

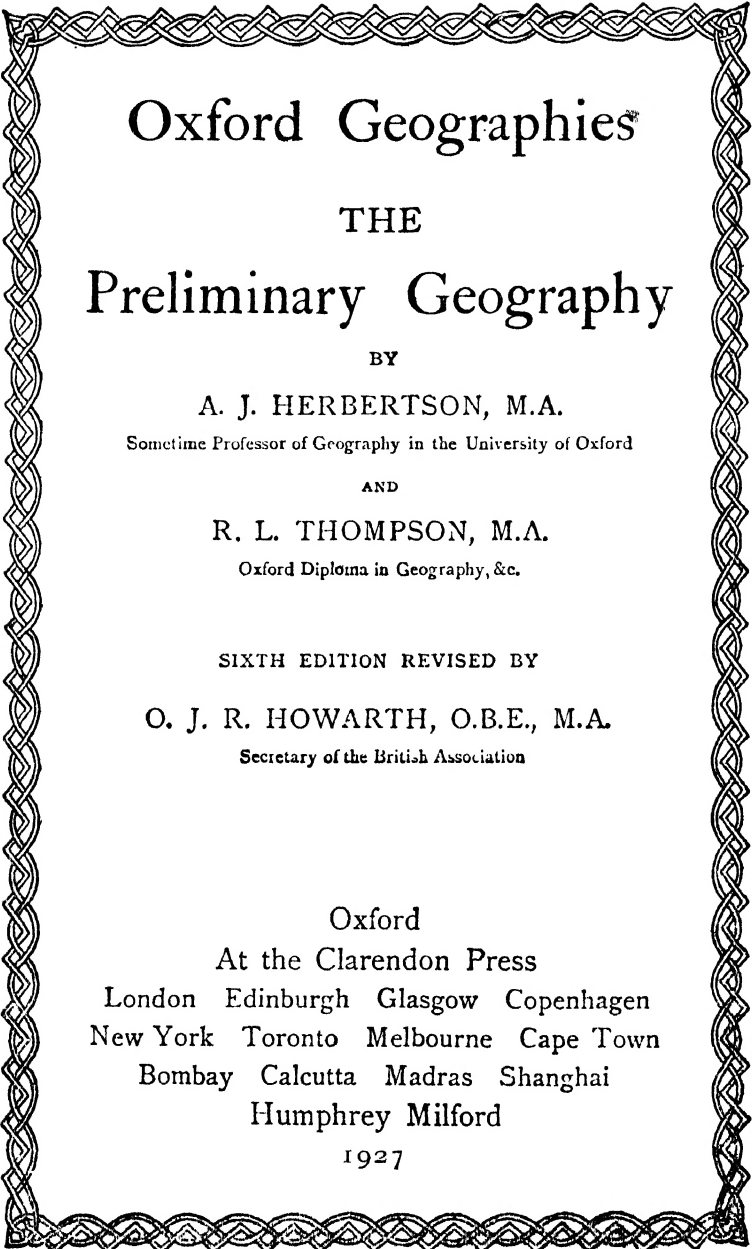
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Oxford Geographies^{*}

THE

Preliminary Geography

BY

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AND

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PREFACE

THE letters which the editor of the series has received in recent years from all parts of the country and from the colonies have induced him to plan a series of which this book is the first. Instead of two unrelated sections of physical and political geography as in older textbooks, an attempt has been made to write a series of geographies which contains the information usually expected from candidates for preliminary, junior, and senior local examinations, and other examinations of a similar standard, on geographical and educational lines. This, the first or preliminary volume is largely descriptive. It endeavours to give definite pictures of the different regions of the globe, with an outline of the salient topographical features. Here and there short descriptions are condensed from well-known books of travel, to which the writer here expresses his acknowledgements. Where there has been much condensation no quotation marks are used. Explanations of the phenomena described are inserted where the pupil is likely to profit most by them, and, as far as possible, with reference to what can be observed at home.

A glance at the table of contents will show that a very unusual order of arrangement has been followed. This has not been decided upon without much consideration. The writer believes that the order here followed will be found a truly educational one. It begins with the simplest geographical conditions, and reserves the most complex for the final study. Everywhere the attempt is made to proceed as gradually as possible from the known to the unknown. The comparative method is employed throughout.

America is taken before any part of the Old World. North America is first described. That continent is very simple in structure. It extends far north of the Arctic circle and considerably farther south of the tropic. It has therefore the entire range of climate zones, from polar to tropical, and a similar series of vegetation zones. Further, it illustrates almost every type of human life, from the simplest to the most complex, with the exception of that lived in the equatorial forest. South America is described next and compared in detail with the

northern continent. This comparison establishes many of the most important geographical laws and gives a general outline of the distribution of climate and vegetation on the Earth's surface. The simplest regions of the Old World, the temperate forest lands and steppes of Eurasia, are next selected for description. The monsoon and equatorial regions of Eastern Asia come next, then Australia, and Southern Asia. Africa follows next. The northern region of this continent is described with the Mediterranean lands, of which it is geographically and historically part. The highly complex regions of Central Europe and the British Isles are reserved till the last. The final chapter deals with the natural regions of the Old World and the resemblances between these and the natural regions of the New World, and the geographical conditions to which these resemblances are due.

