian-shan rift-valley
Posthumous Altaids ...	Alps, Atlas	None
Southern marginal arcs ...	Dinaric arc	Himalaya
Depression south of marginal arcs	Valley of Shotts, Levant	Indo-Gangetic plain
Southern plateau	African plateau	Peninsula of India

The classification is open to several doubts and drawbacks. It is based on the view that the essential difference between the structures of Europe and of Asia is that the foundered areas in Europe are peripheral, and in

* The Dinaric Alps belong to a different subclass from the Alps, but to the same subclass as the Apennines and Tauric mountains.

Asia they are central, such as the amphitheatre of Irkutsk. But the whole of southern and eastern Asia is fringed by seas due to the foundering of the former margins of the continent, such as the Sea of Okhotsk, the Japanese, Yellow, and China Seas, the Bay of Bengal, the Arabian Sea, Persian Gulf, and Red Sea. Hence Asia has also been affected by marginal collapse, though Europe is not without central subsidences, such as the plain of Hungary; while as the western Mediterranean and the Black Sea are inter-Altaid, they may be regarded as internal.

The second distinction is that from the Sea of Azov to Texas all the western Altaids are backfolded, so that most of the mountains are overfolded from south to north; whereas in Asia the great later folding, which was contemporary with the posthumous folding of Europe, was from the Continent outward, being eastward in Japan, southward in the Himalaya, and south-westward in southern Persia. This reversal of direction between the later movements of Europe and Asia appears capable of simple explanation; for in Asia the mountains were thrust outward from the great plateau towards the nearest ocean basins, whereas in Europe the present basins were not formed until after the mountain folding; and they were, therefore, not available for the relief of the compressed crust.

3. *The Relations of the Mountains of North-Eastern Siberia.*—Suess's separation of the Himalaya from the mountains of north-eastern Asia appears to be valid. Such mountains as the Yablonoi, Stanovoi, and the Khingan mountains have none of the features of the Alpine chains. Suess even proposed that the word Stanovoi should be omitted from the maps, since this so-called chain is only a plateau or height of land, of which the steep face towards the Pacific is due to the foundering of the Pacific floor. The Yablonoi mountains are a better-marked range, because they form a narrow band of high land between two great valleys. The work of Kropotkin threw much light on the essential structure of this district, and prepared the way for Obruchev's conclusion that these mountains are only long horsts left between two rift-valleys. Cherski and Kropotkin considered that these valleys had been made by denudation, but Obruchev * rejected this conclusion, and attributed their formation and the basin of Lake Baikal to "disjunctive dislocations," and Suess has adopted Obruchev's conclusions. The views of this country from the Siberian railway show the characteristic features of a series of parallel block-mountains and rift-valleys, so that the tectonic origin of these valleys seems to me correct. The Khingan mountains are also due to faulting, for they are the eastern dissected fault-scarp of one of the plateaus in the Primitive Nucleus,† and they are described by Obruchev

* The most accessible statement of Obruchev's views are in his paper "Orographik und Tektonik Transbaikaliens, auf Grund neuester russischer, von 1895 bis 1898, ausgeführter Forschungen." '7th Inter. Geogr. Kongress,' vol. 2, 1899, pp. 192–206.

† That the Primitive Nucleus does not extend as far as the Khingans is suggested by the title of the chapter in the Oxford edition, "Peripheral Formations to the East of the Vertex." The title in the original says, "im Osten des Scheitels."

as the tectonic boundary between Transbaikalia and Manchuria. These two regions appear to have no Alpine chains, and the eastward continuation of the Alpine-Himalayan line passes from the Himalaya, through Burmah, to the Malay archipelago.

In some respects, therefore, Suess's explanation seems to me a valuable advance; but in others the traditional classification seems of greater geographical usefulness. The partial rejection of Suess's classification does not, however, invalidate his main principles of mountain distribution. The chief cause of mountain formation appears to be the slow contraction of the Earth, which, though taking place continuously, results in the formation of mountain chains at special epochs of crustal disturbance. These disturbances produce bands of intense folding and overthrusting; and these bands of crowded folds have become more and more restricted in width and distribution, as the Earth grew older and its crust thicker. The direction of these folded bands has been greatly influenced by rigid massive crust blocks.* The folds have been sometimes flung against these inflexible forelands and become asymmetric and broken, like waves of the sea which beat against a projecting headland. But further from the forelands the folds are symmetric and shallow, like the swell on the open sea.

The mountain folding is followed by the collapse of great crust-blocks during the reaction from compression. The subsidences around the continents have formed the great marginal deeps and sea basins. In the interior they have caused broad sunklands and long rift-valleys. These foundered areas may break across the mountains; but their usual position is behind the fold mountain chains which, owing to the relief of pressure, often undergo secondary backfolding towards the sunken areas.

Intense folding is a deep-seated process, and may be accompanied by a still deeper subcrustal flow; the direction of the main movement, during a period of mountain formation, may therefore not be correctly indicated by the superficial disturbances. Owing to the action of subcrustal flow, as Bailey Willis has pointed out, the pressure which formed the Asiatic mountains may have acted in the opposite direction to that accepted by Suess. Nevertheless his doctrines of mountain distribution appear to remain valid, and the third volume of his great work will doubtless take its place as one of the primary documents on the geography of Asia and the classification of its mountains.

Dr. J. W. Evans (before the paper): I have been unexpectedly asked to take the chair on the occasion of Prof. Gregory's lecture on the Classification of the Mountain Systems of Eurasia by Prof. Suess. I feel it an honour to do so,

* De Launay in his 'La Géologie et les Richesses Minérales de l'Asie' (816 pp., 10 pls.), 1911, lays especial stress on the influence of the older crust-blocks on the trend of the mountain lines.

because the occasion is an important one. It is the first time since the death of that great geologist that we have an exposition of his views in this country, and I am sure there is no one so well qualified to give it as Prof. Gregory. For some twenty years past Prof. Gregory has been, so to speak, the apostle of Suess's views in this country; in fact, a great many of us owe our knowledge of them to him. I certainly do myself, and I look forward with great interest to hearing them put before us to-day.

Prof. HERBERTSON (after the paper): It has been a great pleasure to listen to Prof. Gregory's admirable synopsis of Suess's views on the structure of Eurasia. Those of us who have attempted to make such an abstract for ourselves know how much time and trouble it takes to disentangle the main facts and conclusions from 'The Face of the Earth' in spite of its occasional summaries. We admire and thank Prof. Gregory for his characteristically lucid account, which will be read with gratitude by many a student of geography when it appears in the *Geographical Journal*.

My first acquaintance with Suess's generalizations was gained from Prof. Steinmann's lectures some twenty years ago; and I remember, when writing the general chapter on Asia for Dr. Mill's 'International Geography' a little later, with what delight I read Suess's recently published paper on the "Asymmetry of the Northern Hemisphere," which contains many of the ideas developed more fully in his larger book. No one can study such morphological works without gaining enormously, not merely a knowledge of structural processes and results, but an understanding of topography which cannot be obtained in any other way. The idea of the building up of the northern land masses round centres or nuclei of early consolidation by successive additions outwards of belts, first sufficiently plastic to be folded and then slowly becoming rigid, while further out a new pliable belt appeared, is not merely fascinating, but invaluable for the study of the topography as well as of the morphology of the continents. Each morphological area has its own set of topographical types, and it is an immense simplification to the geographer to know that only certain types of surface features can be found in each successive morphological belt. The dissected Trans-Baikalian highland, an old mountain system base-levelled, then elevated as a mass or block in which great valleys have been eroded, is akin to the Black Forest and other highlands of Central Europe, and not to the more recently folded systems such as the Alps. I have been accustomed for some years to call such base-levelled old mountain systems which have been raised and carved into valleys and ridges by erosion, highlands, and to call mountains the belts of more recently folded strata. Most of the highland areas are under 6000 feet, while much of the land over 6000 feet is part of the great mountain systems. Mountainous structure of course occurs below 6000 feet, but the topography of the two types, mountain and highland, is usually very different, and hence it is important for the geographer to make the distinction.

So I agree with Prof. Gregory that the southern mountain system of Eurasia, from the Pyrenees and Alps to the Himalaya and the mountains of western Burma, should be grouped together and distinguished from such highlands as those of Britanny. I also sympathize with his objection to the translation of *Scheitel* by "vertex." The German term is not a happily chosen one, and nucleus certainly represents Suess's idea more truly than the more literally accurate vertex.

In considering Suess's work we must remember what he was attempting. He was trying to sketch the chief phases of the Earth's structural history, and his divisions are based on structural and historical considerations. The value of this work for geographers is found in our being able to associate his divisions with certain types of surface forms; but we must not expect that his groupings and those of the geographers will agree in all respects. Such a paper as that by Prince

Kropotkin on the "Orography of Asia," published in the *Journal* (vol. 23, pp. 176 and 331), is perhaps more useful to most students of geography. But those who have taken the trouble to study Suess, and to compare the morphology and the topography of Eurasia, will never regret it.

Having had so much from Prof. Gregory we naturally ask for more. I should be glad if he would give us, say at another afternoon meeting, his own views on the structure and topography of Eurasia, and in doing so to review the papers on the structure of Eastern Asia which were among the latest important publications of the late Baron von Richthofen, the views expressed by Prof. de Launay in his works, as well as other recent contributions to this very complex subject.

Prof. Lyde: I only speak under protest and by special request, and I protest from two points of view. One is, the paper deals with a subject I know very little about, and the other is that, so far as Prof. Herbertson has referred to some points, I am myself his pupil in all those matters. One or two things I might suggest, but only from the narrow point of view of economic geography. Prof. Gregory did refer to the main point; he says, "In some respects, therefore, Suess's explanation seems to me to be a valuable advance, but in others the traditional classification seems of greater geographical usefulness." That seems to me to be exactly the point. For geographical purposes, geological classification does not seem to be what we need. Then he says, "The essential geographical feature in a mountain system is its existing relief, and not the early history of its materials." From a teaching point of view, certainly it seems to me absurd that one should dissociate such absolutely similar sierra types as the Pyrenees and the Caucasus, and associate either with an area like Brittany. Again he says, "A geographical classification of mountains should unite those in which the relief is similar *owing to* their being of approximately the same age and to their having similar structure." I do not quite go with that "owing to." No doubt it is only when you get areas of the same structure, under the influence of similar processes, and those processes carried to a similar stage, that you would get precisely similar results. From my own point of view, I would prefer that the human note should be emphasized, even in the structure of mountains. Prof. Gregory says, "Hence the northern border ranges like the southern chains have been described as Alpine. If the term Alp be used in its original sense for a mountain pasture, these mountains may be justly called Alpine, but they are not Alpine in internal structure." If they are called Alpine from the point of view of pasture, I would suggest the word should be written with a small "a." But in economic geography I cannot see that internal structure is the vital consideration. I would practically decide whether a range is Alpine by the test of whether we can or cannot tunnel it. It does not matter to me whether the Alleghany scarp has or has not been folded along its upper edge in comparatively recent years; that is of no vital importance. The essential thing is that the Pennsylvania and Ohio railway has to climb up a permanent 2000-feet level. In the first page of the paper he refers to the current classification. I would suggest that this is not rigidly current in economic geography, at all events in teaching it. I know a good many economic geographers who would not even accept it as it stands, because the human note is the essential thing, even about the mountains; and it is expressed in such terms as transport, economic products. One would ask whether such and such a formation is granite, or—if it is sedimentary—whether it is of an age that would give it the possibility of coal. With regard to transport, one would ask, Is it an Alpine area with typical alternation of peak and pass, or a sierra with typically even skyline? In the one case, one wants, no doubt, the time relation of the particular area to its neighbour, *e.g.* the metal-bearing scarp to its coal-bearing flank; in the other case, the space

relation, *e.g.* the level and gradient. But I would prefer a "current" classification into highland areas and highland lines. One may talk of a peneplain or block as being old, and of the line as being young folded mountain, but the essential point is whether the mountain is of the Alpine or the sierra type. The only point I want to press is that in all these classifications, if you want to be useful geographically, you must emphasize the human note, partially at all events.

Dr. EVANS: We have heard a great deal of mountain ranges in various parts of Asia of which we have hardly known more than the names before. When I first studied geography we used to take a relief map of Asia, more or less incorrect, of course, and follow the lines of mountains and form them into groups, and show how they were collected together in certain points in knots, and further on expanded like an ample sleeve, so as to form a series of radiating mountain masses, and then we were satisfied we had made a scientific classification. The man of science, with all deference to Prof. Lyde, believes that the only classification is that which is genetic, which explains how the mountains came to take their present form, and I am convinced that even if our interests are mainly economic, we shall understand and remember the chief features of the mountains and their relation to human development and industry all the better if we understand their structure and their history. This history is in the main the history of the building of the continents. As a general rule, the oldest part of a continent consists of ancient rocks which have been folded into a solid mass at a remote period. They constitute what Suess calls the "Scheitel," and Prof. Gregory the nucleus, though I would suggest that a more suitable word would be the core. This core has, by the operation of forces of denudation, been long since levelled to a plain or peneplane, and as the result of its original compression it has been converted into such a solid block that it has in most cases resisted all further change, except, of course, a certain amount of faulting, of which Prof. Gregory has given us some valuable studies. Such a block has formed the centre on which the building up of the continent has taken place. At different geological epochs, as a result of the compression of the Earth's surface, the softer rocks round the core have been thrown into folds, giving rise to mountains of the Alpine type. In course of time, these too, in their turn, have been ground down to form an extension of the central block. The latest of these folds have given rise to the present mountains of the Alpine type, which form arcs on the margin of the continent, and they in turn are destined to go through the same process of planation.

If subsequent crushing of the older harder rocks occurs, the mountain masses which are formed must differ in character from those which result from folding of later, comparatively soft strata. This is illustrated in the south-west of England. There the great movements of Permian times folded the softer Carboniferous rocks into small undulations, often of a diagrammatic character, while the Devonian rocks, which had by that time become thoroughly consolidated, were crushed and overthrust in a totally different manner; and in the early part of the Secondary Period, when the mountains resulting from the earth-movements still existed, there must have been fundamental differences in the external characters of the hills of the Carboniferous and Devonian districts. Everywhere we have not only got to take into consideration the date of the folding, which is of great importance, because it is only those which are of late date which are represented by mountains of the Alpine type, but also the character of the rocks which were folded.

It is not too much to say that it is mainly to Prof. Suess that we owe the great progress which has taken place in the study of mountain building in the last quarter of a century; but at the same time I agree with Prof. Gregory that his

classification is open to criticism. A grouping which separates the Alps and the Himalaya, and places mountains like the Caucasus in the same category as the hills of Britanny, can only be regarded as hopelessly misleading. I am sure we are very much indebted to Prof. Gregory for bringing the subject before us, and I hope that some of those who have listened to his interesting paper have registered a vow that they will read the whole of the book that forms its subject, the third volume of that great monumental work of Suess, 'Der Antlitz der Erde.'

Prof. GREGORY: I have to thank all the speakers for their kind remarks, and am glad to hear that Prof. Herbertson also prefers nucleus to vertex, and of his use of the term "highlands." In regard to the question whether nucleus or core is the better, I long hesitated between those two terms, and talked it over with others, and though from the literary point of view I prefer core, nucleus on the whole seemed rather better. If everybody agreed to use core, I would certainly adopt it. The main point of this afternoon's discussion has been as to the basis of the ordinary classification of mountains for geographical purposes. I think any such classification must be essentially a compromise; and when I find Dr. Evans saying it must be genetic, while Prof. Lyde declines to accept genesis at all, I hope I have suggested a satisfactory compromise. But even from the point of view of the economic geologist it does not seem quite safe to disregard structure. One railway contractor went into the bankruptcy court because he contracted for a railway tunnel on a wrong idea of the structure of the mountain. The fact that a mountain range is tunnelable does not make it necessarily Alpine. Some mountain blocks are so long and narrow that they can be tunnelled, yet they are simply blocks left by faulting. I think it is going too far to disregard structure altogether, and I think the term Alpine should be limited to mountains of which the formation has been largely due to folding.

THE LOST FORESTS OF AFRICA.

By Captain C. H. STIGAND.

WHEREVER the white man, in his first explorations in Africa, has met with agricultural tribes living in juxtaposition to forest areas he has found those tribes busily destroying the great timber trees with fire and axe, and extending their cultivation at the expense of the forest area. The native has learnt that the fertile soil, freshly cleared of forest, yields him a most productive harvest for his crops. As he is, as a rule, quite innocent of the arts of scientific agriculture and manuring, this freshly cleared land begins to get poor after a few years of cultivation. He then proceeds to clear more forest, rather than make use of fallow land already cleared. As long as there is any forest to attack he continues to devastate it either until it is finished, or, in recent years, until the white man steps in to protect what remains.

Stanley, in his journey from the Aruwimi to Lake Albert, speaks of the enormous clearings he encountered in the great forest, round native villages. Even before coming to the cultivated areas it was often necessary to pass through miles of fallen trees, left to dry until ready for burning. In British East Africa the natives have continued

encroaching on the forests of the escarpments, Kenya and elsewhere, until stopped. If the white man had deferred his occupation of Africa another hundred years the chances are that, in the east at any rate, he would have found no forests. It would then have been difficult for him to believe that some of the expanses of prairie and bush he met with had once been covered by fine trees.

The usual native method of clearing is to cut down smaller trees and undergrowth with the axe. These are left till dry, and then piled round the big trees and fired. Finally the big trees fall and are left till dry enough to burn. It might be thought that if forests were being destroyed in some parts they were growing up as fast in other places, but this is not so, at least in the parts known to me, East and Central Africa.

First let me explain the kind of forest of which I am speaking. It is not the country of scrub and bush, interspersed with long grass and an occasional big tree, or the bush of gnarled and stunted thorn trees, or else the great woods of anæmic and thin trees, struggling upwards as if for air, but giving no shade. All these types of country are occasionally spoken of as "forest," but I speak of the great forests of timber trees, festooned with lianas and vines, to the floor of which, deep in damp mould, rotting leaves and decayed and fallen trees, the sun scarcely reaches. An area of such a forest, once it is cut down, does not grow up again. Its edges may encroach imperceptibly on the surrounding country, where it is not attacked. For instance, the last tree may grow and spread its branches further over the outside land, dropping its leaves and dead twigs over the earth until enough humus has been formed to encourage a young tree to take root, and the latter may in twenty or thirty years have grown up sufficiently to have reclaimed another few yards of the unforested area. This may happen, but such slow progress can do little to counteract the destruction of the native clearings, progressing at the rate of perhaps several hundred yards a year.

The soil of the cleared area is subjected alternately to the fierce rays of the sun, which dry up the moisture, and the tropical downpour which washes all the good out of it and into the nearest watercourse. The termite establishes himself and eats up any dry stumps and woody substance to be found. After a few years of cultivation the native abandons the spot for fresh ground, and it becomes covered with rank weeds or long grass. This is subject to the yearly bush fires, which further dry up the soil. Perhaps after a time gnarled and stunted bush and scrub is able to make headway against the yearly scorching, but the magnificent timber trees are gone for ever.

It stands to reason, then, that the forested areas must formerly have been greater than they are now; how much greater depends on how long the native has been at work on them. Presumably the native has been clearing forest, more or less, ever since he learnt the art of agriculture, though at first he may not have appreciated the full value

of virgin soil. It is also possible that the continent may have been more sparsely populated at that time, but not of necessity, as slave raiding, intertribal wars, mahdism and sickness have, to our certain knowledge, considerably reduced the population of large areas.

I am unaware if there is any definite evidence available as to the date the central African acquired his agricultural habits, but we can certainly say that he was not cultivating many of his present products prior to the sixteenth century. For instance, maize is supposed to have been unknown in the old world until Columbus brought it to Spain in 1520. It now forms the staple food of many tribes, whilst bananas and manioc (or cassava), the principal diet of others, were originally discovered in America. These three, together with tobacco,* were probably introduced by the Portuguese to their African settlements on the coast, and from thence spread inland. The sweet potato and the sorghum (or jowari), the latter perhaps the most widely cultivated crop in Africa, are supposed to have come from India, and probably were of earlier introduction; possibly the sorghum may have reached certain parts of northern Africa long before. However, prior to the arrival of the American crops it is probable that the central African was more of a hunter, and less of a cultivator, than he is now.

Even if we assume that he has only been an active cultivator from the probable date of maize and manioc reaching him—say, three hundred years—and taking into consideration his wasteful methods, this time would be sufficient for a populous tribe to eat 20 to 40 miles into a forest. So a forest belt of from 40 to 80 miles in width might have been made to disappear if there were a tribe on each side of it. Sorghum-planting natives working southwards from the north might have had time to make much greater inroads.

Let us now try to obtain evidence of where forests have actually extended to, and see how far the result agrees with the above. First, however, it would be as well to define roughly the existing forest areas. The tropical forests of Africa, like those of South America, follow the line of the equator. Starting from the east we have, on the coast, a small forested area to the north of Mombasa. Travelling westwards we get a patch on the slopes of Mount Kilimanjaro and another round Mount Kenya. Next a strip on the Aberdare range, and strips west of this on the escarpments either side of the Rift valley; that on the west side being by far the longest and broadest. In Uganda we get the Mabera forest, and to the west the Budonga forest, and again, south of this, forest about Ruwenzori. Crossing Lake Albert, after a bare strip on its western shore, we get the great Ituri and Congo forests, prolonged westwards and northwards by the forested region of the French Congo, Cameroons, Southern Nigeria, and the west coast.

* Certainly the lanceolate-leaved tobacco of the Virginian type. There is also a tobacco of a short and broad-leaved type.

We thus see that, whereas the east coast is almost without forest, the further west one goes the greater and more continuous the forests. The whole is shaped, more or less, like a triangle with the apex on the east coast and the base on the west.

The forests of the west coast are mostly in low country; those on the east are mostly on the slopes of high mountains. The latter may be attributed to the greater moisture of the highlands; or it may be that the slopes of mountains would be the last places which the natives would choose to clear for cultivation.

Mount Kenya is surrounded by a belt of forest, and, about 40 miles to the west, the slopes of the Aberdares are similarly clothed. Between the two is the thickly populated country of the Kikuyu, a land of steep and bare red hills and treeless ravines. At first sight it is difficult to believe that this country has ever been under forest. The following considerations, however, seem to prove that it was so:—

(1) On either side the natives can be found encroaching on the forested slopes, and there the conversion of the rich forest into bare red hills can be seen in all its stages;

(2) Streams from the mountains pass through the populated country in treeless valleys. Where they emerge from the inhabited country into the uninhabited plains, they may be found with their banks lined with big forest trees;

(3) It is the custom of the people to keep certain spots, generally on hilltops, as sacred groves, no man daring to cut down or disfigure any vegetation growing on such a spot. Owing to this, one finds dotted about in this treeless country little groups of trees, sometimes bearing lianas, characteristic of forest vegetation.

Seeing these miniature islands of forest, left in an ocean of cultivation, it is not difficult to picture a forest formerly stretching from Kenya, on the one side, to the Aberdares on the other. The Kikuyu are an immensely prolific people; they are known to have increased enormously of late, and are believed to be fairly recent arrivals in this locality.

There is, moreover, a further proof of the recent destruction of forest in this part. Just about midway between the two forests is one of these little groves on a knoll, and this grove is, or was, inhabited by a family of a dozen or more colobus monkeys. Now, the colobus is perhaps the most purely arboreal monkey there is; he does not come to the ground. In his natural state he lives flying from tree to tree, and in this manner he covers considerable distances. In the forest their peculiar croaks can be heard coming nearer and nearer, passing overhead and receding again as they travel. It is inconceivable that this group of colobi could have come overland from the nearest forest, 20 miles distant, or that they inhabit this very restricted area from choice. I presume that native clearings formerly left a considerable patch of forest, severed from those

on each side, and that this area was reduced year by year, till at last these colobi had only this sacred grove left to them.

Similarly, it may be assumed that all forest patches, where colobi are found, were at one time joined up together. For instance, they are found in the Agurr mountains east of Nimule, a locality surrounded by more or less sterile country. They have, however, there a certain amount of area to inhabit, and can follow the tree-lined streams for considerable distances. The period at which this country was connected with other forests may have been indefinitely long ago. It is only when the colobus' quarters are as restricted as those of the sacred hill, that it is impossible to believe that they have long been confined to such a small area.

A typical forest denizen is the chimpanzee. The farthest east this animal occurs is in the Budonga forest of Uganda. He is common in the Ituri forest. The farthest north I know of his presence is in the gallery streams 20 or 30 miles north-west of Mount Wati. I believe further west he is found still more northwards. Such places are far removed from his typical haunts. There are here no extended areas of forest, but only the indications of the remains of forest in small patches and the tree-lined "gallery" streams. I cannot help thinking that at not so distant a date these parts were linked up with the Ituri and Congo forests. The green parrot, in its distribution, closely follows the chimpanzee. I do not know of its occurrence so far north as the latter. The deduction I would make is that the parrot, on finding the forests receding southwards, retired with them, whereas the chimpanzee, on finding himself isolated, was unable to do so.

The okapi and the pigmy are also typical forest dwellers. They were known to the ancient Egyptians, as is proved by a drawing of the former and a mummy of the latter. There is a record of an expedition being sent to fetch some pigmies to Egypt about 3400 B.C. Now the earliest mention of anywhere south of Egypt is about 4000 B.C. At the date of the above expedition the negroid peoples extended as far north as Assuan. The ancient Egyptian rulers appear never to have included in their dominions country any further south than about the fourth cataract, or the Atbara, and that only at rather a later date. When this expedition left, Assuan was the southernmost limit of their rule.

The nearest point to Egypt that the okapi and pigmy are at present found is the Ituri forest. To reach that locality the expedition would have had to negotiate the cataracts between Halfa and Khartum, to have got their ships on the upper reach. They would then have had to proceed about one thousand miles up the Nile, passing through the sudd region, until they reached the limit of navigation, and then left their boats and proceeded some hundreds of miles over land. Considering how little the Egyptians ever extended their rule into the savage countries to the south, it is difficult to believe that they had an intimate knowledge of a country so far distant. It is easier to believe that the okapi and the pigmy were

found in those days nearer to Egypt, possibly in the Bahr el Ghazal, and hence that the forested area reached to that locality.

It is said that the ancient Nile gauges on the Halfa reach show that the river at high Nile was then much higher than it is now by some 26 feet. In the course of time it might be expected that the bed of the river has worn to a lower level, but not so rapidly as this. A large forested region on the upper Nile would have meant more rainfall and consequently a higher Nile.

Above is collected a certain amount of evidence, though very meagre, as to the extent of former forests. Before trying to materialize it let us consider—

1. The valley of the Nile as compared to the basin of the Congo.

2. The desert regions of the world as compared with the regions of tropical vegetation.

1. The valley of the Nile is, generally speaking, dry and lacking in vegetation, whereas the Congo basin is moist, well watered, and thickly clothed. On the Gado-Welle frontier the change is very marked. On the Nile side of the frontier the country is less fertile; it bears chiefly thorn and stunted trees, and the watercourses are poorly clothed. Directly the frontier is crossed—and one meets streams which find their way ultimately into the Congo—one finds them lined with a luxuriant growth; many of them form what the old travellers called gallery streams, viz. streams flowing in a narrow belt of forest. This difference in vegetation may be partly due to the steeper fall of the ground on the Nile side, for whereas the country drops 1000 feet or so to the Nile in 100 miles on the one side, it drops only a few hundred feet in a similar distance on the other side. Yet to the east of the Nile at this part, where the country is more or less flat, its sterile nature is equally manifest. The whole valley of the Nile gives one the same impression, whereas the Congo basin gives one the idea of moisture and luxuriant growth. However, the forest belts on the banks of the Alla and the Azuka rivers, in Uganda, south of Lake Albert, show that a forest growth is not incompatible with the upper parts of the Nile. The deduction I would make from this is that the upper parts of the Nile were probably once forested to a certain extent. The loss of a forest area, together with the lesser rainfall, has imposed on the upper parts a sterility natural to somewhat lower stretches. The basin of the Congo, with its greater rainfall, is, *par excellence*, the region of forests.

2. The desert regions of the world are so uniformly in one line of latitude throughout that the chances are that they are caused by considerations quite apart from human agency. It would thus be futile to expect to find traces of forest in a well-defined desert area. Similarly the line of tropical vegetation on the equator is so consistent in all parts of the world, that where it is absent one may be led to suppose that there is a certain amount of probability that this was not always the case.

Desert regions are found, very approximately, between the latitudes of 15° and 40° both north and south of the equator. In the northern hemisphere there are the deserts of Gobi, Rajputana, Arabia, Sahara, and the salt lakes of Utah all, more or less, on the same line. In the southern hemisphere there is less land, but where continents exist, on the corresponding lines of latitude, we have the desert regions of Australia, the Kalahari, and the shingle desert of Patagonia. Practically all these deserts are more pronounced on the west sides of their continents than on the east, and many of them are protected from the open sea on the east side by a strip of more fertile land. For instance, we have the more fertile parts of China interposed between the Mongolian deserts and the sea. The deserts of Australia, the Kalahari, and of North America are all to the west of their continents, with more fertile country to the east. If one can make any deduction from this it is that fertile areas, and hence old forest areas, are more likely to have encroached on desert areas to the east than they are to the west.

An area of luxuriant tropical vegetation clings closely to the equator throughout the world, viz. New Guinea, the Congo, and the Amazon basins. In East Africa, on the equator line, this luxuriant belt is more or less missing, or only appears in patches. The inference is that it was not always so. South of this in Portuguese East Africa, Nyasaland and north-eastern Rhodesia there seems to be no evidence of former forest, either from the presence of forest trees or of forest denizens. They are lands of thin struggling trees, with only an occasionally big tree in a river-bed. Indeed, these are countries outside the tropical belt, and further west we get the desert country of German South-West Africa. The presence of the Sassaby, a denizen of the open plains, near Lake Bangweulo, seems to point to the country south of that lake being formerly more open than it is now. For these Sassaby are cut off from the main habitat of the species to the south, by several hundred miles of bush country. Presumably, at some time or other, that country must have been more open to allow them to reach that spot.

The final deductions I would make from the evidence collected above is that about three hundred years ago, when the Central African first began cultivating the plants introduced by the Portuguese, there was an almost continuous forest belt across Africa. Leaving the coast north of Mombasa, it may or may not have reached the Kenya forest. Anyhow, the Kenya forests extended then southwards of their present limits. This mass joined the Aberdares by a broad strip of forest 40 to 80 miles broad, and continued unbroken until the eastern edge of the Rift valley was reached. Here it may have crossed the valley about Nakuru, or only occurred in patches, as it does now in a few places. On the west side of the valley there was a big stretch of forest extending as far north as Elgeyu, and this mass proceeded west almost unbroken as far as Muhoroni and north-westward, embracing Elgon. A great part of Uganda was

forested, and the forest crossed the Nile north of Lake Albert and connected with the Ituri forest. The latter then extended northwards, on the Congo side of the Sudan-Congo border, till level with Mount Wati, and from there swept westwards across the south part of the Welle, with perhaps occasional indentations in the line, until it joined up with the forests of the French Congo.

Five thousand years ago, at the time the Egyptians sent their expedition to catch pigmies, the forest areas must have been very much greater, and then, probably, the natives of Central and North Central Africa had not yet begun to clear the ground. We know that then the Blacks extended farther northwards, and probably the heart of the forest in Central Africa was quite uninhabited. The people living on the edge of the forest gradually cleared and pushed southwards, allowing the blacks about Assuan, in their turn, to retire from that neighbourhood. Arab invasions from Arabia probably pushed the original inhabitants still further backwards.

In those days the forests may have extended down the Nile to Rejaf, have occupied all the Welle and penetrated far into the Bahr el Ghazal.

SEASONAL DISTRIBUTION OF RAINFALL IN THE BRITISH ISLES.

ALTHOUGH the seasonal variation of rainfall in these islands is comparatively small, it is of a highly interesting character, so that the detailed paper on the subject lately published by Dr. H. R. Mill and Mr. C. Salter, of the British Rainfall Organization, is specially welcome.* It is valuable not only because of the various facts elicited, and marshalled in a novel manner, but also because, the general causes of rainfall being now fairly understood, it gives an impetus to the profitable explanation of some of them by theory. The maps, which are based on records from 283 stations during the thirty-five years 1875–1909, and duly produced in the paper, show for each month of the year, and for seasonal groups of months, the percentage which the average rainfall of the month and season bears to the average annual fall, this being done by a series of "isomeric" lines.

It is generally admitted that thirty-five years is a period long enough to furnish satisfactory values of average rainfall, and when in 1910 Dr. Mill thought it desirable to revise the average rainfall values for use in "British Rainfall" the period chosen for the new average was the said thirty-five years 1875-1909. Although the Camden Square record cannot supply two consecutive thirty-five year periods, there are twenty-two overlapping periods of that length between 1858 and 1913, and it is found that the curves derived from them representing the march of the seasonal variation resemble one another very closely, with the result that the basis of thirty-five years may be taken as yielding a fair approximation to normal conditions. Moreover, if the differences between the overlapping thirty-five year periods are small in the case of Camden Square, they would be found even smaller, so Dr. Mill feels

* "Isomeric Rainfall Maps of the British Isles" (*Quart. Journ. R. Meteor. Soc.*, January, 1915).

assured, for stations of higher average rainfall. It is interesting, however, to note in this connection that there are two months in the year which appear from a comparison of the overlapping periods for Camden Square to be undergoing a progressive change, namely September, which has been becoming drier, and June, wetter of late years, and the September change seems to apply to the country as a whole, not only to the London district.

The salient features of the seasonal variation as exhibited by the maps in question are best exemplified by the months of January, April, July, and October. In January, although the general rainfall of the country as a whole is less than in December, the winter type of the distribution attains its full development, which means that highest percentages occur in the wet, hilly regions in the west and north-west, and the lowest in the dry, flat regions of the east. In the western Highlands, where January is actually the wettest month of the year, the percentage is as high as 12, whereas over East Anglia and Lincolnshire it is less than 7. By April, the driest month of the year over a large part of the country, a summer type of distribution is already apparent, the percentages falling in the wet western districts and rising in the east; but the differences in this month are not great. The lowest percentage, 5, occurs in the very region which had 12 in January, whilst over Central England the highest figure, approaching 8, is found. In April, too, a secondary relationship is brought out in that the inland districts are somewhat wetter than the coastal.

The map for July reveals the full development of the summer type of distribution, and is almost exactly the inverse of that for January. The highest percentage, 11, occurs in the dry Fen country, the only district where July is the wettest month of the year, although around London July is wettest next to October; the lowest, 7 or below, in all the wet hilly regions in the west, viz. Devon and Cornwall, Wales, the Scottish highlands, and the west of Ireland. It must be remembered, however, that the actual rainfall over the east of England in July is less than that in the west, where the percentage of the annual fall is lower. By October the conditions are the inverse of those in April, this month over the country as a whole being the wettest of the year, and the inland regions being drier than the coastal. The winter type of distribution, however, though in process of development, is not yet quite so apparent as is the summer in April,* the highest isomer, 12, passing right round the coast of England and Wales, and the lowest, 9, embracing central Ireland. In December the rainfall is the greatest of the year over the greater part of the wet western districts, and is nearly everywhere else greater than in January, whilst the winter type of distribution is scarcely less marked. For the British Isles as a whole the months of October and December, considering the relative areas covered by the various percentage values, are the wettest of the year, the percentage which their average fall bears to the annual average being in each case 10·6, but the area over which October is the wettest month of the year is greater than that over which December is; whilst in the generally driest month, April, the percentage falls as low as 6·1. For the twelve months the percentages for the whole kingdom are: 9·1, 7·5, 7·5, 6·1, 6·3, 6·6, 8·0, 9·5, 8·2, 10·6, 10·0, 10·6: but the figures, of course, are different with reference to England, Scotland, Ireland, and Wales taken separately.

Briefly, we may describe the character of the seasonal variation of rainfall in these islands as bi-phase; for whereas on the one hand there is a percentage excess

* The reason being that the transition from the summer to the winter distribution which already begins to show on the September map is nearly obliterated in October by peculiarities connected with the generally high autumn rainfall.

in the wet hilly western parts of the country during the winter half of the year (October to March), with maximum in December and January, and a percentage excess in the dry, flat, eastern parts during the summer half (April to September), with maximum in July,—on the other hand, throughout the country the isomeric values are lower during the spring half-year (January to June), with minimum in April, than during the autumn half (July to December), with maximum in October.

Altogether the subject looks mathematically attractive, and thinkers would do well to bear this in mind as further facts are brought to light. The interpretation of the main facts adduced in the paper is not difficult when one remembers that to get rain out of the atmosphere this must not only be supplied with vapour, but must be rising—either in the processes of cyclonic circulation or under the influence of orographic features, or both. The July maximum referred to above as occurring in eastern England is the well-known effect of excessive insolation in producing heavy summer thunder rains; the October maximum over a large part of the country, including the region with a high July rainfall, is due to the increased intensity of cyclonic action at a season when the rapidly cooling land surface chills the rainy Atlantic winds as they reach these shores; but the December and January maximum in the western districts of high annual rainfall is somewhat enigmatical. These are the months when cyclonic circulation is most frequent and intense over the entire country, yet it is only among the mountains of the west that it provokes a rainfall higher than in October, the temperature in the flat eastern districts apparently falling too low in winter to permit a rainfall as heavy as in autumn. This circumstance, coupled with the fact that the greatest January percentage excesses over the October values occur not only in the west as a whole, but specially in the most mountainous districts, would seem to suggest that the winter excess with respect to autumn in that region has an orographic rather than a cyclonic origin.

On the other hand, there are indications in the monthly charts of mean atmospheric pressure over the British Isles (see Bartholomew's 'Atlas of Meteorology') that, although the barometric gradient from south-east to north-west is steeper in January than in October in accordance with greater intensity of cyclonic movement, the paths of the rainy atmospheric depressions lie more across the country in the autumn, tending to skirt the western seaboard in the winter, and if such indications are correct the small January rainfall in the east of England as compared with the October would be wholly or partially accounted for.

A very difficult problem of great geographical interest in the study of British rainfall, which has often been discussed by Dr. Mill and which we may hope he will not find impracticable of ultimate solution, is that of separating cartographically the orographic rains from the cyclonic or "meteorological" rains. Once this can be done, we shall be able to see what proportion of the higher annual rainfall in the west than in the east of Britain is due to the accident of the high ground being mainly situated there, and what proportion to greater proximity to the Atlantic Ocean.

L. C. W. B.

REVIEWS.

EUROPE.

'Highways and Byways in Lincolnshire.' By W. F. Rawnsley. Illustrated by F. L. Griggs. (London: Macmillan. 1914. Pp. xviii., 519. *Maps and Illust.* 5*s. net.*) According to the lights of this well-known series, full justice is done by both writer and illustrator of the present volume to one of the most

interesting counties in England. The writer discourses pleasantly (if with some tendency at times towards colloquialism) on matters descriptive, literary, and historical; the artist is thoroughly at home whether in portraying the magnificent architectural subjects with which the county abounds, or in catching its characteristic scenery and atmosphere.

ASIA.

Babylon.

'The Excavations at Babylon.' By Robert Koldewey, translated by Agnes S. Johns. London: Macmillan & Co. 1914. *Illustrations.* 21*s. net.*

This book illustrates the remarkable series of excavations which have been carried out at Babylon with patient continuance from the year 1899 to 1911, under the direction of German archæologists. In it we find not only the latest literary contribution to a subject of world-wide interest, but a series of carefully executed pictures and plans without which the technical references to architectural and topographical features would be hardly intelligible. The work began with the opening up of the Procession Street of Marduk in 1899, and investigations followed on the site of the Temple of Ninmach, the centre of Amran, and the principal citadel. The great gate of Ishtar was excavated in 1902, and since then digging operations have been carried out at many points which have practically unearthed successive layers of foundations, indicating the plans of successive cities from the time of Hammurabi to that of the Persian conquest. Centuries of local history have thus been revealed by the testimony of Babylonian bricks, and by the vainglorious records of the kings who added from time to time to the magnificence of the imperial capital and left their records about on stones and tablets. The book is but a plain and simple story of the results of unremitting labour, but the illustrations, which include reproductions in colour of the designs in enamel which decorated the walls of the principal gates and palaces, are of exceptional interest. The character of early Babylonian decoration in no way foreshadows the development of style which is to be found in the later Persian enamelled brickwork. The latter is almost modern in conception and execution. A word must also be said for the topographical plans with which the book is well supplied. They are delightfully clear and instructive.

T. H. H.

Western China.

'On the Trail of the Opium Poppy.' By Sir Alexander Hosie. 2 vols. London: George Philip & Son. 1914. *Maps and Illustrations.* 25*s. net.*

These volumes record the daily life spent by the author in two long journeys in the north-west and south-west of China, undertaken in 1910 and 1911 to investigate how far the suppression of opium cultivation was a reality. The results of the investigation are given in the official reports published as appendices at the end of the second volume. Briefly summarized they amount to this: In two of the provinces, Shansi and Sechuen, opium cultivation has practically been exterminated, while in Shensi, Kansu, Yunnan, and Kweichou the cultivation has decreased to the extent of perhaps 75 per cent.

But the book is devoted more especially to a description of the country traversed each day, rather than to the matter which forms the subject of his official reports. The incidents of the day, the botany of the countryside, the local handicrafts, the produce met *en route*, mills, bridges, and crops, all pay

their toll of interest, and it may safely be said that there are few men better qualified than the author to tell of the varied industries and commerce of China.

The routes travelled have as a rule already been described by Sir A. Hosie or by others, but a *détour* from the main road made in Kweichou from Lang-tai to Ta-ting through the mountains near the headwaters of the Wu-chiang and Chen-yuan rivers seems to form an exception.

With regard to opium, there is one point which does not seem to be clearly brought out. So far as can be gathered from the book, the farmers seem to have been reluctant to give up such a profitable crop. "It is the Emperor's will; We must obey," was the answer given on one occasion to an inquiry as to their behaviour, when crops were torn up by the soldiers. But the answer seems insufficient to explain their compliance, nor is it shown from what quarter came the pressure that brought about this mighty reform. When Tso Tsung-tang started his famous campaign against Yakub Beg in 1876, the penalty of death was instituted for smoking opium. But, if an aide-de-camp of the general is to be trusted, the troops not only planted crops to meet the needs of the next year's campaign, but also grew opium in the mountain valleys at a distance from the main road. Tso Tsung-tang was a man of his word and living among his troops, while the Emperor in 1910–11 dwelt in a corner of the empire far removed from the great opium-growing centres in Sechuen, Yunnan, and Kweichou, and the last days of his dynasty had almost arrived. And yet in Kweichou and Yunnan, where opium passed as currency and bulky crops were valueless on account of the difficulty of transport, the edict was obeyed, and only in a few places were there collisions between the people and the soldiers, who came to pull up crops which they themselves valued as opium smokers.

In other parts of China, beans, rape, and other oil-producing plants are taking its place, but in Kweichou the author's own attendants commented on the decrease in traffic, due as they presumed to the destruction of the poppy.

Will the time ever come when China will realize that the beauties of the country might be made as profitable to her as they are to Japan, and that the first thing needed to encourage an influx of foreign visitors and foreign money is decent inns? The loathsomeness of the taverns and hovels in which travellers have to spend their nights is again and again reverted to by the author, and with good cause. But the loess fields of the north-west, the cañons of the Yellow river, the fertility of Sechuen, and the wonders of the limestone region between the Yangtse and the West River, together with the flowers and the trees which gave a charm to each day's journey, are features which dwell upon the memory of writer and reader.

W. R. C.

Travels in Northern China.