The task of selecting from the infinity of geographical facts those of greatest educational importance and practical utility has been difficult, and the editor will be grateful for notes of omissions or criticisms of inclusions.

While the three books form a natural series, this volume is so planned that it can be used independently of the other two. All that it contains may fairly be expected to be known by pupils working up to the preliminary standard, but a number of sections might be omitted at a first reading. These are indicated in the text.

The writer desires to thank many friends, including several old pupils, for criticisms and suggestions too numerous to acknowledge in detail.

The numerous diagrammatic maps are not intended to replace but to supplement good atlases and wall-maps. Younger children might learn much by tinting them with coloured pencils. For fuller descriptions of various lands, which cannot be compressed into these volumes, teachers should refer to Mrs. Herbertson's *Clarendon Geography* (2 vols. : Oxford).

OXFORD,
September, 1907.

In the course of revision for the fifth and sixth editions, the maps and diagrams have been almost entirely remade.

October, 1917.

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OXFORD

PRELIMINARY GEOGRAPHY

I. THE WORLD AND ITS DIVISIONS.

The World. Most of us have relatives or friends who have left home for other parts of our own or foreign lands. Their letters tell us how their new scenery and climate differ from our own, and how different races adopt different modes of life from ours. Often too, we receive photographs, which show these differences more clearly than words can do. Unless we can ourselves visit all parts of the world we must to a large extent depend on these and similar sources of information, books, pictures, and maps, for descriptions of lands which we have not seen with our own eyes. Thus we get a general idea of a world: parts of which are always hot, while other parts are always cold; of lands covered with dense forests, and of others where not a tree is seen and where many curious things are used for fuel; of lands where men eat meat only, of others where they rarely taste it; of lands so fertile that a few weeks' work means abundance of food, and of others so barren, that human habitation is impossible. Such knowledge is part of geography. Geography, however, has to do more than describe the world. It has to give us the reason of what it describes, and to explain the many differences and resemblances between different parts of the Earth's surface.

In this book we shall see something of different parts of our world, in the course of a journey round it.

The Shape and Size of the Earth. On a clear night we see the stars as sparkling points of light, and perhaps the

Moon, round and bright like a golden plate. If we look carefully at the Moon, its centre seems to bulge out towards us and its edges to bend backwards or recede, so that it looks like a ball. For many reasons, which we shall learn later, this Earth or World on which we live is also believed to be a ball. It is a very large ball, nearly 8,000 miles or 500,000,000 inches across, and 25,000 miles around. (If we were to make a model of the Earth and build a big ball or globe measuring as many inches as the World measures miles, St. Paul's Cathedral in London would easily go inside it.)

Land and Water. Part of the surface of this globe or ball is covered with land and part with water. The way in which the land and water are arranged on the Earth's surface is represented in the accompanying figures, which show different views of the Earth's surface. The land is shown shaded, and the water in white. The water surrounds the masses of land, which are divided into continents, and these into many countries. The largest of these masses is called the Old World, including the continents of Europe, Asia, and Africa, and the next the New World (North and South America). There are many hundreds of smaller islands, some of which are marked on the map. Australia and Antarctica rank as continents. The British Isles can be seen in figs. 2, 4, and 6.

Peninsulas and Isthmuses. Notice how the lands of the World almost meet round the Arctic Ocean. In the New World two greater masses, called North and South America, each tapering at one end, are joined by a narrow neck of land. Such a narrow neck of land is called an isthmus. A very narrow isthmus nearly separates the Old World into two parts, between Asia and Africa. When a mass of land is almost but not quite surrounded by water it is called a peninsula (i. e. almost an island). Notice the many peninsulas of Eurasia (the name given to Europe and Asia together).

The Ocean. Although it is possible to visit all parts of the ocean without crossing any land, it is convenient to have special names for different parts of what the map shows as a single ocean. The narrower S-shaped part of the ocean



FIG. 1. The Western Hemisphere.



FIG. 2. The Eastern Hemisphere.



FIG. 3. The Southern Hemisphere.



FIG. 4. The Northern Hemisphere.



FIG. 5. The Water Hemisphere.



FIG. 6. The Land Hemisphere.

between the Old and New Worlds is called the Atlantic, and part of this forms the Arctic Ocean. The great expanse of water which separates the opposite sides of these two islands, the Old and the New World, is called the Pacific. The ocean between Africa and Australia is the Indian Ocean.

Straits. The Old World is separated from the New World by a narrow belt of sea joining the Pacific and Arctic Oceans. Such a narrow belt of sea is called a strait. Find other straits on these figures and on Fig. 7.

Summary. We now know the shapes and names of the five largest land-masses and of the three largest divisions of the ocean, and that a narrow neck of water is called a strait, and a narrow neck of land an isthmus. The small white patches surrounded by shading on the map are sheets of water surrounded by land. These are lakes or inland seas.

An atlas should be used with all these small maps.

II. FROM NORTH TO SOUTH OF NORTH AMERICA.

The study of the World. We cannot visit all parts of the World, but we may learn what others have seen. Let us begin by describing a journey round the World, and some of the more important things seen during it. From time to time we shall compare the scenery, climate, and vegetation of one part with another.

We shall begin with the New World. Our first journey will be from north to south across the middle of North America. Then we shall cross from east to west, follow the west coast and return by the east coast to where we started. Then we shall cross the Old World and follow its coasts, and finally return to Britain again.