'A Woman in China.' By Mary Gaunt. London: Werner Laurie. [1914.] 15*s. net.*

The authoress has furnished us with a picturesque and occasionally amusing record of her wanderings in Northern China. The drollness of Mrs. Gaunt's Chinese guide and incidents of daily travel form a pleasing relief to the cruel horrors that form apparently so essential a part of all recent Chinese annals. One of the more interesting localities visited was Jehol, the hunting palace of the Manchus, on the outermost edge of the province of Chihli. Here, it may be remembered, in 1793, the Emperor Chien Lung received Lord Macartney, the first British ambassador to China, and Sir George Staunton wrote an interesting narrative of the journey. The photographs that illustrate the park, the lakes, pavilion, temples, etc., of Jehol are decidedly interesting, and seem to

disprove Sir George Staunton's lament that there is a ubiquitous dearth of forest trees and vegetation throughout this part of the country. Readers at all familiar with the wealth of recent literature on China will understand that the present work contains little beyond the average impressions of a cultivated tourist who from the necessities of the case was unable to devote time to serious investigation. In accordance with the not very praiseworthy modern practice, the book is profusely illustrated with small photographs of a uniform size. Surely landscapes, mountains, river scenes, towns, whole stretches of the Great Wall, portraits, small groups, and elaborate but smaller objects such as the astronomical instruments on the eastern wall of Peking require some discrimination as regards the scale of reproduction.

Although most of the localities described are fairly well known, an index map showing the line of route and positions of the places mentioned in the narrative would have added to its general interest.

Assam and the N.E. Indian Frontier.

'History of Upper Assam, Upper Burmah, and North-Eastern Frontier.' By Colonel L. W. Shakespear (2nd Gurkhas). London: Macmillan & Co. 1914. 10*s. net.*

There are few parts of India less known than those covered by the title of the present work. Most of this region which the author describes to us as more or less a *terra incognita* and at present largely covered by impenetrable jungle, was once the centre of thriving communities, and possessed at one time of important buildings such as forts and temples connected by old raised roads, the remains of which are still clearly to be seen in many parts. It is generally assumed that climatic conditions tended largely to bring about subsequent decay, for the climate is distinctly enervating, and each race that has settled there has in course of time lost its vigour and been supplanted by hardier folk, who in their turn have succumbed to love of ease and luxury. The disappearance of cities, canals, and other landmarks of the past is attributable to the soft alluvial soils of the valleys, which have often permitted the rivers to cut for themselves fresh channels, frequently destroying and carrying away the towns and buildings which history tells us did exist along their banks.

The early history of Assam is mostly legendary, but enough has been elicited by authorities like Meyer, Hannan, Bryan Hodgson, and others to connect the events of those times with historical landmarks of adjacent countries with which Assam had easy intercourse. Coming down to later times, three principal kingdoms claim notice, viz. the Kacharu, Kocches, and Ahoms, whose zenith of power arose at 1230, 1560, and 1700 respectively.

The later annals of the countries, of course, are in the main narratives of the European travellers and explorers from the east or west, who have placed on record all that has been ascertained regarding the tracts traversed. These chapters and sections are mostly dealt with geographically, and comprise the experience of Cooper in the Mishmi hills, Needham from the Sadiya side, Prince Henry of Orleans in his journey across south-west China, and various other expeditions.

As a collection of narratives and data regarding a region of unusual complexity whose literature it is often difficult and yet desirable to trace in view of the unexploited and obscure character of these frontier regions, this handbook is a useful contribution: credit being especially due for a good index, for well-selected photographs, some coloured plates, and a useful bibliography.

An Ornithologist in Siberia.

'A Summer on the Yenesei.' By Maud D. Haviland. London: Edward Arnold. 1915. 10*s.* 6*d. net.*

Without displaying the fact on the surface, this book contains some original work and many observations of considerable value. It claims attention both on account of its charming descriptions of bird-life on the "tundra," and as an example of what keenness and skill can do in bringing to light the essential points in the life-history of a country which is utterly desolate and forlorn. Whether it is in connection with wild birds or shy natives, Miss Haviland proves her ability as a close observer. Her passing observations on the aborigines and the Siberian colonists are of real interest.

The writer, with her companions, voyaged down the Yenesei to Golchika, an island in the estuary which forms the mouth of that river. Two months were spent here—all that the short summer season allowed—for the birds were already preparing to move southwards in mid-August, and the travellers were all but caught in the ice of the Kara Sea on the homeward voyage. In spite of having been preceded by Seebohm, Miss Haviland's work in the ornithological line is by no means a repetition of that classic 'The Birds of Siberia.' Nowhere is there greater need for prolonged investigation than in a region where the avifauna consists of summer visitors. This is shown by comparing the bird-notes collected in any one locality, in different years, by the three observers—Messrs. Seebohm and Popham, and Miss Haviland. Species that one visitor records as very scarce are noted by the next as being quite common in the same locality another year. Seebohm's list of species is, therefore, no longer a reliable guide to the birds that summer on the lower Yenesei, for varying annual climatic changes cause corresponding pulsations in the bird population.

Some interesting side lights are thrown on the life and labours of the Siberian colonists on these outskirts of Greater Russia. New-comers and aborigines seem to work as well together as Russian always does when thrown with Asiatic. The natives are treated liberally, obeying their own laws and being judged by their own people. The system of taxation is pronounced to be a mistake; for, assessed as it is on the clan and not individually, the family life—which is almost religion to such people—is being destroyed. The tribes tend to break up and scatter in order to escape the tax. Drink is, of course, a curse to them when in contact with the Russian; the long winters alone in the tundra, away from vodka, have probably been their saving. But it is noteworthy that simultaneously with the news of war, Russian officials appeared by magic, even on far-off Yenesei, to carry out the Government's crusade against alcohol. The same paternal Government encourages colonists, judiciously compensating them for their rough work of pioneering by exemption from military service. The general reader will find pleasure in Miss Haviland's word-pictures of the bird-life, of the wild-flowers, and of the spell of the northern waste itself. There is also a very definite addition to our knowledge of the ornithology of that particular locality. The illustrations prove how very essential it is to be able to take good bird-photographs in these days. The omission of a sketch-map is not justifiable, especially when the reader is transported to such an out-of-the-way place as Golchika, and one repeatedly wishes to compare latitudes.

D. C.

'Travels in the Mogul Empire, A.D. 1656–1668.' By François Bernier; translated and edited by A. Constable, second edition revised by Vincent A. Smith. (Oxford: University Press. 1914. Pp. lii., 498. *Maps and Illustrations.* 6*s.*) The present editor has applied various emendations to the work of his predecessor, and refers to a few important errors in a preface. The book, though in great measure historical, is also of high interest to the student of travel in the East, and the original maps, simple though they are, are worth careful inspection.

'The English Factories in India, 1646–1650.' By W. Foster, C.I.E. (Oxford: University Press. 1914. Pp. xxxii., 363. *Frontispiece.*) This is an important addition to the Series records of early British activity in India, published under the patronage of the Secretary of State for India. Like its predecessors, it consists of a calendar of documents preserved in the India Office, the contents of each document being summarized and extended quotations being frequently made. The last are not only of general interest, but sometimes of geographical value.

'The Island Dependencies of Japan.' By Charlotte M. Salwey. (London: E. L. Morice. 1913. Pp. ix., 149. *Maps and Illustrations.* 5*s.*) This is a simple account, historical, geographical, and descriptive, of Formosa, the Ryū Kyū, Bonin, Kuril, Pescadores, and other islands, and of Japanese Sakhalin (Karafuto). It contains much evidence of careful study and research, and demonstrates clearly the varied interests of these lands. It has suffered from inadequate revision in proof, and (generally for that reason) there appears here and there a hard saying, such as this reference to geological history—"Possibly, Japan itself had a nearer proximity to the great continent of China, or Russia on the western side."

AFRICA.

The Kavirondo and their Country.

'Alone in the Sleeping Sickness Country.' By Felix Oswald, D.Sc., F.G.S., F.R.G.S. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1915. *Seventy Illustrations and a Map.* 8*s.* 6*d. net.*

Dr. Felix Oswald went to British East Africa in 1911 to examine Miocene deposits on the east coast of the Victoria Nyanza in the hope (which was realized) of discovering fossils, and thus adding to our knowledge of the past history of the continent. With the results of these investigations he is not concerned in the book under notice. The deposits he examined were situated in a region occupied by the Kavirondo—a happy circumstance since it enabled the author to make a close study of that people, who are noted chiefly in that, like the dwellers in Eden, they are naked and not ashamed. Dr. Oswald fills in many details omitted by previous students of the Kavirondo, of whom he leaves a very pleasant impression. The author finds a strong resemblance between the Kavirondo in their primitive condition and the early Britons; moreover, he was "irresistibly reminded of the similarity between the British rule in Africa on the one hand and the Roman domination of Britain on the other." The Kissii, the only other race through whose territory Dr. Oswald passed, wore clothes indeed, but were an inferior people to the Kavirondo.

Considerable areas in the district in which the author worked had been rendered desolate by the ravages of sleeping sickness, and on one occasion he intended camping at a spot which the natives, stricken by the plague, had just abandoned. Dr. Oswald was himself bitten by tsetse fly; happily no permanent ill effects followed.

The value of this book lies largely in its detailed and precise information. We

get a careful account of all the rock formations on the route traversed, which was from Karunga bay to Kavirondo gulf, and indications as to the value of the land for development by Europeans. The necessity of afforestation in all districts where this is possible is rightly insisted upon. The author describes vividly the insect plagues encountered. We hear incidentally of the trials attendant on fossil hunting in places where the puff-adder abounds, leopards lurk, wasps are aggressive, the heat is 150° in the shade, and one's native "assistants" have a bouquet compared to that of putrid onions.

Evidence was found that the former level of the Nyanza was 300 feet above its present level (see pages 120 and 129). On terraces which probably marked the former level Dr. Oswald discovered stone implements, which he thinks may be assigned to the period when the Bushmen occupied the country. Finally, we may commend the last chapter as containing one of the best accounts we have noted of what may be seen—by the trained eye—from the carriages of the Uganda railway. Many readers, too, will be relieved to find that there are no stories of hunting exploits in the book.

The photographs of scenery are good; those of the people are mostly too small to be very effective. F. R. C.

AMERICA.

PATAGONIA.

'Northern Patagonia: Character and Resources.' Vol. 1. Text and Maps by the Comision de Estudios Hidrologicos, Bailey Willis, Director. (Ministry of Public Works, Argentine Republic.) New York: Scribner Press. 1914. *Maps and Illustrations.* $8 *net.*

The Argentine Government, anxious to attract colonists and visitors to the regions of the Argentine Patagonia, and fully alive to the value of advertisement, has issued a most comprehensive guide to the railway recently constructed from Port Antonio on the Atlantic coast (at the head of Gulf San Matias) to the lake region of Nahuel Huapi, which lies in the Andine region about due west of that port. From Nahuel Huapi an extension into Chile across the great divide is apparently a very practical corollary. The guide is complete. It is supplied liberally with photographs and with a separate volume of map illustrations which leave nothing wanting in information as to the topography and general physical appearance of the country and its economic advantages. Railway construction, after bridging the waterless track which extends westwards from the coast for rather more than 100 kilometres to the Valcheta depression, passes through a district which differs in many essential respects from the generally accepted notions of the Patagonian pampas. It is far more rugged and broken; and there has consequently been none of the rapid surface line-laying which has so often led to ill-advised alignments with excessive grades, but which promised quick development of traffic and early dividends. The whole length of this line of 630 kilometres from the Atlantic coast to the yet undeveloped "city" of Nahuel Huapi passes through a country whose resources are chiefly pastoral, in which local traffic will be derived from grazing and irrigation districts. It is a traffic which in itself would justify the construction of a railroad for business purposes. The rapid output of it has been subordinated to the necessity for very careful surveys, and it is to the gradual recognition of this necessity, no doubt, that of late progress in railway development in Argentina has appeared slow. It is worth noting that the earliest examination of the route as a practical commercial line was made by Dr. Francisco Moreno, a Gold Medallist of the Royal Geographical Society. Settlements have already been established at several points along the

route, the most important perhaps being that at Maquinchao, about two-thirds the distance from San Antonio to the Andine foothills, to which point the line is apparently already open. Here, or at Marilantquen, which is not far west of Maquinchao, will be the junction for a railway striking southward and skirting the base of the Andes. As long ago as 1902 a railway was projected which should run parallel (approximately) to the San Antonio—Nahuel Huapi line, south of it, connecting Port Madryn *viâ* the Welsh settlement of the Chubut (following generally the course of that river) with the town of Esguel in the valley of "16th October"—the valley which formed the most important feature in the boundary dispute between Argentina and Chile at the beginning of the century.

That line will, it is hoped, achieve construction eventually, after the completion of the one under review. At present it is exactly where it was in 1902, *i.e.* it extends from Port Madryn to Rawson on the Chubut and no further. No line projected from the Atlantic coast across Patagonia to the Andes can afford to neglect the ultimate prospect of a trans-Andine extension with the Pacific. That from Nahuel Huapi has already been surveyed, and as it proves to be feasible it will eventually be possible to travel by rail to Valdivia from the lake region *viâ* the Cajon Negro. 'Northern Patagonia' suffers but little from the literary limitations of ordinary official style. It is full of interesting information, and even if the story is confined to plain statements of practical value to prospective settlers, it is easy enough to gather from between the lines as well as from illustrative photographs that there is here a future opening for the seeker after all that is new and beautiful in mountain and lake scenery such as probably exists nowhere else in this much-travelled world. The Southern Andes with their wild contrasts of snowfield and valley, purple and scarlet with the autumn tints of the beech woods, their rugged outlines and totally unexpected visions of deep-seated lakes lying smooth and soft beneath wind-swept heights, offer new fields for the artist and the traveller of inexhaustible beauty. They will soon be opened up to the European visitor, and this Andean Switzerland will gradually become the playground of the world. Already it may be said that the great glacier-fed lake of Nahuel Huapi has been prepared for the coming of the sportsman by the introduction of fish. This is a new development which has proved most remarkably successful, and undoubtedly adds to its attractions. Big game is scarce in the Andes. The huanaco is too tame for sport; the huemul is a deer of but inferior personality; the puma is no doubt attractive, and the wild cattle may still be reckoned as within the sphere of sporting activities; but, on the whole, it must be admitted that it is the natural beauty of the country, the glory of its mountains and lakes and its rivers, which constitutes the chief call of Patagonia to the European.

T. H. H.

'Through the Grand Canyon from Wyoming to Mexico.' By E. L. Kolb. (New York: The Macmillan Co. 1914. Pp. xxi., 344. *Map and Illustrations.*) This is a delightful book; one which is of fully sufficient interest and excitement to be enjoyable to readers who know nothing of the Grand Canyon. The adventurous journey is one seldom made, and this account will take rank with any by those who made it, or part of it, before the Messrs. Kolb, who refer to the work of their predecessors in an appendix and elsewhere. And the journey was not one merely of adventure; the travellers had been living near the Canyon for some years "following the work of scenic photography," and it may be guessed that this volume contains many evidences of their skill.

'Panama: the Canal, the Country, and the People.' By Arthur Bullard (Albert Edwards). (New York: The Macmillan Co. 1914. Revised and

enlarged edition. Pp. xiv., 601. *Maps and Illustrations.* 8*s.* 6*d. net.*) First published in 1911, Mr. Bullard's work on Panama has now been brought up to date and embellished with additional photographs. Half of it or more is historical. The rest records facts and impressions about country and people at the present day, and about the construction of the Panama canal, in the picturesque style of American journalism. A folding map of the republic of Panama is almost illegible.

ANTHROPOGEOGRAPHY.

Early Man in the Channel Islands.

'Prehistoric Times and Men of the Channel Islands.' By Joseph Sinel, Curator of the Jersey Museum, etc., with a foreword by Dr. Arthur Keith. Jersey: J. T. Bigwood. 1914. Pp. 135. *Numerous Maps and Illustrations.*

Few more interesting works than this have ever been published on the past history of man in North-West Europe. But for the indirect consequences of the present war, which took away the reviewer to America with Mr. Sinel's book in his hand (so to speak), this treatise on one of the most interesting phases of Palæanthropology should have received earlier notice in the pages of the *Geographical Journal.* There is so much "palæogeography" (if I may harp on the Greek adjective) in this book that a notice of it is quite in keeping with the geographical limitations of our *Journal.* It shows us convincingly how the Channel Islands (and most recently Jersey, the largest of the group) were the hill crests of Northern France overlooking the broad valley which is now the British Channel; and how, long after that channel was formed or reformed in the latest among the many insulations of England, Jersey, Guernsey, Alderney were islet-crowned peninsulas of France advancing into the waters of the ever-enlarging strait which separated Normandy from Devonshire. By this time, with Britain once again an island, or at most connected with Calais by narrow sandy flats, Neanderthal man had been evolved somewhere in France or the Rhine Valley, a much later growth of time than *Homo sapiens*, and in some respects a throw-back to the brute. Neanderthal man had a very large brain, but one which may have generated only a humble intellect. He had retained from the original generic Homo lowly configurations of skull and limbs, markedly Simian features, in fact. But in respect of his teeth, he had departed far more from the anthropoid than the modern Englishman, and very much more so than the black Australian or the Negro. This and other important traits in *Homo neanderthalensis* (no longer rightly owning his first given name of *primigenius*) were made known to us by Dr. Arthur Keith; and the chief evidence which put Dr. Keith on the right track came from Jersey. Apparently Neanderthal man arose so comparatively late in Earth-history that the overland route to England was already eaten away by the desire for union between the eroding waves of the North Sea and these of the British Channel. So far no trace of this aberrant species of the genus Homo has been found in our country. He ranged seemingly from Austria and the Rhine to Gibraltar, France, and Belgium. But he certainly inhabited Jersey, so that we can claim him posthumously as a subject of the Duke of Normandy and British King-Emperor.

Down to about three years ago Neanderthal man was looked upon as the first definite stage behind *Homo sapiens*, back towards the ape ancestry. But we now know that *sapiens* preceded him in time, in England at any rate, and that the difference between the two was probably so considerable that even if they met and mingled connubially there was little likelihood of their generating a mixed progeny which has survived to this day. So that all talk of this and

that modern race being "neanderthaloid" has been swept away by Dr. Keith's discoveries. Least of all is the Australoid akin to Neanderthalensis. The problem concentres on the teeth. The teeth of this clumsy, shambling, big-brained, heavy-browed human were more specialized than the teeth of *H. sapiens* for the proper grinding-up of a hard vegetable diet. The canines were even smaller than those of modern man, and the molars were "taurodont" and not "cynodont" like ours; which means that they had the spaces between the fangs filled up with cement instead of being low-crowned like other human teeth.

Mr. Sinel's book, however, treats of man in Jersey and Guernsey not merely in most remote times beyond the faintest glimmering of history, but right on through the Palæolithic, Neolithic, and Bronze ages, down to the advent of the iron-using Aryans, almost to the coming of the Romans. It is a work of the greatest interest and of much scientific value. Its maps and diagrams are clear, and its photographs of skulls, of the sites of discoveries, of stone and flint implements and utensils, of gold torques, and submerged forests are important contributions to Palæanthropology, and to our study of the prehistoric life of man in north-west Europe. Who would have thought that all this could have come out of the tiny Channel Islands, that they could have had such a far-reaching and honourable past in human history? Another triumph for the "little countries"!

H. H. Johnston.

HISTORICAL GEOGRAPHY.

Early Portuguese Nautical Science.

Joaquin Bensaude, 'L'astronomie nautique en Portugal à l'Époque des grandes découvertes.' Berne: Max Drechsel. 1912.

'Regimento do Astrolabio e do Quadrante. Tractado da Spera do Mundo.' Réproduction fac-similé. Munich: Carl Kuhn. 1914.

Luciano Pereira da Silva, 'A astronomia das Lusiadas.' Lisbon. 1913.

A very important discovery was made, in recent years, in the Royal Library at Munich, throwing light on the history of nautical astronomy with reference to the Portuguese discoveries of the fifteenth and sixteenth centuries. The little book that has been brought to our knowledge is entitled 'Regimento do astrolabio e do quadrante.' Only this one copy is known to exist, but it is one of many prepared for the use of Portuguese seamen under the superintendence of the Mathematical *Junta* or committee, appointed by King John II. of Portugal. A facsimile of the original in the Munich Library has been presented to our Society.

It is in two parts. The first part contains full instructions for finding the latitude with seventeen examples, rules for correcting observed altitude of the polar star, a list of sixty latitudes on the west coast of Africa as far as the equator, rules for placing tracks on a chart, and tables of sun's declination for the year. The second part is a translation of the treatise on the sphere by Sacrobosco, who was a Yorkshireman from Holywood near Halifax, as the name implies.

The discovery led to the publication of a learned work by Senhor Joaquin Bensaude. The author shows that the tables of declination are derived from a Portuguese and not, as has hitherto been incorrectly assumed, from a German source. It appears that in about 1473 a learned Portuguese Jew, named Abraham Zacuto, composed a work in Hebrew, entitled 'Almanac Perpetua,' in which he gave the tables of declination. On the Mathematical *Junta* of King John II. there was another Jew called "Messer José." His full name

was José Vizinho, Physician to the King. "Messer José" translated the 'Almanac Perpetua,' and thus the means were provided for finding the latitude when the Portuguese discovery ships were so near the equator or beyond it that the pole star, always used in Prince Henry's time, ceased to be available. The *Junta* advised the use of the astrolabe for observing altitudes. This instrument, in a very complicated form, had been used for astronomical and astrological purposes for centuries by the Moors of Cordova and Bagdad, and was well known to Zacuto and Vizinho. They appear to have simplified it by taking out all the parts except those necessary for taking altitudes. The one used by Vasco da Gama must have been very large, for when he landed at the Angra de Santa Helena to observe with it so as to get a more accurate result than the motion of the ship allowed, the instrument was suspended from a triangle. There is a curious old book in the Coimbra University Library, entitled 'Campendio del arte de navegær por el Licenciado Rodrigo Camorano,' which gives full instructions for the construction of a wooden or metal plane astrolabe.

The 'Regimento' found at Munich is an example of the little navigation books, based entirely on Portuguese studies, which were issued to the seamen of that nation during the age of discovery.

Hitherto a passage in the 'Decadas da Asia' of Barros has been interpreted to mean that the Portuguese were supplied with tables of sun's declination from the Ephemeris of J. Müller of Konigsburg (known as Regiomontanus), and that the plane astrolabe was also provided for the Portuguese by Martin Behaim of Nuremberg.* Humboldt held this opinion, and Ziegler, in 1874, wrote that, "if Germany did not take a part directly in the great discoveries of the fifteenth and sixteenth centuries, it was German savants who, by their contributions to science, gave the most essential aid." Finally, the German Emperor, when he was at Lisbon in 1905, claimed that Portuguese discovery owed its success to German science.

The little book in the Royal Library at Munich quite disposes of such a claim. Senhor Bensaude gives conclusive evidence that the tables of declination in the 'Regimento' were taken from the 'Almanac Perpetua' of Zacuto, and not from the Ephemeris of Regiomontanus. The plane astrolabe was as little due to Behaim. It is unjust that the Portuguese of their heroic age should be robbed of any credit that is due to them. Their discoveries as well as their science were their own.

Senhor Bensaude's work contains a very able and learned discussion of the subject, which is one of great interest to comparative geographers. His views have the full concurrence of Prof. Gallois of Paris (*Annales de Geographie*, No. 130, July 15, 1914), as well as of Prof. Wagner of Göttingen.

Since the appearance of Senhor Bensaude's work, Prof. Luciano Pereira da Silva has written an interesting little book on the astronomy of the *Lusiadas* of Camoens, which first appears in numbers in the *Revista da Universidade de Coimbra*. While treating of all the points which his countryman Bensaude has so ably brought to light, Prof. Pereira da Silva quotes passages from the *Lusiadas* which show the complete knowledge possessed by the great poet, of the nautical science of his day. C. R. M.

* The claims put forward on behalf of Behaim were, it will be remembered, refuted by Dr. Ravenstein in his learned memoir accompanying his facsimile of Behaim's Globe (*Journal*, vol. **33**, p. 679), which also gave a good deal of information on King John's Junta. In fact, Senhor Bensaude acknowledges his indebtedness to Dr. Ravenstein's work for the stimulus to his own study.—[Ed.]

GENERAL.

Health in the Tropics.

'Tropical Diseases.' By Sir Patrick Manson, K.C.M.G. London: Cassell & Co. 1914. *Illustrations and Diagrams.* 12*s.* 6*d. net.*

'Tropical Diseases: a Practical Handbook.' By H. C. Lambart, M.D. London: Griffin & Co. 1914. *Illustrations.* 8*s.* 6*d. net.*

There has been, within the last few years, a great advance in pathological research into tropical diseases, while new treatment has been adopted for many diseases peculiar to the tropics, so a thoroughly revised edition of Sir Patrick Mason's well-known manual has been rendered necessary. For instance, there is now little doubt but that yaws is produced by a germ closely resembling the parasite of syphilis; that beri-beri, the scourge of Malaya, results from a diet of over-milled rice; and that the deadly disease so common in the Philippines and the Yangtze Valley is produced by a water-borne parasite known as *Schistosomum Japonicum.* Then the new methods recently introduced in the treatment of familiar diseases, such as salvasarsan for yaws, antimony for sleeping sickness, and emetine for some forms of dysentery, are carefully described and criticized by the author.

A new feature of great value to the tropical practitioner is the appendix on Protozoa, which gives the latest information on the parasites which are such important factors in the causation of disease.

Dr. Lambart's textbook is perhaps more adapted for the traveller and resident in tropical countries than for the practitioner. It gives adequate information on the principal tropical ailments (omitting all non-essential matters), and the alphabetical classification makes reference easy. Though the author has only room for the briefest summary of the history and etiology of each disease, he gives the latest results of scientific research, and has drawn largely on the works of specialists, especially on that of Sir Patrick Manson. Aids to diagnosis, a very full therapeutic index (prescriptions) hints on the treatment of bites by venomous animals and snakes, advice on sanitation, diet, etc., add much to the practical value of this handbook.

In snake-bite the approved treatment with anti-venene injections discovered by Dr. Calmetti of the Pasteur Institute, Lille, is lucidly explained. This anti-venene serum has proved very efficacious for the bite of cobra, krait, and Russel's viper. But unfortunately these serums are in a sense homœopathic, and a serum prepared for one kind of venom is practically useless for another.

E. A. R. B.

'Some Geographical Factors in the Great War.' By T. Herdman. (London: Brown. *N.d.* Pp. 71. *Maps.* 9*d.*) The five chapters comprised in this little book are cast somewhat in the form of lectures. They deal with general considerations, the great land gates, the seas, the commercial war, and the problems of nationality. The scope of these topics is outlined in the first few pages, with a commendable restraint, which is to be observed throughout the book, in the direction of keeping the discussion within strictly geographical limits. The last chapter gives a clear presentation in brief of the vast difficulties in the way of adjusting European frontiers and nationalities.

'Nature Notes for Ocean Voyagers.' By Captains A. Carpenter and D. Wilson-Barker. (London: Griffin. 1915. Pp. xvi., 181. *Maps and Illustrations.* 5*s.*) The possession of this book ought to go some way towards relieving what is commonly called the tedium of an ocean voyage. It is

designed for the amateur, being written "for the many voyagers who feel a need for information on their unfamiliar surroundings at sea." With the limitations of such readers kept judicially in view, the authors discuss the physical conditions, life, and vegetation of the oceans, weather, and the movement of waves, and also traditions and sea-lore, so that their stock-in-trade is certainly comprehensive. There are many illustrations, both of the beautiful and of the curious, and also maps, most of which suffer from the common complaint of over-reduction.

THE MONTHLY RECORD.

EUROPE.

Regulation of the Lake of Lugano.—The question of the regulation of the Lake of Lugano (Lago Ceresio), which had been under discussion spasmodically for some years, has lately been brought somewhat nearer solution, though it is hardly likely that actual steps towards the realization of the project will be taken under existing circumstances. Two separate objects have been in view from time to time —the regulation of the rise and discharge of the lake so as to ensure a relatively constant level and obviate damage by floods; and the utilization of the supply for water-power and irrigation. Schemes in furtherance of one or other of these objects have been set on foot from time to time since 1874, but none has led to definite result, partly through the difficulty of reconciling opposing interests. The formation of the "Società della Tresa" in 1900, and the support given to its proposals by the Council of State of the Swiss Canton of Ticino, seemed likely to have a more positive outcome; but opposition was again encountered, and a new move was made in 1906 with a view to a regulation of the lake in the public interest (apart from the utilization of the water). The co-operation of Italy was sought and obtained for a thorough study of the question, and the elaboration of a suitable project was entrusted to Signor C. Ghezzi, who presents his conclusions in an elaborate report issued as No. 4 of the *Comunicazioni della Divisione dell' Idrographia Nazionale* at Berne. The report, which is accompanied by an atlas of charts and tables, deals exhaustively with the hydrography of the lake and its basin, on which it brings together in convenient form a mass of hitherto scattered or inaccessible data. The works proposed include the construction of a dam 71 metres long above the bridge over the Tresa, and of a sluice for the regulation of the discharge at low water; the correction of the bed of the Tresa down to a specified point, and the provision of a regular gradient of 2·5 per cent.; the widening of the Strait of Lavena, and the lowering of the bottom both here and beneath the arches of the bridge connecting Melide with Bissone. It is claimed that these operations would both lower the level of extreme high water and raise that of low water, besides affording improved facilities for navigation and increasing the minimum discharge of the Tresa from 4·5 to 8 cubic metres per second.

ASIA.

Anticipated Drainage Changes in Central India.—In the *Records of the Geological Survey of India* (vol. **44**, part 3, 1914), Dr. L. L. Fermor calls attention to existing conditions of drainage on the border-line between the Son (Ganges) and Mahanadi systems, changes which he thinks are bound, possibly within the present century, to lead to diversions of the upper courses of the Son and its tributary the Rer. The basin of the southward-flowing Hasdo, a tributary of the Mahanadi

which drains the greater part of Korea state, forms a remarkable wedge running up between those of the Son to the west and the Rer to the east; and as the distance to the sea by the Mahanadi is much less than by the Ganges, the Hasdo naturally has a much steeper gradient than the other two rivers, and reaches a much lower level than they in the area in question. This has enabled some of its tributaries to cut back the watershed to within very short distances (1 to 4 miles) of the Son and Rer, the intervening water-partings being extremely low—probably, on the side of the Son, not more that 50 feet in places above the bed of that river. Dr. Fermor discusses in detail the question of the localities where the anticipated beheading is likely to take place; much, of course, depending upon the nature of the rocks, which vary in hardness between the Gondwana sediments and archæan granites and gneisses, both which types are represented. The fact that, with the more rapid southward gradient, so much of the drainage still finds its way north of the Son, is probably due to the resistance to erosion offered by the Archæan axis. He suggests, however, that the Gondwana sediments were deposited by an ancient river flowing south-east through a breach in that axis, and that the Hasdo may be merely opening once more the ancient pre-Gondwana channel.

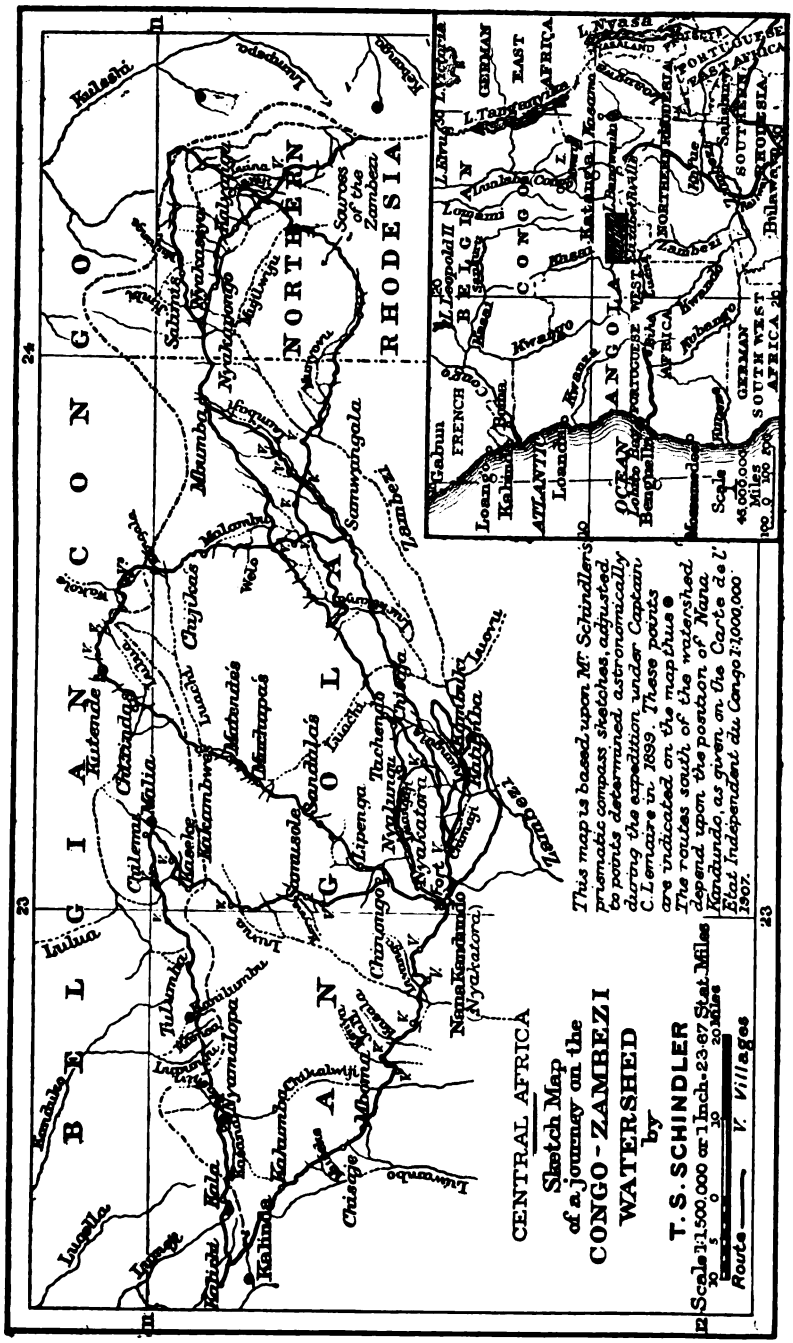
Vegetation of the Tinnevelly Hills.—In the *Records of the Botanical Survey of India*, vol. 6, No. 5, Mr. M. S. Ramaswami describes a botanical tour in the Tinnevelly Hills carried out by him and Mr. D. Hooper on behalf of that Survey. Besides a complete list of the plants collected, the paper contains some interesting notes on the altitudinal distribution of the vegetation of the district visited, and its affinities with that of neighbouring regions. The trip led the travellers to the inner slopes of the Ghats, which, in contrast to the generally bare slopes further east, contain much evergreen forest, frequently at low elevations. Above 2500 feet there are large stretches of moist heavy evergreen "shola," these slopes generally getting the full force of the south-westerly monsoon, as well as heavy showers during the north-easterly monsoon. The trees are very tall and of many different species, and the herbaceous vegetation extremely rich. The plants of the high elevations include species of *Clematis*, *Begonia*, *Lobelia*, *Rubia*, etc. Lower down *Strobilanthes* shrubs become abundant, followed by others belonging to the *Rubiaceæ* and *Acanthaceæ*. Near the foot of the hills there are species of *Euphorbia*, *Grewia*, *Dioscorea*, *Aristolochia*, and a host of Leguminous plants and Composites. In certain of the forests towards the north the preponderance of typical Ceylon plants was remarkable. The collections as a whole revealed an appreciable endemic element in the flora, making about 7 per cent. of the whole. Only a little over 2 per cent. were purely Ceylon species, against 10 per cent. peculiar to South Peninsular India; while 26 per cent. were common to the two regions. Of the remainder, about half were forms distributed throughout India, the other half extending in varying proportions to Assam, Burma, and Malaya. *Leguminosæ* and *Rubiaceæ* are the orders best represented.

Hydrographical Surveys in the Dutch East Indies.—Among other evidences of enterprise in their eastern possessions within recent years, the Dutch authorities have shown a praiseworthy activity in the survey and charting of the coasts of the islands, large and small, of the Malay Archipelago. A summary of the work done within the past five years, supplementing previous reports in the same publication, appears in the January number (1915) of the *Tijdschrift* of the Netherlands Geographical Society, accompanied by a chart on which the extent of the hydrographical work so far accomplished is clearly shown. From this it appears that the surveys have covered the whole of the coastal waters of Dutch Borneo and Celebes; those on the north side of Java and on both sides of the island chain to the east as far as the Solor group and western Timor; nearly the whole eastern

side of Sumatra and about a third of the western side, including the Nias and other groups of lesser islands; and portions of Gilolo and the western extremity of New Guinea, with the Aru islands. The largest unsurveyed area lies between Celebes, Timor, and New Guinea, including Ceram and Buru, the Moluccas and other small groups; but the whole of the south coast of Java and some two-thirds of the west coast of Sumatra have still to be taken in hand. Some of the work (such as that along the north side of Java) dates back to the eighties of last century or even earlier, but the greater part has been carried out since 1900, and that in the extreme east and west only within the past five years. It is not stated to what extent the triangulation of the coasts has been accompanied by soundings, but as the colouring of the chart shows, in places, fairly broad expanses of sea as surveyed, it may be supposed that the determination of depths has formed part of the work.

AFRICA.

A Journey on the Congo-Zambezi Watershed of Kadungu, Angola.—Mr. T. S. Schindler sends the following notes on the map published herewith: These prismatic compass sketches were made at different times during itinerating trips, and refer to the country on the extreme northern extremity of the Zambezi system. Besides being interesting as the divide between two large river systems, the country is attracting attention as being the natural line for railways that will connect the mines in Katanga with the port of Lobito, on the west coast, which will provide the shortest and consequently the cheapest route for conveying minerals from the large deposits in Katanga to the ocean. Once these two lines—the Belgian, which is being worked westwards from Elizabethville, and the Benguella railway, which is pushed forward from the west—have joined up, this will be accomplished, and, as a consequence, agricultural development will also result. So far practically nothing has been done in this direction, although the country is suitable for it. Cattle do well, and have so far been remarkably free from disease. From small experiments carried on, there seems no doubt that wheat could be cultivated in the dry season by irrigation. Most European vegetables will grow, and, of course, such native produce as has been cultivated by the natives, as mandioc, mealies, castor-oil, beans, bananas, plantains, pine-apples, and also other fruits that have been introduced (such as oranges, lemons, citrons, etc.). Rice, which was introduced only some ten years ago, does excellently, and tons of it are grown annually by the natives. The rainfall is good. Last wet season it amounted to 52·43 inches, which is probably below the average. The population is comparatively large. The people belong to the Va-Luena tribe. When Livingstone passed through their country, on his way to Loanda, they were a very small tribe inhabiting the region on the junction of the Luena river with the Zambezi. Most of the country now occupied by them was then under the sway of the great Lunda chief, Mwata Yamvo. Names of chiefs whom Livingstone mentioned, such as Skinte, Katema, Kakenge, etc., were in reality titles of offices held under Mwata Yamvo, and these names were given to successive holders of the positions. It was probably only after the death of this great chief that the Va-Luena in the south of his kingdom and the Va-Chokwe in the west encroached on his dominions and ousted the Va-Lunda, enslaving and killing many of them, until the rest submitted and were assimilated by the Va-Luena tribe in the region of the Congo-Zambezi watershed, from near the latter's source to as far as the northward bend of the Kasai. Apparently the Va-Luena also extended southwards from the Lwena river, and are being found as far as the junction of the Lungerungu and the Zambezi. In the south they are, however, called Va-Lovale (Ba-Lobale). On the left bank of the Zambezi, where the country is more hilly, and thus gave more natural



protection against the Va-Luena aggression, the Va-Lunda still hold their independence, but are much scattered.

AMERICA.

Natural Regions of North America.—A good deal of attention is being at present directed to the definition of Natural Regions as the basis for the proper understanding of the geographical factors by which man's activity is conditioned. Two papers have lately appeared in the United States in which the question is discussed in its bearings on North America. One of these, by Mr. W. L. G. Joerg, treating of the subdivision of that continent into Natural Regions, is published in vol. 4 (for 1914) of the *Annals of the Association of American Geographers* (Reprint, 1915). In the other, more limited in scope, Mr. W. G. Reed considers the climatic provinces of the western United States. Both writers are well acquainted with previous work in this direction, both of a general and special character, and both bear testimony to the value of the pioneer work of Prof. Herbertson, in his paper on the Natural Regions of the World published in the *Journal*, vol. 25, p. 300. Mr. Joerg makes some judicious remarks on the methods to be adopted, and while fully recognizing the difficulties arising from the variety of the elements to be taken into account—structure and relief, climate, vegetation, etc.—is evidently of opinion that results of real utility may be gained. Of the above elements one may predominate over another, and the problem is to evaluate their relative importance. Structure and relief will, *e.g.*, be the guiding principle in the delimitation of the Cordillera; low rainfall, in that of the Great Plains. The selection of the predominating element may be prescribed by the rank of the unit to be subdivided, and there may be a lack of coincidence between major regions and the minor regions which constitute them; for a mountain range may divide two of the former while itself forming one of the latter. The evaluations arrived at are, of course, subjective, and the criterion is not absolute accuracy but expediency. Mr. Joerg reviews in turn the considerable number of previous classifications suggested for North America, and by utilizing the most valuable points in each, arrives at one of his own, which is still put forward as provisional only. As concerned only with one of the main factors in the study, Mr. Reed's task is a simpler one, but even here there is room for considerable differences in the results reached by different students. For some purposes it may be practicable to establish temperature provinces or zones, and also to establish rainfall provinces, but both factors must be considered together in any classification which will throw places with similar climates into the same group and places with dissimilar climates into different groups. In the western United States the differentiation is not so much by latitude as by position east or west of the Sierra-Cascade Range, which divides regions distinct not only in the amount of the rainfall, but in the seasonal distribution both of rainfall and temperature. In the whole region to the west the conditions are so similar that it may be treated as a single province (the "Pacific Province"), though capable of subdivision for detailed consideration. Similarly the "Rain Shadow Area" to the east may rank as a province, characterized by deficient precipitation.

Canalization of the La Plata Estuary.—The improvement of the navigable channel leading up the La Plata estuary to Buenos Aires has for some years been a desideratum in view of the increasing draught of the vessels which make use of it. From 1905 onwards energetic steps have been taken to bring about the desired result, firstly by a detailed survey of the floor of the estuary, secondly by experimental dredging operations; and a general statement of results is given in the *Boletin de Obras Públicas*, published officially in the Argentine Republic, Tomo IX., Año 1913 (Buenos Aires, 1914), The chief obstacle to navigation by vessels of large

draught is the bar (known as the Barra de Punta Indio), which runs diagonally across the estuary from the Argentine shore to that of Uruguay—100 kilometres, or 62 miles—along the line where the meeting of the tidal with the river water induces a precipitation of the sediment carried by the latter. The bottom is composed chiefly of a soft plastic clay, rendered more compact in places by a certain admixture of sand, etc. The detailed survey of the bottom had as its principal objects the location of the natural thalweg—which might be supposed to offer the best advantages for canalization, as most likely to be kept open by natural causes—and the charting of the bottom deposits according to their character, as this too would be of great importance in the selection of a suitable trace. During the operations seventy-six lines of soundings were run, with seven thousand individual determinations, and the result permitted the establishment of a provisional trace across the bar, 80 kilometres (50 miles) in length, between the 26-foot contour-lines on each side; this being the depth fixed upon in the first instance for the new channel. The proposed route was buoyed, and the concentration of navigation on this particular line was found to have a beneficial effect on the depth, the mud being loosened by the passage of vessels, and so more readily carried away by currents. The dredging experiments have since shown the feasibility of proceeding by the method of suction, and have already led to no small progress in the actual work. On the basis of a depth of 26 feet, a bottom width of 330 feet, and a gradient of 1 in 250 at the sides, the total volume of material to be excavated is reckoned at 47 odd million cubic metres, of which 35 million have already been removed. A gradual further deepening will be proceeded with, with a view of providing eventually a 30-foot channel, if possible.