From Britain to the North of the New World. Look at Figures 1, 4, and 6 and pick out Britain and the New World, and see how the one lies with reference to the other. Then turn to Fig. 7 which shows this on a much larger scale.

Arctic North America. Our route from Britain to the Arctic waters of North America takes us round the southern end of the great island of Greenland, the interior of which is always buried beneath snow and ice. Here we might pause to observe the life of the Greenlanders. They are few in number. We can hardly call them a land people, for the sea supplies most of their food, the oil (from sea animals) for light and heat, and the driftwood which the Arctic peoples turn to innumerable uses. There are no trees in so severe a climate. Hence there are no cereals or vege-

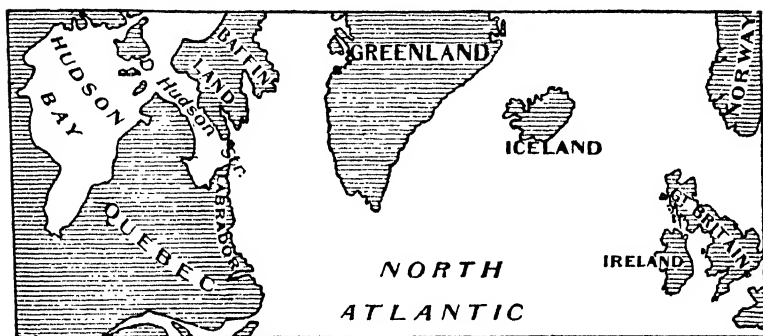


FIG. 7. The Lands and Seas between Britain and Arctic North America. This map is on a larger scale than those of Figures 1-6. Compare it with them; and then compare Hudson Bay as shown here with Hudson Bay as shown on Fig. 8.

tables to vary the monotonous fare of flesh and fish. Canoes, of course, are a necessity of life, and have to be made of the skins of animals. In these the men hunt the seal, whale, and other sea animals. The weapon used is the harpoon, which is so ingeniously devised that it can be thrown without being lost. The white bear, the arctic fox, are trapped. In winter the people of the icy desert, the Eskimo, live in snow huts, and in stone ones in summer. Only a few families are found at any one spot, and such groups are widely separated from each other. Away from the sea coast vast areas of snow and ice are uninhabited. All

the scattered inhabitants of the Arctic islands and the frozen northern margin of the mainland lead a very similar life, with no domesticated animals but the dog, which hauls the sledges over the frozen ground.

Vessels from Scotland, Norway, and other northern lands visit these northern waters in summer to hunt whales, seals, and walrus for the oil and skins which they supply.

Making our way through Hudson Strait, which can only be done in summer, we should find ourselves in the great Hudson Bay, which like Hudson Strait and the northern seas is closed by ice in winter. Landing on the northern shores we should find a desolate region well named the Barren Grounds.

The Barren Grounds. All the northern part of North America is buried beneath snow during the winter, which lasts for many months of the year. The Sun never rises high above the horizon, and the days are very short. The long dark nights are often made glorious by the aurora, a strange illumination of the sky, occasionally seen so far south as England. In spring the snow melts over most of this region, flooding the rivers, and making the land swampy. Then a carpet of mosses and lichens comes to light, and a kind of reindeer, called the caribou, which lives on moss, wanders north in search of food. Innumerable birds too come north, to nest and breed. In their track comes the hunter, and for a few weeks the Barren Lands are peopled. Then the days draw in, and the first frosts warn bird and beast to seek the south again. Winter settles down once more.

The Forest Belt. Landing on the southern shores of Hudson Bay would take us into a better country, where a few trees appear. At first the birches, willows, spruces, &c., are mere dwarf shrubs, low and stunted, and covered with grey lichens, or caribou moss. There are no towns round Hudson Bay, but a number of trading posts, to which the Indian or half-breed hunters bring their skins, receiving in return food, clothing, guns, cartridges, tools, and other needs of life. At York on Port Nelson, at the mouth of the Nelson River, we

might land and continue our southward journey first by canoe, and later on by steamer. It is intended to build a railway from Port Nelson to Winnipeg.

We paddle up the Nelson River in canoes made of birch-bark. We penetrate deeper and deeper into the forest. Instead of birches we find tall firs, for many hundreds of miles. There are many rapids in the river's course, where its bed descends abruptly from higher to lower ground. At such points it is necessary to land and carry the canoe, which is fortunately light, up stream along the banks to the calmer waters above the rapids. This is called a portage.

The Cold Forests. Imagine miles and miles of forest, the taller trees spreading out their leaves high above the heads of the lower ones which are crowded together between. The ground is covered with moss and strewn with fallen branches. Trees block the path everywhere, and the easiest way through the forest is to follow one of the streams. For this a boat is wanted and forests of this kind provide a splendid material, the tough bark of the birch tree. This is turned inside out, and sheets of it are skilfully sewn together with the split roots of the spruce for thread. Next it is lined inside with long thin strips of cedar wood fastened by ribs of the same wood set closely together and plastered with pine-tree resin. In such a boat the American Indian makes his way along the rivers from place to place, carrying his light canoe when necessary through the forest from one stream to another. His food he gets by hunting and fishing. Very often his wife fishes too, and she always collects the game, chops the firewood, dries the flesh and meat not wanted at once, tans the skins of the animals her husband kills, and makes from them tents, clothes, shoes or mocassins, leggings, and laces for the snow-shoes used in winter.