AUSTRALASIA AND PACIFIC ISLANDS.

Prof. W. M. Davis's Researches on Coral Reefs in the Pacific.—We have already alluded to Prof. Davis's return from a successful expedition to the Pacific for the study of coral reefs, carried out with the support of the Shaler Memorial Fund of Harvard University, and with the further aid of a grant from the British Association. A preliminary report on the results of his investigations has now appeared both in the United States (*Science*, March 26, 1915) and in this country (*Nature*, April 15; the report being here prefaced by remarks signed "J. W. J."). Prof. Davis undertook the study in the belief that certain lines of evidence—and these by far the most important—had been too much neglected by students of the subject, and he therefore devoted special attention to them. Of the many theories put forward in explanation of the origin of coral reefs, any one, he points out, will satisfactorily account for the visible features of sea-level reefs themselves, and the study of these alone cannot lead to any valid conclusions. Independent evidence must be sought, and it can be readily obtained only by a study of the central islands within oceanic barrier reefs, or of massive elevated reefs such as occur in certain of the Fiji islands. Both, in his view, afford strong confirmation of the correctness of Darwin's theory of subsidence—the former from the embayments in their shore-lines to be seen in hundreds of cases, which, as Dana long ago pointed out, can only have been produced by subsidence; the latter from the relation of the limestones to the eroded surface of the pre-existent foundation. This must have stood above sea-level before the reef was deposited on it, and must have subsided to receive its marine cover. All theories of barrier reefs which involve a fixed relation of the reef foundation to sea-level during the formation of the reef-mass are, Prof. Davis maintains, excluded by the evidence of submergence obtained by him; and he shows in detail how the glacial-control theory recently elaborated by Daly will not hold for such reefs. For atolls, too, the subsidence theory is by

far the most probable, as it can hardly be supposed that subsidence should occur *only* where central islands should be present to attest it, and not in the case of reefs of identical appearance, though without such central islands. It is pointed out by "J. W. J." that areas of upheaval as well as of subsidence can be clearly traced over the whole of the Pacific, the two being in some cases so strangely intermixed as to suggest the existence of a system of faults. Prof. Davis would no doubt allow that *recent* movements of elevation have taken place in many cases, but he would apparently contend that these have been subsequent to the formation of the reefs, and have no bearing on their origin.

The Hawaiian Earthquakes of 1868.—An important contribution to our knowledge of these earthquakes is made in a paper by Mr. H. O. Wood (*Bull. Seismol. Soc. of America*, vol. 4, 1914, pp. 169–203). The earthquakes occurred after the beginning of eruptions in both Kilauea and Mauna Loa, and on this account have generally been considered of volcanic origin. The account given by Mr. Wood leaves little doubt as to the incorrectness of this conclusion. The chief characteristics of the volcanic earthquakes are that the epicentres of successive earthquakes are approximately coincident, the foci are shallow, the disturbed areas small, the main shocks begin suddenly and are of brief duration, and the aftershocks, if any, are few in number and soon over. The Hawaiian earthquakes of 1868 were very numerous, and included three (on March 28 and April 2 and 4) of great intensity. The strongest, that of April 2, which originated to the south of Hawaii, disturbed an area of about 375,000 square miles, or about the same as that of the Californian earthquake of 1906. The earthquake was thus of the first order of magnitude, and its focus must have been situated at a great depth. The number of shocks from March 29 to April 10 is estimated at more than two thousand, between three and four hundred having been felt on some days. Though in no case could the exact position of the epicentre be determined with accuracy, there is no doubt that in successive shocks the epicentre varied considerably in position. Thus, in every respect, the earthquakes differed from typical volcanic earthquakes, and agreed with true tectonic earthquakes. The interest of this conclusion lies in the close connection in time and space between important tectonic earthquakes and eruptions of two of the great Hawaiian volcanoes. Of this connection, we have a more recent example in the eruption of Sakurashima and the earthquake of January 12, 1914, in Southern Japan (see *Nature*, vol. 93, 1914, pp. 716–717).

HISTORICAL GEOGRAPHY.

The Strait of Anian.—The much-discussed question of this strait—the old-time representative of Bering Strait before ever a European voyager had approached the region in which it is situated—is once more dealt with by Mr. Godfrey Sykes in the March number (1915) of the *Bulletin* of the American Geographical Society. Without advancing any decidedly new ideas, the paper may be useful as bringing together the main factors of the problem, and especially for its reproduction of various old maps of importance for its understanding. One or two points are, however, missed by the writer, who seems hardly acquainted with all the previous literature on the subject, especially the German contributions of the late Prof. Ruge and Herr Sandler. Like them, he rightly insists on the leading part played by the sixteenth-century cartographer Gastaldi in introducing the strait into the conceptions of geographers, and on the provenance of the name (with others associated with it) from Marco Polo's narrative. But while reproducing Gastaldi's map of Eastern Asia (1561), in which the province of "Ania" is marked in the extreme north-east of China, as well as Zaltieri's map of 1566, in which the "Strait of

Anian" is shown, he makes no mention of Gastaldi's rare tract of about 1562, in which the strait first appears by name in literature, so far as can be ascertained.* Nor does he refer to the important part played by Ramusio through his publication of Polo's text, his version having evidently been used by Gastaldi, who was closely associated with him, and prepared the maps for his famous collection of voyages.† Mr. Sykes points to the change in Gastaldi's views of the relations of Asia and America between 1550 and 1561, as shown by a comparison of his maps of those dates, and seems to imply that the separation of the two was somewhat of a new idea at the latter date. But it must be remembered that, besides the hemisphere of 1554 published by Tramezini, and reproduced with the paper (which itself has been thought possibly the work of Gastaldi), many maps of the first half of the century had shown a water passage between the two continents, running up to the far north. Such were Mercator's double cordiform map of 1538, those of Desliens, Desceliers, Munster, and others. The complete separation of America from Asia was also insisted on by Verrazzano in his report on his voyage of 1524 (cf. *Journal*, vol. 35, p. 429). Of *maps* in which the strait of Anian is shown by name, mention might have been made of the sheet from an anonymous Venice atlas reproduced by Kretschmer (possibly earlier than Zaltieri's), and that accompanying Frobisher's voyages in search of a north-west passage (1578). The latter part of the paper deals with what is really a distinct subject—the various fictitious accounts of supposed voyages into or through the waterway connecting the Atlantic with the Pacific by the north of America—those of Juan de Fuca, Maldonado, De Fonte, and others. This was, no doubt, too wide a subject to be fully dealt with in the limits of the paper, which says little of the efforts in search of a passage from the Pacific side at the latter part of the seventeenth century, or the maps in which such a waterway was drawn across Canada towards Hudson Bay.

OBITUARY.

Colonel D. M. Lumsden.

We much regret to record the death, at the comparatively early age of 64, of Colonel Dugald McTavish Lumsden, C.B., eldest son of the late Mr. James Lumsden, of Peterhead. Colonel Lumsden was best known to the public for the part which he played in the Boer war by raising, largely at his own expense, the corps of Anglo-Indian mounted infantry which bore his name, and which did such excellent service during the protracted operations from April 1900 onwards. He went out to a tea estate in Assam at the age of 22, and soon became known and popular as a first-class shot and as a keen volunteer. He became a captain in the Durrung mounted rifles in 1887, and finally took command of the F Squadron of the Assam Valley Light Horse. To geographers he was known for his journey to the Abor country in 1909 with the late Mr. Noel Williamson and the Rev. W. L. B.

* While Ruge connected Polo's Ania with Annam, Sandler saw in it a reference to the Ainos, thinking, like Gastaldi and his contemporaries, that the passage is descriptive of the countries beyond China to the north. But Yule's interpretation of the Gulf of Cheinan (on which the places in question were placed by Polo) as a supposed arm of the sea running up into the hinterland of Tonking, presents far fewer difficulties.

† It would be interesting to know whether the strait figures in the wall-maps at Venice, supposed to have been restored by Gastaldi under Ramusio's direction.

Jackman, an account of which appeared in the *Journal*, vol. 37, p. 621. Although unsuccessful as regards its main object—the discovery of the supposed falls of the Tsangpo—it may justly be said to have given the spur for the subsequent advance in this region, culminating in the military expedition and important explorations since successfully accomplished.

Mr. J. F. Stackhouse.

Among the victims of the disaster to the *Lusitania* was Mr. J. Foster Stackhouse, whose name had been before the public a good deal during the past few years through his efforts to organize a new British Antarctic Expedition (*Journal*, vol. 42, p. 575). Having been forced to abandon this undertaking, he had latterly taken up the project of an expedition for oceanographic research, and had spent some months in the United States endeavouring to obtain support for it in that country. He had had some experience of polar travel through voyages to Spitsbergen and neighbouring parts of the Arctic Regions, and a short account of a trip to Jan Mayen was given in the *Journal*, vol. 39, p. 79.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *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 as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

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.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Glaciology. *La G. (I.G. De Agostini)* **2** (1914): 282–293. **Novarese.**
Ghiacciai quaternari delle Alpi occidentali. By Vittorio Novarese. *Maps and Illustrations.*

Alps—Valleys. *La G. (I.G. De Agostini)* **2** (1914): 294–303. **Patrini.**
Contributo allo studio orogenetico di alcune valli prealpine. By Plinio Patrini. *Illustrations.*

Europe—Political. **Toynbee.**

Nationality and the War. By Arnold J. Toynbee. London: J. M. Dent & Sons, 1915. Size 8½ × 5½, pp. x. and 522. *Maps. Price 7s. 6d. Presented.*

France—Alps. **Bénévent.**

Recueil Travaux I.G. Alpine (Univ. Grenoble) **3** (1915): 69–100.

Le Manival (Etude de cône de déjection). Par E. Bénévent. *Illustrations.*

France—Ariège. **Reynier.**

Recueil Travaux I.G. Alpine (Univ. Grenoble) **3** (1915): 1–56.

La région Privadoise (Ouvèze et Payre). Par Elie Reynier. *Illustrations.*

France—Basses Alpes. **Blanchard.**

Recueil Travaux I.G. Alpine (Univ. Grenoble) **3** (1915): 57–67.

L'Hydrographie du Bassin superieur du Verdon. Par Raoul Blanchard.

France—Savoy. **Gaillard.**

Les Alpes de Savoie. (Second volume.) La frontière franco-italienne entre la Seigne et le Thabor. Guide pour l'alpiniste par Émile Gaillard. Macon: C. Faure. N.D. Size 7 × 4½, pp. xiv. and 326. *Maps. Price 8s.*

France—Savoy. *B.R.S.G. (Rome)*, Ser. V., **4** (1915): 31–68, 227–275. **Giannitrapani.**

La Savoja. By Luigi Griannitrapani. *Illustrations.*

A careful piece of regional work.

Gibraltar. *J.R. Anthropological I.* **44** (1914): 264–269. **Duckworth.**

Cave Exploration at Gibraltar in 1912. By W. H. L. Duckworth. *Illustrations.*

Italy—Abruzzi. **Festa.**

Escursione Zoologiche nei Monti della Vallata del Sangro (Abruzzi). By Enrico Festa. Turin, 1915. Size 10 × 6½, pp. 12. *Illustrations.*

The illustrations (from photographs) give a good idea of the morphology of the district.

Italy—Anthropogeography. *Mem. Geografiche* **8** (1914) No. 26: 295–461. **Gasperi.**

Studi sulle sedi e abitazioni umane in Italia. I. Le Casère del Friuli. By G. B. de Gasperi. *Illustrations.*

Italy—Calabria—Historical. **Douglas.**

Old Calabria. By Norman Douglas. London: Martin Secker, 1915. Size 9½ × 6, pp. vi. and 352. *Illustrations. Price 15s. net.*

Italy—Glaciology. ——

Società Italiana per il Progresso delle Scienze, Bollettino del Comitato glaciologico italiano (sotto gli auspici del C.A.I. e della S.I.P.S.). Num. 1. Rome, 1914. Size 10½ × 7½, pp. 113. *Map and Illustrations.*

A valuable new publication, giving results of survey and observation in various groups of Italian glaciers.

Italy—Northern Plain. **Lorenzi.**

G. Riv. Italiana **21** (1914): 269–354, 401–450, 497–530, 576–604.

Studi sui tipi antropogeografici della pianura padana. By Arrigo Lorenzi. *Illustrations.*

Italy—Sardinia—Population. **Anfossi.**

B.R.S.G. (Rome), Serie V., **4** (1915): 165–195, 277–295.

Ricerche su la distribuzione della popolazione in Sardegna. By G. Anfossi. *Sketch-maps and Illustrations.*

Italy—Sicily—Erosion. *Pubbl. I.G. Fisica e Vulcanologia*, No. 2 (1915): pp. 7. **Platania.**

Marmitte dei Giganti di Erosione Marina. By Gaetano Platania. *Illustrations.*

Italy—Sicily—Etna. *Pubbl. I.G. Fisica e Vulcanologia*, No. 3 (1915): pp. 12. **Platania.**

Le Recenti Eruzioni dell' Etna. By Gaetano Platania. *Illustrations.*

Italy—Statistics. *La G. (I. G. De Agostini)* **2** (1915): 8 Maps. ——

Cartogrammi statistici d'Italia.

These maps show various distributions, such as those of illiteracy, the incidence of taxation, progress of the Cadastral Survey, etc., etc.

Italy—Venetia—Olive. *Riv. G. Italiana* **21** (1914): 2–45, 137–175, 204–250. **Toniolo.**

La distribuzione dell' olivo e l'estensione della provincia climatica mediterranea nel veneto occidentale. By Antonio Renato Toniolo. *Map and Illustrations.*

Poland—Place-names. *G. Teacher* 8 (1915): 5–14. **Ehrlich.**

Polish Place-names. By Ludwik Ehrlich.

Useful rules for pronunciation, followed by a long list of names with Polish spelling and its English equivalent.

Russia. **Graham.**

Russia and the World. A study of the war and a statement of the World-problems that now confront Russia and Great Britain. By Stephen Graham. London: Cassell & Co., 1915. Size 9½ × 6½, pp. xii. and 260. *Illustrations. Price* 10*s.* 6*d. net.*

Russia. **Hubback.**

Russian realities. Being impressions gathered during some recent journeys in Russia. By John Hubback. London: John Lane, 1915. Size 7½ × 5, pp. xii. and 280. *Maps and Illustrations. Price* 5*s. net. Presented.*

Sweden—Geomorphology. **De Geer.**

Sveriges Geol. Undersökning, Ser. Ba. 9 (1913): pp. 24.

Beskrivning till översiktskarta över Södra Sveriges Landformer. Av Sten de Geer.

Sweden—Hydrography—Maps. **Smedberg.**

Sveriges Hufvudflodområdens officiella Kartor. Af Richard Smedberg. (Särtryck ur Flotnings-Tidskrift, H. 1 (16), 1915.) Stockholm, 1915. Size 11 × 8½, pp. 339. *Map.*

A catalogue of official maps of the principal water-systems of Sweden.

Sweden—Lule River. **Frödin.**

Årsbok Sveriges Geol. Undersökning 7, 1913 (1914): No. 4, pp. 276.

Geografiska studier i St. Lule älvs källområde. Av John Frödin. (Ser. C, No. 257.) *Maps and Illustrations.*

Studies in the basin of the Lule River and the lakes drained by it.

Sweden—Scania. **Grönwall.**

Årsbok Sveriges Geol. Undersökning 7, 1913 (1914): No. 1, pp. 118.

Frågan om djupborrningar i Skåne. Av K. A. Grönvall. *Maps and Illustrations.*

United Kingdom—Leicestershire. **Kelsey.**

Oxford County Histories. Leicestershire. By Charles E. Kelsey. Oxford: Clarendon Press, 1915. Size 7½ × 5, pp. 220. *Sketch-maps and Illustrations. Price* 1*s.* 6*d. net. Presented.*

United Kingdom—Nottinghamshire. *G. Teacher* 8 (1915): 16–26. **Fawcett.**

The Long Eaton District. Geographical Conditions and Problems of a Growing Industrial District. By C. B. Fawcett. *Sketch-maps.*

ASIA.

China. *G. Teacher* 8 (1915): 1–5. **Roxby.**

Some Aspects of the Geography of China. By P. M. Roxby.

China—Ngan-Hwei. *Variétés Sinologiques*, No. 40 (1914): pp. 129. **(Zi.)**

Notice Historique sur les T'Oan ou Cercles du Siu-Tcheou Fou, particulièrement sur ceux du district de Ou-Toan. Par Etienne (Zi).

China—Sechuan. *Variétes Sinologiques*, No. 43 (1915): pp. 35. **Roux.**

Carte du Se-tch'ouan Occidental levée en 1908–1910. Par François Roux. *Maps.*

China and Tibet—Exploration. **Tafel.**

Meine Tibetreise. Eine Studienfahrt durch das nordwestliche China und durch die innere Mongolei in das östliche Tibet. Von Dr. Albert Tafel. 2 vols. Berlin, 1914. Size 10 × 7, pp. (vol. 1) xii. and 352; (vol. 2), 346. *Maps, Illustrations, and Sections. Price* 21*s.* 6*d.*

Chinese Turkestan. **British Museum.**

Guide to an Exhibition of Paintings, Manuscripts, and other Archæological Objects collected by Sir Aurel Stein, K.C.I.E., in Chinese Turkestan. London, 1914. Size 8½ × 5½, pp. 58. *Map.*

Eastern Asia—Guides. ———

Official guides to Eastern Asia. Vol. 1. Manchuria and Chōsen (pp. 350). Vol. 2. South-Western Japan (pp. 370). Vol. 3. North-Eastern Japan (pp. 488). Tokyo: The Imperial Japanese Government Railways, 1913–14. Size 6½ × 4½. *Maps, Plans, Diagrams, and Illustrations. Presented.*

India—Economic. *B. American G.S.* **47** (1915): 81–99. **Packard.**

Response to Rainfall in India. By Leonard O. Packard. *Maps.*

India—Himalaya—Glaciers. *Records Geol. Surv. India* **44** (1914): 280–335. **Grinlinton.**

Notes on some Glaciers of the Dhauli and Lissar Valleys, Kumaon Himalaya, September, 1912. By Captain John L. Grinlinton. *Maps and Illustrations.*

India—Musulmans. **Bourne.**

Hindustani Musulmans and Musulmans of the Eastern Punjab. By Major W. Fitz G. Bourne. Calcutta, 1914. Size 10 × 6, pp. vi. + 110. *Price Re.* 1 *or* 1*s.* 4*d.*

India—Salt deposits. *Records Geol. Surv. India* **44** (1914): 241–264. **Christie.**

Notes on the Salt Deposits of the Cis-Indus Salt Range. By W. A. K. Christie. *Illustrations.*

Japan—Alps. *Scottish G. Mag.* **31** (1915): 113–120. **Oseki.**

Some Notes on Glacial Phenomena in the North Japanese Alps. By K. Oseki. *Sketch-map and Diagrams. Also separate copy.*

Philippine Islands—Bog. *J. Ecology* **3** (1915): 24–31. **Gates.**

A Sphagnum Bog in the Tropics. By Frank C. Gates. *Illustrations.*

Philippine Islands—Luzon. *Philippine J. Sc.* **9** (1914): 391–434. **Gates.**

The Pioneer Vegetation of Taal Volcano. By Frank C. Gates. *Map and Illustrations.*

AFRICA.

British East Africa—Survey. **Williams.**

East Africa Protectorate. Survey Department. Annual Report, by Captain G. C. Williams, for the year ending March 31, 1914. Nairobi, 1914. Size 13½ × 6½, pp. 16. *Maps and Illustrations.*

French West Africa. **Joffre.**

My march to Timbuctoo. By General Joffre, with a biographical introduction by Ernest Dimnet. London: Chatto & Windus, 1915. Size 7½ × 5, pp. 170. *Sketch-map. Price* 2*s. net. Presented.*

German South-West Africa—Geology. **Versfeld.**

South African J.Sc. **11** (1915): 187–238.

The Geological structure of portions of German South-West Africa. By W. Versfeld. *Illustrations.*

Mauritius. *Scottish G. Mag.* **31** (1915): 180–185. **Waring.**

The Distribution of the Population in Mauritius. By H. E. A. Waring. *Sketch-map.*

Nigeria, Southern—Ethnology. **Talbot.**

Woman's Mysteries of a Primitive People. The Ibibios of Southern Nigeria. By D. Amaury Talbot. London: Cassell & Co., 1915. Size 9½ × 6½, pp. 252. *Illustrations. Price* 10*s.* 6*d. net. Presented.*

Sahara—Tuareg. *J.R. Anthropological I.* **44** (1914): 351–375. **Zeltner.**

Les Touareg du Sud. Par Fr. de Zeltner. *Illustrations.*

South Africa and Indian Ocean. *South African J. Sc.* **11** (1915): 169–179. **Schwarz.**

The lost land of Agulhas. By E. H. L. Schwarz. *Sketch-maps.*

Will be noticed in the next number.

Tripoli. **Franchetti.**

La missione Franchetti in Tripolitania. (Il Gebèl.) By Leopoldo Franchetti and others. Florence: Fratelli Treves, 1914. Size 10 × 6½, pp. 610. *Maps and Illustrations. Price* 15*s.*

An important publication, giving the results of studies of the geology, water supply, agriculture, and other economic resources of Tripoli.

Place-names. ———

Norme per la trascrizione Italiana e la grafia Araba dei nomi propri geografici

della Tripolitania e della Cirenaica. (Ministero délle Colonie.) Rome: C. de Luigi, 1915. Size 9 × 6½, pp. 43.

NORTH AMERICA.

Alaska—Mountains. *Alpina Americana*, No. 3 (1914): pp. 22. **Brooks.**

Mountain Exploration in Alaska. By Alfred H. Brooks. *Maps and Illustrations.*

Alaska—Mt. McKinley. **Balch.**

Mount McKinley and mountain climbers' proofs. By Edwin Swift Balch. Philadelphia: Campion & Co., 1914. Size 10½ × 7, pp. 142. *Presented by the Author.*

The writer upholds Dr. Cook's claim to have reached the highest point.

Canada—Alberta. *Canada, Geol. Surv., Museum B.*, No. 4 (1914): pp. 1–36. **MacKenzie.**

The Crowsnest Volcanics. By J. D. MacKenzie. *Illustrations.*

Canada—Boundaries. **White.**

Boundary disputes and treaties. By James White. Toronto: Glasgow, Brook & Co., 1914. Size 11 × 8, pp. 750–958. *Presented.*

Canada—British Columbia. ——

Province of British Columbia. Report of the Survey Branch of the Department of Lands for the Year ending December 31, 1914. Victoria, B.C., 1915. Size 10½ × 7½, pp. 226. *Maps and Illustrations.*

Canada—Montreal. *Minutes P.I. Civil Engineers* **198** (1915): 104–207. **Cowie.**

The Transportation Problem in Canada, and Montreal Harbour. By F. W. Cowie. *Map, Plan, and Diagrams.*

Canada—Montreal. **[Ross, Robertson, Labelle.]**

The Harbour of Montreal. Annual Report, 1914. [Montreal, 1915.] Size 9 × 6, pp. 121. *Plan and Illustrations.*

Canada—Place-names. *T.R.S. Canada* **8** (1914): 259–293. **Ganong.**

An Organization of the Scientific Investigation of the Indian Place-nomenclature of the Maritime Provinces of Canada. By W. F. Ganong. [Fourth Paper.] *Also separate Copy.*

Canada—Resources. **Department of the Interior.**

The unexploited West. A compilation of all the authentic information available at the present time as to the natural resources of the unexploited regions of Northern Canada. By Major Ernest J. Chambers. Published under the direction of F. C. C. Lynch and Hon. W. J. Roche. Ottawa: Department of the Interior, 1914. Size 10 × 6½, pp. xvi. and 362. *Sketch-maps and Illustrations.*

Canada—Saskatchewan. **Tyrrell.**

Gold on the North Saskatchewan River. By J. B. Tyrrell. (From *Bulletin Canadian Mining Inst.*, February, 1915.) [Toronto, 1915.] Size 9 × 6, pp. 68–81.

North America—Cordillera. **Daly.**

Canada, Geol. Surv., Mem. No. 38 (1912): pp. xxvii. and 1 to 546; xxvii. and 546 to 557.

Geology of the North American Cordillera at the Forty-Ninth Parallel. By Reginald Aldworth Daly. In three parts. *Illustrations and Maps (pt. 3).*

North America—Mountain-building. *J. Geology* **23** (1914): 633–654. **Blackwelder.**

A Summary of the Orogenic Epochs in the Geologic History of North America. By Eliot Blackwelder.

CENTRAL AND SOUTH AMERICA.

Bolivia—Political. ——

B. Dirección Gen. Estadística y Estudios G. **10** (1914): 193–294.

División Político-Administrativa de la República de Bolivia.

Brazil. **Bruce.**

Brazil and the Brazilians. By G. J. Bruce. London: Methuen & Co., 1915. Size 9 × 6, pp. 308. *Illustrations. Price 7s. 6d. net.*

Peru. *National G. Mag.* **27** (1915): 172–217. **Bingham.**

The Story of Machu Picchu: The National Geographic Society—Yale University Explorations in Peru. By Hiram Bingham. *Illustrations.*

South America—Anthropogeography. **Adams.**

The Plateau Peoples of South America. An essay in Ethnic Psychology. By Alexander A. Adams. London: George Routledge, 1915. Size 7½ × 5, pp. 134. *Illustrations. Presented.*

West Indies—Lesser Antilles. *B. American G.S.* **46** (1914): 662–678. **Fewkes.**

Relations of Aboriginal Culture and Environment in the Lesser Antilles. By J. Walter Fewkes.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Northern territory. *J.R.S. Arts* **63** (1915): 386–400. **Lindsay.**

The Northern Territory of Australia. By David Lindsay. *Map.*

New Zealand—Mount Cook. **Du Faur.**

The conquest of Mount Cook and other climbs. An account of four seasons' mountaineering on the Southern Alps of New Zealand. By Freda Du Faur. London: G. Allen & Unwin, 1915. Size 11 × 7, pp. 250. *Illustrations. Price* 16*s. net.*

Combines a review of previous mountaineering work in the Mount Cook region, with an account of the author's own climbs.

MATHEMATICAL GEOGRAPHY.

Geodesy—Instrument. **Madsen and Petersen.**

Den Danske Gradmaaling, Ny Række, Hefte Nr. 14. Registrerings-apparat til Tyngdemaalingspenduler. Udgivet af V. H. O. Madsen. Beskrevet af Aage Petersen. Copenhagen, 1915. Size 10½ × 9, pp. 13. *Illustrations.* [French *résumé.*]

Sundials. **Washington.**

Calculations for Sundials. By Colonel F. P. Washington. [Type-written sheets.] Size 10 × 8. *Diagrams.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Huntington.**

The Solar Hypothesis of Climatic Changes. By Ellsworth Huntington. (From *B. Geol. S. America* **25** (1914): 477–590.) *Maps and Diagrams.*

Climatology. **Norlind.**

Einige Bemerkungen über das Klima der Historischen Zeit nebst einem Verzeichnis mittelalterlicher Witterungserscheinungen. Von Arnold Norlind. (*Lunds Universitets Årsskrift*, N.F., Afd. I., Bd. 10, Nr. 1.) Lund and Leipzig, 1914. Size 10 × 6½, pp. 53.

See note in the January number (1915), p. 82.

Coral reefs. *B. American G.S.* **46** (1914): 561–577, 641–654, 721–739. **Davis.**

The home study of Coral Reefs. By (Prof.) W. M. Davis.

Coral reefs. *Science*, N.S., **41** (1915): 455–458. **Davis.**

Preliminary Report on a Shaler Memorial Study of Coral Reefs. By W. M. Davis.

See note *supra*, p. 539.

Volcanism. **Iddings.**

The Problem of Volcanism. By Dr. Joseph P. Iddings. New Haven: Yale University Press (London: Humphrey Milford), 1914. Size 9½ × 6½, pp. xvi. and 274. *Illustrations and Sections. Price* 21*s. net. Presented.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. *J.R. Anthropological I.* **44** (1914): 385–393. **Irving.**

Some recent work on Later Quaternary Geology and Anthropology, with its bearing on the Question of "Pre-Boulder-Clay Man." By A. Irving. *Illustrations.*

Economic Geography. *Scottish G. Mag.* **31** (1915): 82–93, 123–136. **Chisholm.**

Some Considerations in Economic Geography in Connection with the War. By George G. Chisholm.

History of Geography. *La G., I.G. (De Agostini)* **2** (1915): 330–348. **Almagià.**

La Geografia nell' età classica. By Roberto Almagià.

BIOGRAPHY.

Blaeu. **Stevenson.**

Willem Janszoon Blaeu, 1571–1638. A sketch of his life and work, with an especial reference to his large World Map of 1605. Facsimile of the unique copy belonging to the Hispanic Society of America. By Dr. Edward Luther Stevenson. New York: The Hispanic Society of America, 1914. Size 9½ × 6, pp. 68. *Portrait and Facsimiles. Map in separate case, size* 26 × 20½. *Presented.*

Will be reviewed in an early number.

Petermann. **Weller.**

Leben und Wirken August Petermanns. Von Dr. E. Weller. Leipzig: J. Klinkhardt, 1914. Size 10 × 6½, pp. 64. *Portrait.*

Extension of a chapter in a former work by the same author on Petermann and his School.

GENERAL.

Bibliography. **Royal Society.**

Catalogue of Scientific Papers. Fourth series (1884–1900). Compiled by the Royal Society of London. Vol. 14. C. — Fittig. Cambridge: University Press, 1815. Size 11½ × 8½, pp. 1024.

Education. *G. Teacher* 8 (1915): 43–45. **Sutherns.**

Geographical Education in South Africa. By H. D. Sutherns.

Virtually the same communication as that sent to us by Mr. James Hutcheon, summarised in the *Journal* for April, p. 338.

Education—Text-book. **Pickles.**

The surface of the Earth. Elementary, physical, and economic geography. By Herbert Pickles. Cambridge: University Press, 1915. Size 8 × 5½, pp. xii. and 170. *Sketch-maps, Illustrations, and Diagrams. Price* 2*s. Presented.*

Flags. **Gordon.**

Flags of the World. Past and present. Their story and associations. By W. J. Gordon, with illustrations by W. J. Stokoe. London: F. Warne & Co., 1915. Size 8 × 5½, pp. xvi. and 256. *Illustrations. Price* 6*s. net. Presented.*

A useful work, giving a large amount of information not easily accessible elsewhere. There are many coloured illustrations.

NEW MAPS.

By E. A. REEVES, Map-Curator, R.G.S.

EUROPE.

Europe. **Bacon.**

Bacon's New War Map of South-Central Europe (with contour colouring). Scale 1 : 2,725,000 or 1 inch to 43 stat. miles. Size 28 by 20 inches. London: G. W. Bacon & Co., Ltd., [1915]. *Price* 1*s. net. Presented by the Publishers.*

Europe. **Frater.**

Carte de la Frontière Occidentale de la Russie par le Colonel Frater. 1ᵉᵉ Édition (1915). Scale 1 : 2,000,000 or 1 inch to 31·56 stat. miles. Size 20 by 21 inches. Paris: Librairie Militaire Chapelot, 1915.

This map is a companion to that of the western theatre of war published some months ago and noticed in the *Geographical Journal* for November last. It shows by symbols and colours: forests, marshes, railways with their relative importance, routes, fortified towns, and forts; towns are indicated by different symbols according to their population. Hill shading is in brown, and international boundaries in red. Routes and roads are all shown in the same manner, and there is no means of ascertaining their relative importance or condition.

As in the case of the previous map, a large portion of the sheet is taken up with letterpress dealing with the military geography of the Russian, German, and Austrian frontiers, the concentration of troops, and kindred subjects.

Europe. **Service Géographique de l'Armée, Paris.**

Carte du Théâtre des Operations (Front Occidental) avec Répertoire Alphabetique. Scale 1 : 500,000 or 1 inch to 7·89 stat. miles. 15 sheets, each 12 by 16 inches. Paris: Service Géographique de l'Armée, 1915.

These are the sheets of the French Depôt des Fortifications map on the 1 : 500,000

scale embracing the western theatre of war, with boundaries in red. There are no contours, but numerous heights are given in figures. The sheets are folded in a portfolio, and accompanied by a most useful and complete alphabetical index to places. Letters and figures have been added to the borders of the sheets corresponding with those given with the names in the index.

Europe. **Service Géographique de l'Armée, Paris.**

Europe 1,000,000ᵉ (1 inch to 15·78 stat. miles). Sheets: 48° N. 12° E. Milan; 48° N. 18° E. Buda Pesth; 48° N. 24° E. Bucharest; 52° N. 12° E. Munich; 52° N. 18° E. Vienne; 52° N. 24° E. Lemberg; 56° N. 12° E. Berlin; 56° N. 18° E. Dantzig; 56° N. 24° E. Varsovie. Paris: Service Géographique de l'Armée, [1915]. *Price 1.25 fr. each sheet.*

Sheets of Central Europe specially prepared for use during the present military operations. Each sheet contains four degrees of latitude and six of longitude; but in consequence of longitude being reckoned from Paris, the limiting meridians of these sheets are not the same as those of the 1 : 1,000,000 International Map of the World. The style of production resembles generally that of the Balkan map on the same scale, and others of the series that have been previously published. No attempt has been made to give contours, and relief is indicated by hill-shading in brown, with numerous heights in figures. Railways are in black, roads in red, and rivers blue. There is no explanation of the symbols employed. Considerable detail is shown, and there is a large number of place-names—perhaps too many for clearness. Each sheet is separately projected, but the projection selected is hardly satisfactory for the purpose. It is in effect the straight-lined trapeziform projection upon which some of the maps in the early editions of Ptolemy were constructed. Whatever may be said in its favour for a single sheet of a small area, it is quite unsuitable when it is desired to join several sheets, because at the corners the meridians are far from being at right angles to the parallels.

Europe. **E. Stanford.**

The Theatre of War in Eastern Europe. Stanford's War Maps, No. 11. Scale 1 : 1,140,000 or 1 inch to 18 stat. miles. Size 43 by 28 inches. London: Edward Standford, Ltd., 1915. *Price 7s. 6d. Presented by the Publishers.*

A clear and useful map for following the military operations in the eastern theatre of war. Railways and roads, with their relative importance, canals, and a careful selection of towns and villages are given. The general land relief is well brought out by tints in brown at the following intervals in feet: 0 to 500; 500–1000, 1000–2000, 2000–5000, and above 5000. Care has been taken to indicate important passes clearly.

Europe. **Vida de lablache.**

Carte Murale du Théâtre de la Guerre Européenne par P. Vida de lablache. Scale 1 : 1,500,000 or 1 inch to 23·67 stat. miles. Size 36 by 48 inches. Paris: Armand Colin, 1915.

A diagrammatic map showing the eastern and western theatres of war with the relief, principal railways, canals, rivers, and chief towns in a bold style so that they can be seen several feet away. Less important detail and place-names are small and only legible on close inspection. Forts are shown by a special symbol, and the camps of prisoners of war in Germany are underlined. The Balkan States are shown as an inset.

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets, new editions, 1914: vi.–16, Pontivy; vi.–19, Belle-Ile (Est); x.–25, Rochefort; xiii.–18, Château-du-Loir; xiv.–10, Pavilly; xiv.–12, Evreux; xiv.–22, Le Blanc; xvi.–13, Paris (Ouest); xvi.–19, Salbris; xvi.–26, Ussel; xvi.–28, Mauriac; xvii.–37, St. Paul; xviii.–14, Provins; xviii.–26, Issoire; xix.–7, Valenciennes; xix.–25, Thiers; xxi.–25, Lyon (Nord-Ouest); xxiv.–21, Salins; xxiv.–25, Annecy; xxiv.–30, Gap; xxv.–15, Baccarat; xxvi.–24, Vallorcine. Size 13 by 17 inches. Paris: Hachette & Cie.

Sweden. **Sveriges Geologiska Undersökning.**

Geologisk Karta över Sverige. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheet iv. 0. 36, Gamleby. Size 18 by 24 inches. Stockholm: Sveriges Geologiska Undersökning, 1915. *Presented by the Swedish Geological Institute.*

Switzerland. **Kummerly and Frey.**

Offizielle Eisenbahnkarte der Schweiz. Stand auf 1. Januar 1915. Scale 1 : 500,000 or 1 inch to 7·89 stat. miles. Size 20 by 29 inches. Bern: Kümmerly & Frey, 1915.

A new edition of an official map showing Swiss railways up to January 1, 1915.

By various colours and symbols a considerable amount of information is given concerning the railways, but by some oversight the coloured symbols are omitted in the reference, there being only blank spaces instead.

Turkey. **E. Stanford.**

Stanford's War Maps, No. 12. The Theatre of War in Western Asia Minor, the Sea of Marmora, the Bosporus and Dardanelles, Constantinople, and Smyrna. Size 18 by 28 inches. London: Edward Stanford, Ltd., 1915

A sheet containing seven coloured maps and plans on different scales.

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Map showing Elevators in Manitoba, Saskatchewan, and Alberta. Prepared in the Railway Lands Branch, F. C. C. Lynch, Superintendent. Scale 1 : 1,584,000 or 1 inch to 25 stat. miles. Size 16 by 35 inches. 6th edit. Ottawa: Department of the Interior, 1915. *Presented by the Department of the Interior, Ottawa.*

Canada—British Columbia. **Dept. of Mines, Ottawa.**

Geological Survey of Canada. Scale 1 : 62,500 or 1·014 inch to 1 stat. mile. Maps: 70A, Victoria, Vancouver Island; 72A, Saanich, Vancouver Island. Size 18 by 12 inches. Ottawa: Department of Mines, 1914. *Presented by the Department of Mines, Ottawa.*

United States. **Renshawe.**

Panoramic View of the Yellowstone National Park, Wyoming-Montana-Idaho. Prepared by John H. Renshawe from Topographic Sheets of the United States Geological Survey. Scale 1 : 187,500 or 1 inch to 2·9 stat. miles. Size 21 by 18 inches. Washington: Department of the Interior, [1915]. *Presented by the Department of the Interior, Washington.*

A graphic but somewhat roughly executed relief map, printed in colours, giving much the effect of a map taken from a model of the district.

AUSTRALIA.

Australia. **Hunt.**

Map showing average rainfall for the wheat-growing period April to October inclusive, also percentage of average annual rainfall during the same period over Australia and Tasmania. Scale 1 : 12,672,000 or 1 inch to 200 stat. miles. Size 8 by 10 inches.—Frost Map of Australia. Scale 1 : 12,672,000 or 1 to 200 stat. miles. Size 8 by 10 inches. Issued under the authority of the Minister of State for Home Affairs by H. A. Hunt, Commonwealth Meteorologist, 1914.

Victoria. **Geological Survey of Victoria.**

Geological Survey of Victoria. Scale 1 : 31,680 or 2 inches to 1 stat. mile. Sheets: Bullioh, size 10 by 12 inches; Bungil East, size 18 by 12 inches. Melbourne: Geological Survey of Victoria, 1915. *Presented by the Geological Survey of Victoria.*

WORLD.

World. **Bacon.**

New Series of Physical Wall Atlases. The series comprises seven complete atlases as follows: Europe, scale 1 : 8,000,000 or 1 inch to 126 stat. miles; Asia, scale 1 : 16,000,000 or 1 inch to 259 stat. miles; Africa, scale 1 : 12,500,000 or 1 inch to 197 stat. miles; North America, scale 1 : 12,500,000 or 1 inch to 197 stat. miles; South America, scale 1 : 12,500,000 or 1 inch to 197 stat. miles; Australia, scale 1 : 4,600,000 or 1 inch to 75 stat. miles; World in Hemispheres, approximate scale 1 : 39,000,000 or 1 inch to 616 stat. miles. London: G. W. Bacon & Co., Ltd., [1915]. *Price of the seven maps forming each atlas, mounted, 21s. Presented by the Publishers.*

With the more enlightened and scientific methods of teaching and studying geography there follows naturally an increasing demand for suitable appliances, amongst the important of which are maps and atlases. Geographical publishers in this country have already done much to meet the need, and several series of school wall maps on more or less approved lines are already obtainable. The series mentioned above is the latest of these, and consists of seven sets of wall maps, or atlases as they are called, of the World in hemispheres, Europe, Asia, Africa, North America, South America, and Australia. Each set comprises seven maps dealing with the following subjects: (1) contours, (2) vegetation, (3) rainfall (mean annual), (4) rainfall (seasonal), (5) isotherms (January), (6) isotherms (July), and (7) commercial. All the maps measure

about 31 by 38 inches, and those of any one region are on the same scale. The outlines are simple, and on the whole clear; and upon these, principally by means of colour-tinting, are shown the special information and features dealt with. Care has been taken not to overcrowd the maps, and only those names that are essential are given. In some instances there is hardly enough distinction between the colours and tints selected, and in the case of the isothermal maps it would certainly have been an advantage to have shown the isothermal lines in addition to the tinting. Evident pains has been taken with the maps, and there is no doubt they will prove useful; but as wall maps some of the work is hardly bold enough to be clearly seen at a distance, although in a small class-room there may not be much difficulty in this respect. Very properly, where comparison of areas is concerned, equal-area projections have been used for the maps, Bonne's for Europe, and the Zenithal (Lambert's) for the others. There is, however, one exception to this rule, that of Australia, which is drawn on Clarke's Minimum Error Perspective Projection. This is an excellent projection for a region like Australia, and gives a good general representation of the continent; but it is not equal areal. The general idea and scheme of this series of maps is much the same as that of at least two other sets that have been published in recent years, and which have been much appreciated by teachers.

World. **Bacon.**

Bacon's Contour Atlas: North England Edition; Lancashire and Yorkshire Edition; Southern Wales Edition. Size 9½ by 7½ inches. London: G. W. Bacon & Co., Ltd., [1915]. *Price 6d. each. Presented by the Publishers.*

Three of a series of cheap school atlases each containing thirty-seven maps, showing relief by coloured layers system, and distribution of natural phenomena by various tints, with an index at the end giving the latitudes and longitudes of principal towns. The atlases are all similar except that at the commencement there are a few special maps dealing particularly with the districts named.

CHARTS.

Polar Regions. **Soley.**

Currents in the Arctic and Antarctic Regions with attention to water temperatures, colour and formation of ice, and other physical conditions. By Lieut. John C. Soley, U.S. Navy (Retired), in charge of the Branch Hydrographic Office at New Orleans, [1915]. Size 26 by 36 inches. *Presented by Lieut. John C. Soley, U.S. Navy (Retired).*

Charts of the Arctic and Antarctic regions on one sheet, with text below describing generally the physical conditions, currents, water temperatures, and ice formation and coloration. The Arctic chart extends to the 65th, and the Antarctic to the 50th parallel of latitude.

PHOTOGRAPHS.

Asia. **Romanoff.**

Ten photographs of Persia, Caucasus, and Russian Turkestan by Nicolas Romanoff. *Presented by M. Nicolas Romanoff*, 1914.

Excellent enlargements varying in size from 11¾ by 9¾ inches to 14 by 7½ inches, recently exhibited in the Society's Photograph Room. The specimens of architecture, if not entirely geographical, are very interesting and remarkably good.