Lake Winnipeg. After some days' canoeing the river leads into a lake so large that we cannot see across it. This is Lake Winnipeg, one of the innumerable lakes which cover the northern half of North America. The forest is growing

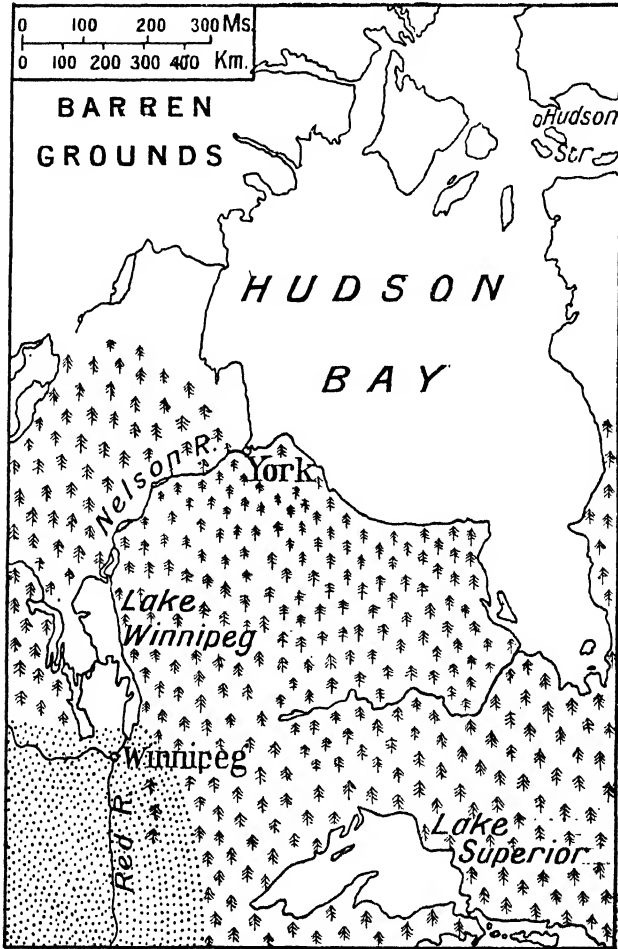


FIG. 8. From Hudson Bay to the Red River of the North. The barren grounds are left white, the forest land has little trees over it, and the grass lands are dotted. Compare the scale of Hudson Bay in this map and in Fig. 7. Measure the distance from York to Winnipeg by river and lake, and from Winnipeg to the source of the Red River.



I. Wheatfields and grain-elevators, Red River Valley (p. 9).



II. Niagara Falls (p. 20).



III. Llamas in the Andes of Peru (p. 33).



IV. Transcontinental railway crossing the Andes (p. 37).

thinner, but the trees are not dwarfs, as they are in the far north, where the climate is much more severe. Making our way round the lake we should see stretching away from it wide plains, treeless except where rivers flow towards the lake between wooded banks. A large river enters the lake at its southern end. It is the Red River, and its valley is one of the most fertile in the world.

The Red River Valley. The Red River valley in summer is a broad expanse of golden wheat. The winters are long and severe and snow lies deep for many weeks. In January the temperature is far below freezing-point and often below zero. The air, however, is dry and bracing, and winter is a pleasant season. In spring the snow begins to melt, thoroughly moistening the soil in which the wheat quickly germinates. Rain falls in early summer when the plant is growing quickly and rain is most needed. Then comes a long spell of warm dry weather, which ripens the full ears. Here we reach the first towns on our journey, where the farmers come to buy and sell. The largest is Winnipeg, not far from the lake. It is built where a river enters the Red River from the west. Many routes meet at Winnipeg, which is now a great city with an immense trade in wheat, sending it east to the ports from which it is shipped to Europe.

***Rivers and their banks.** As the scenery of the winding Red River valley is flat and monotonous we may profitably notice the character of the river itself. We note that where the stream sweeps outward the outer bank is high and the inner bank is low. Next we can see that the water moves more quickly on the outer than on the inner side, and that in a straight reach it moves fastest in the middle. Exactly the same is true of every river, and if there is one near the school you should look at it and see by actual observation that it is true. We notice too that the river tends to eat away its banks. Where it is swiftest its banks are steeper, because the river has eaten away more and more of the land which once

* Paragraphs marked * may be omitted on a first reading.

sloped gently towards it. The colour of the water shows that much loose soil is being carried along, and the quicker the

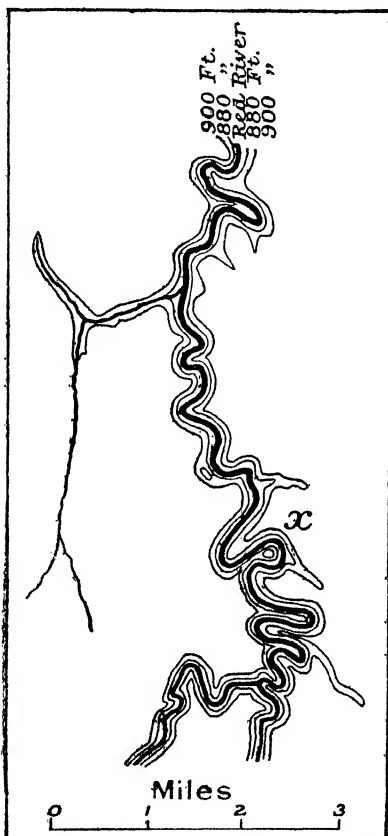


FIG. 9. Part of the Red River of the North. The thin lines are contour lines 20 feet apart. Notice that the land is quite flat except close to the river, where it sinks in some places very steeply over 20 feet. Near *x* the upper and lower ends of a winding are nearly joined. Cf. Fig. 12.

current the more can the river carry. Where the current slackens in moving over a flatter part of its bed its carrying power is not so great.