(1) Palace and gardens of governors of Astrabad, time of Mohammed Agha, 1810; (2) Mosque in Astrabad; (3) Entrance to mosque in Astrabad; (4) Old shrine in Astrabad, carved wood doors, twelfth century; (5) Teheran entrance gate, October, 1913; (6) Teheran, view in bazaar; (7) Shrine, Elisabetpol, Caucasus region; (8) Shrine in Khojent, Russian Turkestan; (9 and 10) Panthers, Persia.

Dolomites. **Torday.**

One hundred and nineteen photographs of the Schlern Dolomites, taken by E. Torday, 1914. *Presented by E. Torday, Esq.*

These photographs are of various sizes from some quite small ones of about 3¾ by 2¾ inches to panoramas of 11½ by 3½ inches. They serve well to illustrate the characteristic features of this district of the southern Tyrol.

(1, 3, 5, 6, and 7) Völs, Schlern; (2) Völs, from the Schlern; (4) Near Völs; (8) A peasant near Völs; (9, 10, 11, and 12), Völs fish-pond; (13) Atzwang; (14) Atzwang, on the river Eisach; (15 and 16) Near Atzwang; (17, 21, and 30) View from St. Constantin; (18) Road from St. Constantin to Atzwang; (19) St. Constantin with Ritten in background; (20) On the road from Waidbruck to St. Constantin; (22, 27) St. Constantin; (23) Between St. Constantin and Völs; (24) Road of avalanche near St. Constantin; (25) The road at St. Constantin; (26) Road from St. Constantin to Umst; (28)

near St. Constantin; (29) The Schlern from the road between St. Constantin and Umst; (31) Road to Gröden from St. Constantin, the mountain pass with anemones; (32) View from St. Constantin in the morning; (33) Sennhütte on the Duftalm, near St. Constantin; (34) The Aichnerin, on the steep road from St. Constantin to Atzwang; (35 and 36) Wealthy peasant woman from St. Constantin; (37) Valley of Eisach from St. Constantin; (38, 39, and 40) Valley of Eisach; (41) The castle near Waidbruck; (42) Near St. Vigil; (43, 44, 45, and 47) St. Vigil; (46) Ruine Salegg; (48, 49, 50, 51, and 52) Wolfsschlucht, Salegg; (53, 54, and 55) The Ritten; (56) Ruins of Hauenstein; (57) St. Valentin; (58, 59, and 60) Kastebruth; (61, 62, 64, and 65) Santner peak; (63) The Santner (Rosszähne on the left); (66) The Puflatsch; (67, 68) Seis; (69, 72, and 77) Near Seis; (70) From the new road up to Seis; (71) Seis, the Puflatsch in the background; (73) View from Seis; (74) Cascade near the new road to Seis; (75) Plague cemetery near Seis, the church, St. Valentin, dates from thirteenth century; (76) Sea of rocks near old road up to Seis; (78, 80, and 82) The brook Ratzes; (79) Brook Ratzes with Gschtadshof above; (81) Bridge over the Ratzes; (83) Seiser Alm (mountain-side pasture land), from brook Ratzes; (84) Mill on the Ratzes; (85) Ratzes; (86, 87, 88, and 90) St. Ulbrich; (89) In St. Ulbrich; (91 and 92) St. Christine; (93) Wolkenstein; (94) Castle, Wolkenstein; (95, 96, and 97) Langkoffel; (98 and 100) Ruin of Castle Aichau; (99) Aichau; (101) Aichau (left) and St. Vigil (right); (102, 103) Prösels; (104) Prösels, with old watch tower; (105) Castle Prösels; (106) Castle of Count Colonna at Prösels; (107) Edelsitz Zimmerlehn; (108) Back from church (near Zimmerlehn); (109, 110) Umst; (111) Schlern; (112) The Schlern; (113) The Schlern under a cloud; (114) Calvary on the Schlern; (115) View from the tunnel on the new road, Schlern; (116) Above the Duftalpe, Schlern; (117) The pass to Gröden; (118) Woman in Gröden; (119) Wood-carver.

Sikkim and Tibet. **Noel.**

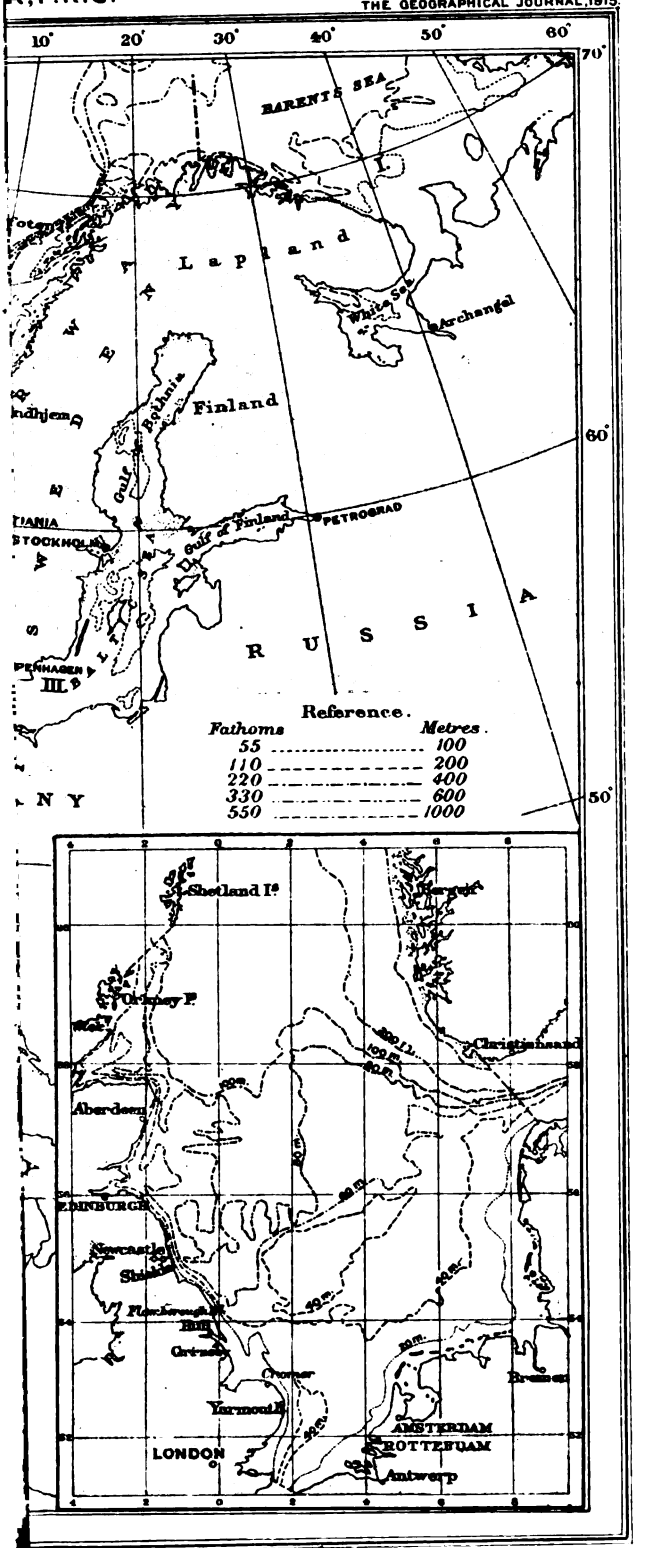
Album of forty photographs illustrating a journey to Tashirak in Southern Tibet, undertaken in 1913 with the object of exploring the eastern approaches to Mount Everest; also some photographs of Kangchenjunga and the Zemu glacier, taken by Lieut. J. B. L. Noel, 1913. *Presented by Lieut. J. B. L. Noel.*

These photographs are of special importance inasmuch as the route followed is but little known, and in many cases they are quite unique. They measure 4 by 3 inches, and are extremely good and clear. Lieut. Noel has carefully described them and mounted them in an album; he has further added to their value for reference by giving at the end a sketch-map of the route showing the places where they were taken.

(1) In the Terai, between Siliguir and Sivook; (2) Typical scenery on the Teesta Valley road, Darjeeling district; (3) Rungpoo, Sikkim frontier post; (4) Gangtok, with the Raja's palace on the hill; (5) Dikchu, Raitadong; (6) Thangu, the last bungalow, 12,800 feet; (7) The Lugnak La from Thangu, giant rhododendron in the foreground; (8) Camp at Mugu thang, Lhonak: the Thé La in the background; (9) The Naku Valley and Chumiumo, Lhonak; (10) Tebli and Chumiumo, Lhonak; (11) Lake on the summit of the Naku La; (12) Fording the Naku chu; (13) Expedition fording the Langpoo chu, Lhonak, on the way up to Zanak; (14) The Goraphu Valley, Lhonak; (15) The Chorten-Nymma La, coolies in the foreground; (16) On the summit of the Chorten-Nyuma La; (17) The desert from the Chorten-Nymma La; (18) Country round Chorten-Nymm entrance to the valley leading to the pass on the right; (19) Chorten-Nymm monastery, Tibet; (20) Mugh village, Tibet; (21) The rock-hewn village of Changmoo, Tibet; (22) Camp at Mugh; (23) The view from the summit of the Langboo La, looking west; (24) Tashirak; (25) Tashirak, showing the frontier wall; (26) Valley below Tashirak leading up to the south side of the peak Taringbau; (27) Two lamas at Guma village; (28) The Dzong-Pen of Khampa Dzong; (29) Two Tibetan women; (30) Woodcutters' huts in the Zemu forest; (31) The natural bridge below the Zemu glacier; (32) Striking camp in the early morning below Siniolchum on the Zemu glacier; (33) The Sugar Loaf from below Green Lake; (34) Simvu and Green Lake, Zemu glacier; (35) Siniolchum; (36) Siniolchum and Little Siniolchum from Green Lake; (37) North-west ridge of Siniolchum; (38) The Tent Peak, Tent Peak Pass and Green Lake glacier; (39) The 19,000-feet gap, Kangchenjunga; (40) Kangchenjunga from the head of the Zemu glacier.

N.B.—It would greatly add to the value of the collection of Photographs which have 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.

nted by British Trawlers
by
R, F.R.S.



FISHING GROUNDS
GARDINER.

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ROYAL GEOGRAPHICAL SOCIETY

REPORT OF THE COUNCIL, 17TH MAY, 1915

AUDITOR'S REPORT AND ACCOUNTS, 1914

Royal Geographical Society

1915

REPORT OF THE COUNCIL.

READ AT THE ANNIVERSARY MEETING OF MAY 17TH.

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

Membership.

In the course of the year 1914 the Auditors have made a statistical enquiry into the membership of the Society for the last five years, in order to provide a sure basis for future investigation of the growth of the Society in its various classes of Fellows: Life Compounders, and Annual Subscribers elected before and after the 25th May, 1908. Tables based upon these investigations have been prepared, and a summary of the results is given below.

An investigation is in progress to discover the average duration of life in the Society of Compounders and Annual Subscribers; of those who resign; and of those who are struck

off for non-payment of subscription. Such figures will be a useful guide to the real strength of the Society, and the results will be given in a future Report.

In former years it has been customary to make a statement of the Membership of the Society on the 30th April in the year of the Report. This date was inconveniently close to the day of the Annual Meeting, and it has been decided for the future to present the definitive statistics of Membership as on the 31st December of the previous year, with an approximate statement of the change since that date.

In accordance with this decision the following Table is presented, to show the changes in the Fellowship of the Society during the year 1914, and a few words of explanation may be given of the form in which it has been prepared.

A large number of Fellows are proposed and elected during the last two months of the year. Many of them are resident abroad, and there is, therefore, at the end of the year, a considerable number who have been notified of their election, but have not completed qualification for Fellowship by paying the Entrance Fee and first Annual Subscription. A certain proportion of those elected never qualify, and their names are eventually removed from the lists; but it is desirable to distinguish between names thus struck off as never having qualified and the names of those who, having been fully qualified Fellows, have eventually to be struck off for non-payment of subscription. The distinction between Annual Subscribers elected before and after the 25th May, 1908, and paying respectively £2 and £3 per year, is of importance in estimating the present and future financial position of the Society.

The Fellowship of the Society during 1914.

	Compounders	Annual Subscribers of £2	Annual Subscribers of £3	Free Life Fellows	Total
On January 1, 1914	986	2737	1417	12	5152
Add—					
Qualified 1914, after election 1913	—	—	70	—	70
Elected 1914	—	—	315	—	315
Transferred	19	—	—	1	20
Re-instated	—	4	2	—	6
	1005	2741	1804	13	5563
Deduct—					
Transferred	—	3	17	—	20
Deceased	28	73	15	—	116
Never qualified	—	—	36	—	36
Resigned	—	50	31	—	81
Struck off	—	41	27	—	68
Unqualified Dec. 31, 1914	—	—	51	—	51
On December 31, 1914 ...	977	2574	1627	13	5191

Of the total Fellowship on the last day of the year, 196 are Women, as against 155 at the beginning of the year.

During the first four months of the year—

33 have qualified after election in 1914.
34 „ „ „ „ 1915.
21 have been elected, but have not yet qualified.
34 have resigned.
51 have died.

By Resolution of the Council of the 8th February, the names of all Honorary Members, Honorary Corresponding Members, and Fellows who were alien enemies were removed during the continuance of the war from the lists of the Society;

and on the 22nd of March the name of Dr. Sven Hedin was removed from the list of Honorary Corresponding Members.

On the 30th April, 1915, the Society was constituted as follows:—

The Patron.
The Honorary President.
Seven Honorary Members.
Fifty-one Honorary Corresponding Members.

Fellows: Life Compounders . . .	977
Annual Subscribers . . .	4183
Life Fellows under Bye-Law III. 6 .	13
Total Fellows qualified . .	5173
Elected, but not yet qualified .	21
	5194

Summary for the Years 1907–1914.

	Compounders	Annual Subscribers of £2	Annual Subscribers of £3	Free Life Fellows	Total
December 31, 1907	964	3524	—	14	4502
1908	971	3509	69	15	4564
1909	964	3376	325	16	4681
1910	978	3210	579	16	4783
1911	987	3060	825	15	4887
1912	977	2913	1026	14	4930
1913	986	2737	1417	12	5152
1914	977	2574	1627	13	5191

The above Table shows that the net increase in the Fellowship of the Society during the year is 39, which is a smaller number than has been recorded for some years. In view, however, of the very unusual circumstances of the last five months of the year, this falling off in the rate of the growth of the Society is easily explained. It will be noticed that 36 new

Fellows elected during the first half of the year never qualified. This is a much greater number of non-qualifications than usual, and is largely due to the fact that so many men proceeded on active service early in August.

Similarly, there was a very natural, but by no means excessive, falling off in the number of proposals and elections in the last two months of the year; and again a considerable number of elected Fellows remained unqualified on the 31st December. These were largely gentlemen whose proposals had been received since the last meeting in June, and who had, before election, proceeded on active service.

Taking all these circumstances into account, the Council are glad to report that the growth of the Society during the year may be considered satisfactory.

The Society and the War.

On the day before the outbreak of the war the whole resources of the Society and staff were placed at the disposal of the Geographical Section, General Staff, for any duty that might be assigned to them, and the Council is happy to record that this offer was cordially accepted by Colonel Hedley, the chief of the Section. Within two or three days the Society's draughtsmen were engaged upon the preparation of a skeleton map of the western theatre of operations. Very shortly afterwards the Society was asked to undertake the preparation of an Index of Names on the tactical maps of Belgium and North-east France, which it was proposed to issue to the Expeditionary Force. A considerable number of volunteer helpers were enlisted for this task, which was carried on at high pressure until its completion early in September. Some 35,000 names had to be abstracted from the maps, given reference numbers, and placed in alphabetical order. It is satisfactory to learn from Colonel Hedley that the Index has proved of value, and is in constant use. The chief burden of the organization was

borne by Mr. Hinks, to whose efforts its rapid and satisfactory progress were largely due.

Four other Indexes to Names have since been undertaken and completed, and a fifth is now ready for press. The later Indexes have been prepared very largely by an excellent staff of lady volunteers, working devotedly under the skilful superintendence of Mrs. Leach, to whom is due a principal share of whatever credit may be given to the Society for this enterprise. Miss Helen Duff, Mrs. James, and Miss Victoria Campbell have been her most regular assistants.

Meanwhile, the preparation of the skeleton map on the scale of 1 : 500,000 had suggested a second map of 1 : 1,000,000, and this idea, in its turn, developed into the suggestion that the Society might undertake to compile the European sheets of the proposed International Map of the World, of which the lines had been laid down in the Conferences of London, 1909, and Paris, 1913, but which had, at the outbreak of war, made comparatively little progress in Europe. After some careful discussion it was agreed that the map should be compiled by the Society under the direction of the General Staff, fair drawn and reproduced at the Ordnance Survey, and published by the General Staff. The first draft of the scheme was prepared by Capt. O. H. B. Trenchard, R.E., and Mr. Hinks. Soon after it had been approved by the General Staff another officer of the Indian Survey, Capt. N. M. MacLeod, R.E., undertook a share in the work, and it is to him that a great part of its unexpectedly rapid progress is due.

As soon as sufficient experience had been gained of the various difficulties arising in the compilation of very heterogeneous material, and it had become possible to employ ordinary draughtsmen upon the work, application was made to the Council for a special grant, and four or five paid assistants were engaged, to carry out the more mechanical operations of tracing and reduction.

Meanwhile more volunteer assistance was obtained for the work of compilation, which demanded a wider range of knowledge; and from time to time a number of ladies and gentlemen have taken an active part. Special acknowledgments are due to Mr. J. H. Reynolds, who for six months has devoted himself assiduously to the preparation of the contour sheets; to Mr. Mills, of the Chinese Hydrographic Survey, who gave valuable help in the early stages of this same part of the work; to Mr. B. C. Wallis, who has done the preliminary compilation of a great number of sheets; and to Mr. O. J. R. Howarth, Dr. H. N. Dickson, Capt. B. F. E. Keeling, R.E., and Mr. Douglas Carruthers, who have each undertaken the definitive compilation of one or more sheets and have rendered invaluable help in the progress of the whole.

Nearly the whole of the centre of Europe has been covered by these compilations, and the map is being extended through Asia Minor to the East and South. It will be placed on sale by the General Staff, and a number of sheets will be ready at an early date.

While considerable demands have thus been made upon the time and energy of the Staff, it has suffered depletion by the enlistment of a number of its most active members. The following is a list of those who are at present serving with various branches of His Majesty's Forces:—

Library	D. A. Jones	2nd Lieutenant, K.O. Royal Lancaster Regiment.
„	R. F. Durrant	First-Class Petty Officer, Royal Naval Armoured Cars.
Map Room	G. Mackay	Sergeant, Royal Field Artillery.
Office	R. A. Hext	Bombardier, Royal Field Artillery (T.F.).
House	A. Pimm	Gunner, Royal Marine Artillery.
„	C. Townsend	Corporal, Wiltshire Regiment.

Several other members of the Staff have joined one or other of the Volunteer Home Defence Corps.

Finance.

The annual report of the Auditors, and the accounts for the year 1914, will be found annexed to this Report of the Council. The accounts of the year are presented in a form which shows the receipts and expenditure belonging to the year, and the financial position of the Society at its close.

In accordance with the practice introduced last year, the statement of Income and Expenditure replaces the old form of statement of Receipts and Payments—the difference being that the new form gives the income and expenditure properly belonging to the year, whereas the old form gave the amounts received and payments made during the year, whether they belonged to the year or not. Thus, for example, the subscriptions for the year 1914 collected in advance in 1913 appear in the statement of Income and Expenditure for 1914, whereas the subscriptions for 1915 received in 1914 do not appear there, but as a liability in the Balance Sheet. Similarly, amounts due to or from the Society on December 31st, 1914, in respect of that year are included in the items of Income and Expenditure for the year, while their totals are shown in the Balance Sheet as Debts due to the Society, and Sundry creditors.

The ordinary receipts for the year 1914 amount to £15,566, and show a decrease of about £942 on the receipts belonging to the previous year, due principally to a falling off in entrance fees and life compositions, owing to causes mentioned in the preceding section. The ordinary expenditure for the year was £13,439, showing an increase of about £115 over the ordinary expenditure of the previous year, and an excess of ordinary income over ordinary expenditure of £2127. Of this amount £1523 was devoted to Extraordinary Expenditure connected with the Building Fund, and the year closed with a small balance on the ordinary account of about £103.

The change in the form of accounts in 1913 precludes a

detailed comparison with previous years. The amounts for 1912 are therefore given in round figures in the following table :—

	1914	1913	1912
Ordinary receipts	£15,566	£16,508	£14,600
Ordinary expenditure	13,439	13,324	13,000

A Balance Sheet, showing the financial position of the Society on December 31st, 1914, is given in the form introduced last year. On that day the principal assets of the Society consisted of the House with its contents, and the two acres of ground on which it stands. In estimating the value of the assets the House has been taken at cost, and the contents at the value for which they have been insured against fire in a policy which has been taken out recently, after careful consideration by the Finance Committee and by the Library and Map Committee. The expenditure on legal charges, alterations, decorations, etc., having no permanent value, have been written off in the Balance Sheet. The principal liabilities at the end of the year were the loan from the Bank of £7000, and the balance of the account with Messrs. Trollope and Colls, about £1500, in respect of alterations and fittings. The loan represents, roughly, the amount by which the Building Fund (including the proceeds of sale of 1 Savile Row and 6A Vigo Street, and of investments) has fallen short of the total cost of the purchase of Lowther Lodge and the installation of the Society in its new home. Provision has been made in the estimates of the present year for completion of the payment for alterations, and in future estimates provision will be made for extinguishing the loan within a few years, should no considerable further additions be made to the Building Fund.

The intended construction of the Society's Hall on the corner site has of necessity been postponed, owing to the failure for the present of the negotiations for sale of the lower half of the garden, which were far advanced at the outbreak of the war.

The Finance Committee have met regularly during the year to control the expenditure of the Society. The accounts for 1914 have been audited by a chartered accountant and certified as correct.

Year Book and Record, 1914.

The seventeenth issue of the Year-Book was published at the end of the year. It contained an illustrated account of the Society's House, with a catalogue of the pictures, portraits, and Museum. It is given without charge to all Fellows applying for it.