Every one knows that if muddy water is allowed to stand in a pail the mud falls to the bottom and the water becomes clear. If we stir it up from the bottom, thus putting it again into motion, it again becomes muddy, but the mud drops once more to the bottom as the water becomes quiet again. Just so with the river. After a flood or where the river flows very slowly the mud settles and raises the bed. Rivers thus do an important work in forming new land, though as we have also seen they help to destroy the land already in existence.

The Upper Mississippi Basin. The Red River gradually becomes less broad, ending as a narrow stream which we follow to a little lake. From this lake a short stream takes us across a forested country to another lake.

Out of this flows a small stream, the Minnesota, along which we travel. Often the river is so shallow that a portage would be necessary for a canoe. Gradually the stream widens to a river, and at last it enters a large river, the Mississippi.

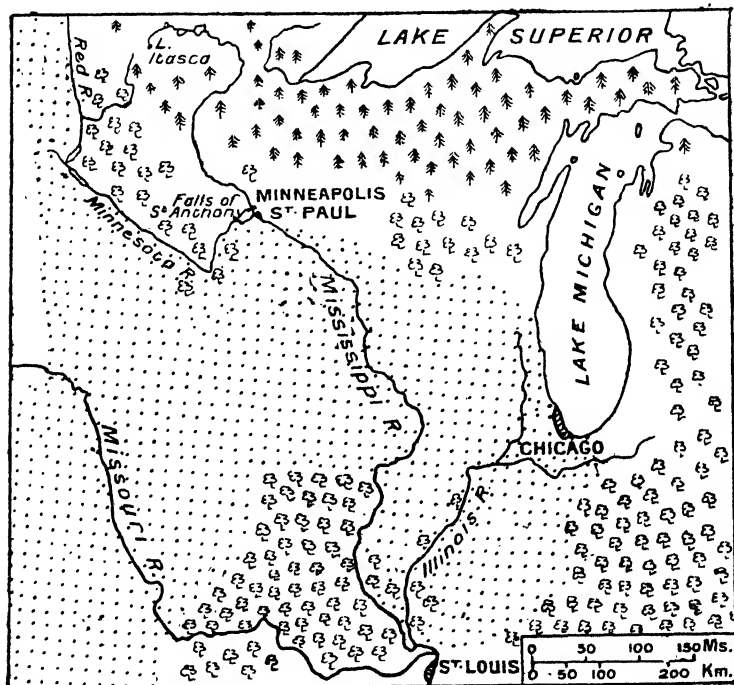


FIG. 10. The Upper Mississippi Basin. The dots show the grass lands, the pointed trees the coniferous forests, the rounded trees the mixed or deciduous forests. Lake Superior is shown north of Lake Michigan. Compare the scale of this map (1 inch = 190 miles) with that of Fig. 17, by looking at Lake Superior in both. Measure the length of the Minnesota river by the Mississippi, between Lake Itasca and the Falls of St. Anthony and between the Falls of St. Anthony and the Missouri.

The Upper Mississippi. The Mississippi has come from a little lake set among the low pine-clad hills which lie to the east of the Red River valley. Just above the confluence of the Minnesota, that is, where the Minnesota enters it, the Mississippi rushes over a ledge of rock forming the fine Falls of St. Anthony. Here a great city has grown up called

Minneapolis. The swift current of the falls is used to make electricity which turns the innumerable flour mills. These grind the grain from the rich wheat lands which we have passed and from others which we have still to cross. Ten miles lower down the Mississippi, a little below the confluence of the Minnesota, is St. Paul, a great trading town.

The Climate of the Upper Mississippi. The climate of this part of North America is dry and bracing. The winters are very cold and lakes and streams are frozen for four or five months. Spring begins in May and is quickly followed by the very hot summer. The autumns are long and dry, with cold nights but warm days.

From the Wheat to the Maize Belt. At St. Paul we might board a steamer, and sail down the Mississippi for many days. The river grows wider and wider, as we steam down stream, and receives many smaller streams, or tributaries, on both banks. Going down stream we have the right bank on our right hand, and the left bank on our left hand. Sailing up stream this is reversed. The right bank is then on our left and the left bank on our right. Our journey is through a land of flat wide-spreading wheat fields, with but few trees. Farther south we begin to see fields of Indian corn, or maize. After passing the mouth of a large river, the Illinois, on the left bank, we suddenly come to a great muddy river, larger than the Mississippi itself, which enters on the right. This is the Missouri. It comes from the high mountains far away in the west and has crossed hundreds of miles first of grass lands and then of wheat lands before it joins the Mississippi. At its confluence with the Mississippi it is already 2,800 miles from its source. For many miles below the confluence the muddy waters of the Missouri keep to the right bank and the clear waters of the Mississippi to the left.

St. Louis. The boat draws up at the wharves of a great city, built on both banks, but principally on the right bank. It was founded by French immigrants who named it St. Louis, for the Mississippi was first explored by Frenchmen. They chose an

excellent site for their city, close to the junction of three large rivers, the Missouri from the north-west, the Mississippi from the north and the Illinois from the north-east. St. Louis owes much of its prosperity to its situation, which commands important routes in all directions.

A walk about the quays and streets of St. Louis soon shows how prosperous it is. Twenty railway routes enter it, making it a great trading centre. By these lines wheat is brought from all directions to be ground into flour. The maize grown in this belt of country is used for fattening pigs and cattle and also for making beer, whisky and starch. St. Louis is consequently a great meat market. Beef is either 'chilled' or canned, so that it keeps good even in hot weather, and can be forwarded by rail or river to the densely peopled manufacturing regions. Bacon is dried and smoked, and pork is cured.

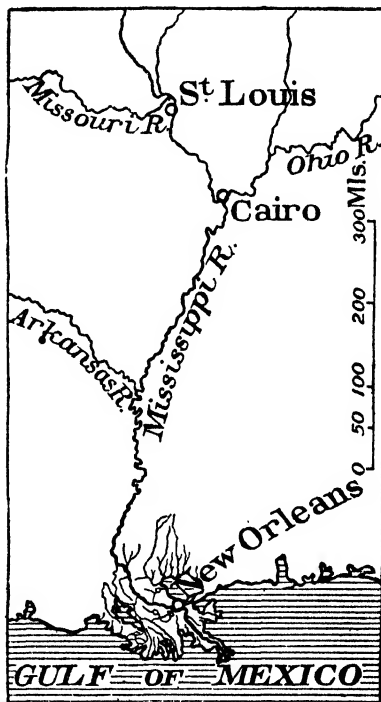


FIG. 11. The Lower Mississippi. The alluvial flood plain begins at Cairo. The wheat region ends, the cotton region begins near the mouth of the Ohio. Maize is very important in the northern half of its map. Measure the distances along the Mississippi, between the Missouri and Ohio, and between the Ohio and the Gulf of Mexico. What is the total length of the Mississippi as shown on these various figures? The actual length is 2,500 miles. Many windings cannot be shown on small diagrams like those in this book, and this explains the difference.

Through the Maize and Cotton Belts. Continuing our journey down the Mississippi, we observe that maize fields

become more and more numerous and wheat fields less common, until we reach the mouth of a great river coming in on the left bank, the Ohio. The city of Cairo is built on the tongue of land between the Ohio and the Mississippi. The character of the country is gradually changing. The days are growing very much warmer. New crops appear. We note first fields of tobacco and farther south the first cotton fields. The country, however, continues flat, except where the river swings round at the foot of a high bank or bluff.

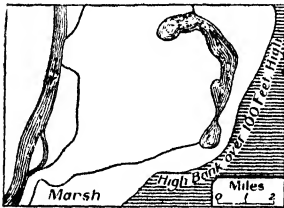


FIG. 12. The Mississippi, showing an old winding which has been cut off and formed into a crescent-shaped lake, by the straightening of the course. Notice the high bank at the foot of which the river formerly flowed. Compare winding at *x* on Fig. 9, where the stage before the formation of the cut-off is shown.

***River Windings.** Here and there we see an old river channel, and beyond it a bluff. In the course of time the river has made a shorter channel, or cut-off, by wearing away the narrow neck of land which once separated two parts of its winding or meandering course. Where it once went round it now goes across.

The Lower Course of a River.

For hundreds of miles from the sea the banks of the Mississippi have to be protected, as they rise above the level of the surrounding flat land. The land slopes down from the banks instead of towards them. This is the result of the gradual raising of the river bed of which we have already spoken. (See p. 10.) To prevent disastrous floods in spring, when the mighty river is swollen by the melting snows, levées or embankments have been built for 1,600 miles, many of them resembling artificial hills. Every few years the river comes down in unusually high flood, rising occasionally more than fifty feet. Then it may break through these defences and flood the flat lands around for hundreds of square miles, destroying fine cotton fields, and perhaps many lives. As the waters gradually disappear a layer of fine mud is left on the

surface. This mud or new land is called alluvium. The whole of the Mississippi valley below Cairo is composed of alluvium.

Many channels now begin to open from the river across the flat land. Their currents run from the river, not towards it, as do tributaries. These channels or bayous, which distribute the waters of the main stream, are called distributaries. Each one is busy building up alluvial land along its banks as it makes its way seawards (see Fig. 13).

New Orleans. We now approach the mouth of the Mississippi and pass through a swampy region of lakes, forests, and sea-marshes where land and water contend for mastery. Only the well-built banks of the river keep it from spreading on all sides over this low-lying region. Just over 100 miles from the sea is the great city of New Orleans, built on a tongue of land between Lake Pontchartrain and a bend of the river. It was so called (by the early French settlers) after the city of Orléans on the Loire in France.