Publications.

The monthly 'Journal' has been issued with regularity throughout the year: the twelve numbers for 1914 forming two volumes of 1438 pages, illustrated by 62 maps and 189 illustrations and diagrams. The total cost of the edition of 6650 copies (including £868 1*s.* 4*d.* for free delivery to Fellows and Institutions) was £3572 10*s.* 10*d.* From this is to be deducted the amount of £1184 11*s.* 4*d.* received from sale of copies to the public and from advertisements.

During the removal to Lowther Lodge the stock of the Society's publications became entirely disorganised, and for a while it was almost impossible to supply back parts and volumes. The heavy task of re-packing and preparing stock lists has been completed during the year 1914, and a revised list of all publications in stock, with prices to Fellows and to the public, is given in the Year-Book. It can also be obtained as a separate list on application to the office.

Library.

During the year ending 30th April, 1915, 1091 books and pamphlets have been added to the Library in addition to serial

publications. Of these 900 were presented, and 191 purchased. The titles of these accessions and of the more important papers in geographical publications have been printed monthly in the 'Geographical Journal.' Among the most important additions to the Library during the year are (of new books):—Mawson, 'The Home of the Blizzard' (2 vols.); Priestley, 'Antarctic Adventure'; Nansen, 'Through Siberia'; Herbertson and Howarth, 'Oxford Survey of the British Empire' (6 vols.); Geikie, 'Antiquity of Man in Europe'; Scott, 'Life of Flinders'; 'Linschoten's Northern Voyages' (reprint by Linschoten Society); McFarlane, 'Economic Geography'; Lake, 'Physical Geography.' The most valuable gift during the year has been the most complete edition of the Mercator-Hondius Atlas (3 vols. folio, 1639), presented by the late Sir Henry Bulwer. Among other old books acquired are:—Digges, 'Pantometria' (1571), one of the earliest treatises on Surveying; La Boulage le Gouz, 'Voyages et Observations,' etc. (1653); 'Van der Broeck's 'Voyage to the East Indies' (1634), with an early representation of the Dodo; Eden, 'History of New Holland' (1787).

The work of the Library has been necessarily somewhat hampered since the beginning of the war through the loss of two members of the staff by enlistment. For the same reason there has been an unexpected delay in the issue of the Catalogue Supplement, but it is now hoped to go to press with this very shortly.

The number of borrowers per week has averaged 25 since the date of the last Report. The sum of £186 0*s.* 8*d.* was expended on books, and £130 4*s.* 4*d.* on binding, during the year ending December 31st, 1914.

Scientific Instructions.

During the year ending April 30th, 1915, the work of Scientific Instruction has been carried on at the Society's house,

and in the field, by the Instructor, Mr. E. A. Reeves, or, during his illness in the summer of 1914, by Capt. H. A. Edwards, R.N.R. Twenty-three intending travellers have been under instruction in Field Astronomy and Topographical Survey, and three gentlemen have been successful in obtaining the Society's Diploma, after examination by the Diploma Committee. In addition to the above, 94 gentlemen in the service of, or probationers for service under, the Colonial Office have attended short courses in elementary surveying and mapping.

The necessary considerable increase in the equipment of smaller surveying instruments has been met out of fees received. The department bears no share of heating, lighting and maintenance, but is otherwise nearly self-supporting.

Instruments.

Instruments to the value of £220 8*s.* 6*d.* have been lent during the past year as follows:—Sir Ernest Shackleton (Antarctic Regions), £120 1*s.*; Mr. T. Lambert Rogers (Northern Rhodesia), £22 10*s.*; Major H. J. Madocks (for military purposes in England), £18 17*s.* 6*d.*; Captain C. A. Vaux (for military purposes in England), £50; Lieutenant G. F. Scott-Elliot (for military purposes in England), £4 10*s.*; Mr. W. C. W. Eakin (Southern Nigeria), £4 10*s.*

The instruments lent to the following gentlemen have been returned during the past year, with the exception of a few that have been lost, or for some special reason are still retained:—Sir W. M. Ramsay, 1908; Mr. E. Hutchins, 1909: Mr. T. M. Ainscough, 1913; Sir Douglas Mawson, 1911; Mr. P. A. Talbot, 1906; Mr. J. G. C. Anderson, 1912; British Antarctic Expedition, 1910; Capt. C. Vicars Boyle, 1906; Major H. J. Madocks, 1915; Lieut. G. F. Scott Elliot, 1915; Capt. C. A. Vaux, 1915.

The following is a list of travellers who still have instruments lent to them in their possession:—Cambridge School of Geography, 1903–5; Dr. W. M. Strong (New Guinea), 1905–7;

Mr. P. A. Talbot (Southern Nigeria), 1906; Mr. D. Cator (Northern Nigeria), 1906–7; Mr. J. Humphrey (India), 1906; Rev. A. B. Fisher (Uganda), 1906; Rev. Thomas Lewis (Angola), 1908; Mr. E. Hutchins (British East Africa), 1909; Mr. M. Hardy (Paraguay), 1910–11; Dr. W. Grenfell (Labrador), 1910; Mr. D. G. Hogarth (Asiatic Turkey), 1911; Sir Douglas Mawson (Antarctic Regions), 1911; Capt. H. D. Pearson, R.E. (Egyptian Sudan), 1911; Mr. W. S. Routledge Easter Island), 1912; Sir M. A. Stein (Central Asia), 1912; Mr. F. Kingdon Ward (N.E. Trans-Frontier of India), 1913; Mr. R. S. Douglas (Borneo), 1914; Sir Ernest Shackleton (Antarctic Regions), 1914–15; Mr. T. Lambert Rogers (Northern Rhodesia), 1915; Mr. W. C. W. Eakin (Southern Nigeria), 1915.

Map Room.

The accessions to the Map Room Collection during the year ending 30th April, 1915, comprise 2323 sheets of Maps and Charts, 23 Atlases (including continuations) containing 850 sheets of Maps, 1667 Photographs, and 492 Lantern Slides. Of these, 124 Maps on 452 sheets, 6 Atlases, 146 Photographs and 405 Lantern Slides have been purchased.

The more important donations to the Map Room during the past year have been already noticed in the 'Geographical Journal.'

Museum.

During the year many interesting things have been given or lent to the Museum. Special mention should be made of the following: the medals awarded to Captain Scott, and his Diary from January to October, 1911, lent by Lady Scott; a sextant telescope left by Captain Amundsen at the South Pole

and brought away by Captain Scott, presented by Lady Scott relics of Captain Parry's Arctic Expeditions, 1823–7, and of the Franklin Relief Expedition, 1852–4, lent by Captain J. F. Parry, R.N.; relics of Captain Parry's Arctic Expedition, 1824–5, of Sir James Ross's Franklin Search Expedition, 1848–49, and of the Arctic Expedition of 1875–6, presented by Sir Albert Markham; the MS. maps of the Congo and its tributaries, by the Rev. George Grenfell, presented by the Baptist Missionary Society.

A portrait in oils of Earl Curzon of Kedleston, President of the Society, 1911–14, painted for the Society by Mr. J. S. Sargent, R.A., has been hung in the Council Room; and several gaps in the collection of portraits of Medallists have been filled during the year.

A catalogue of the Museum and of the portraits and pictures throughout the House has been prepared, and copies are laid in the Museum and Fellows' rooms for reference.

Photograph Room.

A selection of photographs from the collection of the Society is always on view in two large cases in the middle of the room, and framed photographs are hung round the walls. The lantern-slide collection is being arranged in drawers below one of the exhibition cases, and provision has been made for a thorough overhaul of the collection, and the construction of a subject catalogue.

House.

A number of small improvements have been made in the furnishing and equipment of the House for the convenience and enjoyment of Fellows or the efficiency of the Society's work. Considerable improvements in the electric lighting of

the Library corridors were carried out during August; sun blinds were fitted on the Terrace; and the passenger lift refitted.

A very successful reception was held on the 23rd June, 1914, when the walks surrounding the lawn were roofed with canvas and illuminated; the Band of the Royal Artillery played on the lawn, and refreshments were served in a large marquee on the terrace.

AUDITOR'S REPORT.

To the Royal Geographical Society.

MY LORDS, LADIES, AND GENTLEMEN,

I beg to report that I have examined the Accounts of your Society for the year ended 31st December last with the books and vouchers and find them to be correct.

I have verified the Banker's balances and the Securities held for the investments as follows:

Securities held by the Bankers:—
£1334 London and North-Western Railway 3% Debenture Stock.
£100 Newfoundland 3½% Stock.

Securities inscribed at the Bank of England:—
£1121 0*s.* 8*d.* 2½% Consols "A."
£440 2½% Consols "B."
£198 1*s.* Local Loans 3% Stock.
£1028 5*s.* 6*d.* New South Wales 3½% Stock (1924).

The market value of the investments on 31st December is certified by the Society's Bankers at £3,263 4*s.* 7*d.*, as compared with £3,366 10*s.* 8*d.* last year.

The Society's Bankers have also certified to me that they hold the deeds of the Freehold Premises, Lowther Lodge, as security for £7,000, the balance of the loan that was raised in connection with the Building Fund.

The ordinary income of the Society amounted to £15,565 17*s.* 9*d.*, which shows a decrease of £942 10*s.* 7*d.* as compared with the previous year. The ordinary expenditure of the year amounted to £13,438 16*s.* 1*d.*, being an increase of £114 3*s.* 4*d.* over that of the previous year.

There was thus an excess of ordinary income over ordinary expenditure of £2,127 1*s.* 8*d.*

The extraordinary expenditure incurred during the year amounting to £2,023 10*s.* includes £1,523 10*s.* in connection

with the Building Fund. This is made up ot a transfer by Minute of the Council of £900 to the Building Fund for interest and toward repayment of Bank Loan, and £623 10*s.* payments made out of the General Purposes Fund for furniture and fittings at the Society's House.

The excess of total income over total expenditure for the year amounts to £103 11*s.* 8*d.*

The expenditure during the year from Lord Glenconner's gift of £500 for beautifying the House amounted to £254 19*s.* 6*d.* An account of this is set out in the Decoration Fund Account, and shows a balance carried forward to next year of £87 13*s.* 9*d.*

On 31st December, 1913, the deficiency on the Building Fund stood at £10,270 14*s.* Subscriptions received amounted to £1,217 12*s.*, and transfers amounting to £1,523 10*s.* from the General Account bring the total receipts to date to £117,220 13*s.* 9*d.* The expenditure for the year amounted to £752 11*s.* 5*d.*, making a total expenditure of £125,502 17*s.* 2*d.*, and the deficiency at 31st December, 1914, was £8,282 3*s.* 5*d.*

A total sum of £1,500 has during the year been paid off the Loan from the Bankers, which now stands at £7,000.

The arrears of subscriptions after deducting £590 written off under Resolution as irrecoverable amounted to £1,459, which is estimated to realise £600, as compared with £1,588 at the close of the previous year which was valued at £635 and in fact realised £702.

I have the honour to be,
My Lords, Ladies and Gentlemen,
Your most obedient Servant,
W. B. KEEN,
Chartered Accountant.

5th May, 1915.

	£ s. d.	£ s. d.
Subscriptions :—		
Received in advance for 1914	2,034 0 0	
Received in 1914 for 1914	7,165 0 0	
Received in 1914 for previous years	702 0 0	
	9,901 0 0	
Less Subscriptions in Arrear at December 31st, 1913, estimated to realize	635 0 0	
	9,266 0 0	
Add Subscriptions in Arrear at December 31st, 1914, estimated to realize	600 0 0	
		9,866 0 0
Entrance Fees	.. .. ..	1,495 0 0
Life Compositions	.. .. ..	730 0 0
Parliamentary Grant	.. .. ..	1,250 0 0
Royal Premium	.. .. ..	52 10 0
Payments for Scientific Instruction	.. .. ..	611 5 0
Publications :—		
Advertisements in 'Journal'	613 11 11	
Sale of 'Journal'	515 19 5	
Sale of 'Hints to Travellers'	159 14 6	
Sale of Map, Turkey in Asia	15 18 9	
Miscellaneous	72 13 3	
Fees for use of Maps	30 0 0	
Contribution toward part cost of Maps	25 0 0	
		1,432 17 10
Loans of Diagrams and Slides	.. .. ..	1 16 6
Sums received in error	.. .. ..	39 13 7
Miscellaneous Receipts	.. .. ..	11 5 10
Interest on Deposit	.. .. ..	51 2 10
Donation to Library—Sir H. Bulwer	.. .. ..	18 0 0
Dividend :—		
£100 Newfoundland 3½ per Cent. Stock	.. .. ..	6 6 3
Carried forward	.. .. ..	£15,565 17 9

XPENDITURE FOR THE YEAR 1914. *Expenditure.*

	£ s. d.	£ s. d.
ouse :—		
Taxes and Insurance	138 15 11	
Coal, Light and Water	261 12 7	
Repairs, Alterations, etc.	32 6 1	
House Wages	407 0 7	
Furnishing	52 15 5	
Garden	45 0 0	
Miscellaneous and Petty Cash	147 13 8	
		1,085 4 3
ffice :—		
Salaries	1,993 12 4	
Stationery, and Office Equipment	160 13 0	
Printing	49 19 2	
Year Book	211 1 2	
Postages, Telephone and Telegrams	197 7 0	
Audit Fee	21 0 0	
Miscellaneous, Bank Charges, and Petty Cash	32 8 0	
		2,666 0 8
ibrary :—		
Salaries and Pension	746 0 9	
Books and Binding	316 5 0	
Library Catalogue	271 2 8	
Miscellaneous and Petty Cash	9 0 11	
		1,342 9 4
ap Room :—		
Salaries	641 9 9	
Maps and Diagrams	43 10 3	
Cloth	39 7 4	
Photographs, etc.	12 15 3	
Binding	20 4 6	
Miscellaneous and Petty Cash	35 11 0	
		792 18 1
ap-Drawing Room :—		
Salaries	519 12 8	
Stationery and Supplies	29 7 9	
		549 0 5
etings, etc. :—		
Refreshments	152 4 0	
Printing, and Hand Maps	211 0 10	
Anniversary Dinner and Soirée	396 8 2	
Lantern Slides, etc.	58 16 7	
Queen's Hall Meetings	102 10 6	
Attendance and Reports at Evening Meetings	119 0 6	
Miscellaneous and Petty Cash	25 15 5	
		1,065 16 0
edals and other Awards	.. .. ..	46 0 0
ducation :—		
Prizes and Examination Expenses	29 4 0	
Oxford and Cambridge Universities	700 0 0	
Scientific Instruction	599 14 0	
		1,328 18 0
Carried forward	.. .. ..	£8,876 6 9

Income. STATEMENT OF INCOME AND

	£ s. d.	£ s. d.
Brought forward	.. .. ..	15,565 17 9
		£15,565 17 9

XPENDITURE FOR THE YEAR 1914. *Expenditure.*

	£ s. d.	£ s. d.
Brought forward	.. .. ..	8,876 6 9
ublications :—		
Printing 'Journal'	1,494 17 9	
Postage Wrappers, and Addressing	868 1 4	
Separate Copies, etc.	62 17 8	
Maps and Illustrations	877 19 9	
Contributors and Indexer	142 14 0	
Miscellaneous Printing	90 19 8	
Advertising	3 15 9	
Miscellaneous and Petty Cash	31 4 11	
		3,572 10 10
pecial Grants :—		
Delegate to International Map Conference	20 0 0	
Captain Cook Memorial	50 0 0	
I/M Map	5 4 0	
Cataloguing Lantern Slides	35 0 0	
Donations and Subscriptions	19 12 6	
		129 16 6
Research	.. .. ..	18 10 0
Expeditions :—		
Imperial Transantarctic Expedition (Sir E. Shackleton) ..	500 0 0	
Palestine Exploration Fund	100 0 0	
Himalayan Expedition (F. de Filippi)	125 0 0	
Visit to Spitsbergen (Dr. W. S. Bruce)	50 0 0	
New Instruments for Travellers, and Repairs	38 18 6	
		813 18 6
Receipts in error refunded	.. .. ..	27 13 6
Total Ordinary Expenditure	.. .. ..	£13,488 16 1
Note.—Excess of Ordinary Income over Ordinary Expenditure for the year, £2,127 1s. 8d.		
Extraordinary Expenditure :—		
Transfer to Building Fund toward Interest and Repayment of Loan	900 0 0	
Ditto ditto Expenditure on account of the Building Fund	623 10 0	
Portrait of Lord Curzon	500 0 0	
		2,023 10 0
Balance, being excess of Income over Expenditure carried to the Balance Sheet	.. .. ..	103 11 8
		£15,565 17 9

BUILDING

	£ s. d.
To Total Receipts to Dec. 31, 1913	114,479 11 9
,, Subscriptions	1,217 12 0
,, Transfer from General Purposes Account toward Interest and Repayment of Loan	900 0 0
,, Ditto ditto Payments on account of Building Fund	628 16 0
	117,290 13 9
,, Balance, being deficiency at date	8,283 3 5
	£125,503 17 3

DECORATION

	£ s. d.
To Balance of Lord Glenconner's Gift	342 13 3
	£342 13 3

FUND.

	£	s.	d.
By Total Expenditure to Dec. 31, 1913	124,750	5	9
,, Sundry Expenses	20	9	6
,, Legal Expenses, Stamps, etc.	78	7	0
,, Furniture and Fittings	241	6	1
,, Bank Interest on Loan	330	8	3
,, New Road in Forecourt	87	0	7
	£125,502	17	2

FUND.

	£	s.	d.	£	s.	d.
By Expenditure on—						
Pictures	4	19	6			
Binding	250	0	0			
				254	19	6
,, Balance carried to Balance Sheet				87	13	9
				£342	13	3

Liabilities. BALANCE SHEET,

		£ s. d.	£ s. d.
To Bank Loan, Building Fund		7,000 0 0	
,, Sundry Creditors do.		1,371 9 8	
			8,371 9 8
,, Decoration Fund unspent		... ...	87 13 8
,, Subscriptions received in advance		... ...	1,696 0 0
,, Sundry Creditors		... ...	704 14 5
,, Balance, being excess of Assets over Liabilities, viz. :—			
Building Fund—			
Receipts as per separate Account ...	£117,220 13 9		
Less Expenditure not treated as Assets (see contra)	25,502 17 2		
		91,717 16 7	
General Purposes Account—			
Balance as at January 1, 1914	33,609 10 8		
Add proportion of Fire Insurance, Lowther Lodge, prepaid to 1918...	51 19 6		
Excess of Income over Expenditure for year	103 11 8		
		33,765 1 10	
			125,483 18 3
			£136,342 16 3

DECEMBER 31, 1914. *Assets.*

		£ s. d.	£ s. d.
By Building Fund Expenditure (as per separate Account) ...		125,502 17 2	
Allocated as follows:			
Freehold Premises, Lowther Lodge ...	£100,000 0 0	... ...	100,000 0 0
Expenditure upon Alterations, Decorations, Furniture, Legal Charges, etc., not treated as Assets except so far as it is included in the value placed on Furniture below	25,502 17 2		
	£125,502 17 2		
,, Furniture and Contents of Society's Premises, at value placed upon them for insurance—			
Library		13,500 0 0	
Maps, Prints, and Pictures		13,000 0 0	
Furniture and Fittings...		4,000 0 0	
Instruments		2,000 0 0	
Museum Exhibits		1,000 0 0	
Stock of Publications		1,000 0 0	
			34,500 0 0
,, Newfoundland 3½ % Stock (Cumming Bequest)		.. .. ..	100 0 0
,, Sundry Debtors		... ...	519 1 1
,, Subscriptions in arrears £1,459, estimated to realise		... ...	600 0 0
,, Sundry Payments in advance for Insurance, etc.		... ...	97 17 0
,, Balance at Bank, General Purposes Account		337 14 0	
,, ,, ,, Building Fund		89 6 3	
,, ,, ,, Decoration Fund		87 13 9	
,, Balance in hands of Chief Clerk		11 4 2	
			525 18 2
			£136,342 16 3

TRUST FUNDS.

MURCHISON BEQUEST.

£1334 London and North-Western Railway 3 per Cent. Debenture Stock.

	£	s.	d.		£	s.	d.
To Balance from last Account ..	37	14	2	By Grant to Capt. W. C. Macfie (1912)	29	7	8
„ Dividends	37	12	10	„ Grant to Commander H. H. L. Pennell	45	0	0
				„ Balance in Bankers' hands ..	0	19	4
	£75	7	0		£75	7	0

GILL MEMORIAL.

£1028 5s. 6d. New South Wales 3½ per Cent. Stock.

	£	s.	d.		£	s.	d.
To Balance from last Account ..	6	3	10	By Grant to A. F. R. Wollaston	36	0	0
„ Dividends	33	16	4	„ Balance in Bankers' hands ..	4	0	2
	£40	0	2		£40	0	2

LIVINGSTONE MEMORIAL.

£198 1s. Local Loans 3 per Cent. Stock.

	£	s.	d.		£	s.	d.
To Balance from last Account ..	45	6	9	By Balance in Bankers' hands ..	50	18	4
„ Dividends	5	11	7				
	£50	18	4		£50	18	4

BACK BEQUEST.

£561 0s. 8d. Consols 2½ per Cent.

	£	s.	d.		£	s.	d
To Balance from Last Account ..	2	3	4	By Grant to J. N. Dracopoli ..	14	0	0
„ Dividends	13	3	4	„ Balance in Bankers' hands ...	1	6	8
	£15	6	8		£15	6	8

CUTHBERT PEEK FUND.

£1000 Consols 2½ per Cent.

	£	s.	d.		£	s.	d.
To Balance from last Account ..	4	17	8	By Award to John Ball	25	0	0
„ Dividends	23	9	2	„ Balance in Bankers' hands ...	3	6	10
	£28	6	10		£28	6	10

I have examined the above Accounts with the Books and Vouchers of the Society, and certify them to be correct.

23 Queen Victoria Street, E.C.
5th May, 1915.

(Signed) W. B. KEEN,
Chartered Accountant.

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