At New Orleans the river is of lake-like breadth, giving the city a magnificent harbour. Here the cargoes of the river steamers and the freight brought by the many railways which run into New Orleans, are put on board ocean steamers which are able to ascend the river as far as the city.

The best time to see New Orleans is in autumn and early winter when the cotton, pressed tightly into bundles or bales, is brought by river and rail to be sent across the sea, mainly to Liverpool, to supply the Lancashire cotton mills, where it is made into yarn and stuffs. The winters at New Orleans are never severe. Usually it is as warm at mid-winter in New Orleans as it is in the Thames valley in May, or as it is in the extreme north of Scotland at midsummer. Oranges and many other sun-loving fruits ripen out of doors, and the gardens are ablaze with brilliant flowering shrubs.

***The Delta.** We have still 100 miles to go before we reach the mouth of the Mississippi, which flows into the Gulf of

Mexico. The river continues to divide into many distributaries, each of which forms a new strip of land. How does this happen? We know that rivers carry downwards a great mass of fine mud. When the water reaches the sea the force of the current is checked and the mud consequently sinks. Currents in the sea carry some of this mud away and deposit it elsewhere along the coast, but much falls opposite the mouths of

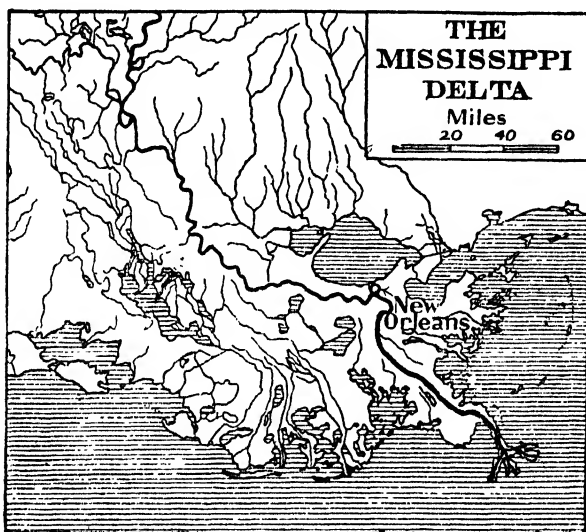


FIG. 13. Notice the main stream and the branches or distributaries which leave the main stream. Some of the rivers rise at the foot of the banks of the main stream, gathering the waters which filter through these banks. Notice the numerous lakes and islands. There are some crescent lakes filling old bends of the river near the present main stream.

the distributaries. There the bed of the sea is being slowly but steadily raised and at last reaches the level of the water. It then forms a marshy land across which the distributaries flow with their burden of mud, to continue the process. As each new piece of land has a yet newer piece raised beyond it the older part becomes firmer. In this way the river is continually forming broad alluvial lands in what were once shallow seas. All the alluvial land across which the distributaries

flow is called the delta. This is because of its fan shape being something like the Greek letter delta, which is shaped Δ . This Δ form is not so well marked in the case of the Mississippi as it is in the case of the Nile for which the term was first used.

Summary. We have now crossed North America from north to south. Everywhere the land has been flat or undulating. No mountains have been seen. We find that we have passed from colder to warmer regions, from lands where snow and ice cover the ground all the year round to others where the winters are mild and genial. We have passed through the belts of almost bare frozen land, through the hardly less desolate Barren Lands, across belts of forest, through wheat fields, maize fields, tobacco fields, and finally cotton fields. Naturally we are inclined to think that the change from the Barren Lands round Hudson Bay to the cotton lands round the Gulf of Mexico is largely due to differences in temperature. This we shall find later is the case. If there are such changes from north to south, do they occur from east to west? Let us see.

III. ACROSS NORTH AMERICA FROM EAST TO WEST.

Newfoundland and the Gulf of St. Lawrence. Having crossed North America from north to south let us now cross it from east to west. Crossing the Atlantic by steamer from Liverpool we sight the coast of the island of Newfoundland (1,900 miles) on the fourth day after losing sight of the Irish coast. It lies at the entrance to the Gulf of St. Lawrence which our steamer enters. At first the gulf resembles an arm of the sea, but gradually the densely wooded hills on both shores approach each other as it narrows. We cannot steam up the river at all seasons. In winter the margin of the sea is frozen and the rivers are ice-bound. Then our port is

Halifax, on the wooded peninsula of Nova Scotia, or St. John, in New Brunswick.

The Eastern Highlands. The line which runs due west from St. John has to cross a belt of highlands before it reaches the St. Lawrence and the lowlands farther west. To avoid this difficult route another line runs northwards not far from the coast and then turns westwards along the southern bank of the St. Lawrence, following the narrowing estuary, as the

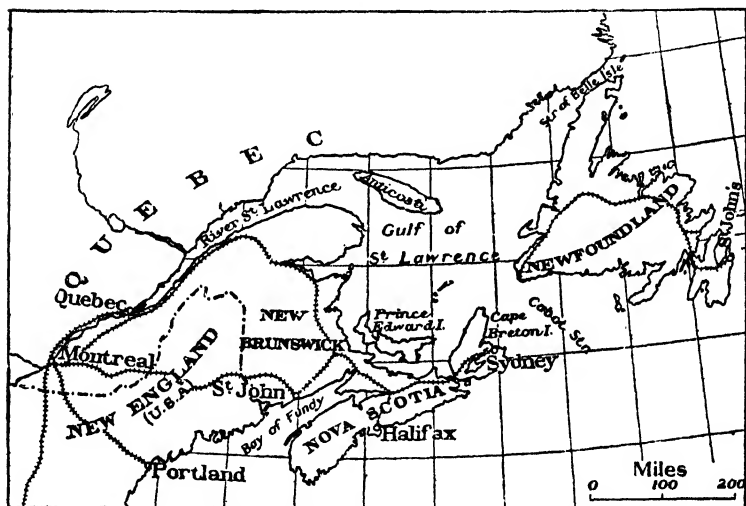


FIG. 14. The St. Lawrence Gulf or Estuary. On this map the more important main railway lines are shown. The dot and dash line indicates the boundary between Canada and the United States of America.

funnel-shaped river mouth is called, to a point opposite Quebec, built round a great rock on the north bank. This was easily fortified, and here the early French settlers, the first Europeans to settle in this region, built their town. The people who live round the lower St. Lawrence are still of French blood and speech. Above Quebec is a still larger city, built on a hilly island in the middle of the river called Mount Royal or in French Montréal, after which the city is named, Montreal. Atlantic liners go as far as this in summer. A great railway bridge crosses the river at Quebec.

The Eastern Forests of Canada. The land into which the St. Lawrence leads is the British Dominion of Canada, which extends across North America to the Pacific. Going westwards from Montreal our way lies first through a partly cleared region, on either side of which lie vast forests of untold value. The cutting and transporting of timber, lumbering as it is called, employs many men during the winter months, when the trees can be easily dragged over the smooth snow to the banks of some frozen stream. When this thaws in winter the great trunks are carried down by the swollen streams to the larger rivers which are flowing to the St. Lawrence. In the course of their descent to the lower valleys the rivers form many waterfalls, whose strong current is made to turn sawmills. These saw the lumber into planks, which are afterwards made up into doors and window frames. The smaller lengths are ground into wood pulp, which is used in making paper.

The Eastern Agricultural Lands. In the narrow flat lands near the river or coast some agriculture is carried on. In the west of Nova Scotia are many apple orchards. Sailing up the St. Lawrence village after village is passed, each with its quaint church. Between them are long stretches of arable land almost unbroken by trees, except an occasional poplar. Dairy farms are very numerous. Butter is made in winter and cheese in summer. What is the reason for using the milk differently at different seasons?

Towards Lake Ontario. Above Montreal the river Ottawa enters the St. Lawrence. We might sail up it as far as the great Chaudière Falls, which turn numberless sawmills. On the high western banks of the river are built the Parliament Houses of the Dominion of Canada, of which Ottawa is the capital. Or we may continue our journey up the St. Lawrence. After passing several rapids the river widens and we sail past a thousand wooded islands into the great lake of Ontario. Skirting its shores we pass many small towns before we reach the large city of Toronto (see Fig. 17).

***Niagara Falls.** Steaming due south from Toronto across

Lake Ontario we come to the mouth of a river which flows through a narrow gorge. This is the Niagara River. Higher up its gorge are the world-famous Niagara Falls, where the river, which is a mile wide, leaps down 160 feet from the flat land above into this gorge. If we examine the rocks of which the sides of the gorge are formed we find that the upper layers

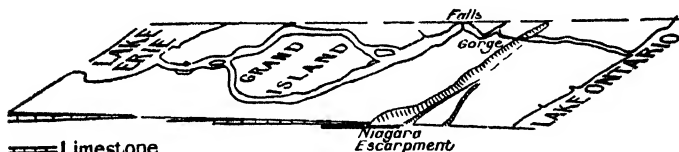


FIG. 15. Sketch of Model of Niagara isthmus, showing the river above the Falls, the gorge and the wider valley below the Niagara escarpment.

are of hard compact limestone lying nearly horizontally. Below these are soft thin loose layers of a rock called shale, which is only a hardened mud and is therefore more easily worn away than the hard upper limestone. Waterfalls of the Niagara type are very common. The softer rocks below are easily

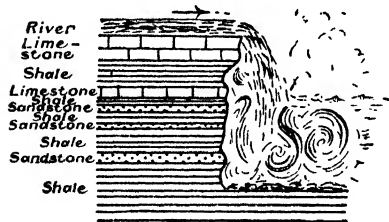


FIG. 16. Diagrammatic Section through Niagara Falls, showing the more easily eroded shales, and more resistant limestones.

worn away, leaving the harder layers above projecting as a cornice. At last as the softer rocks become more and more eaten away the projecting masses above give way, and fall into the gorge below. In this way the waterfall gradually moves up stream. The Niagara gorge below the falls has been formed

by the gradual up-stream movement of the falls, which many thousand years ago were at what is now the lower end of the gorge.

Lake Erie. If we follow the Niagara river up stream it brings us to Lake Erie, another of the Great Lakes of Canada.

Lake Erie is over 250 miles long. Along its shores are many large cities, whose wharves are crowded with shipping. Buffalo, near Niagara, is one of the largest. The electricity which lights the city and turns the mills is made by the waterpower of the Falls. In autumn, before the lakes are covered with ice, many vessels come to Buffalo laden with grain, which is there transferred to trains. To Cleveland come steamers

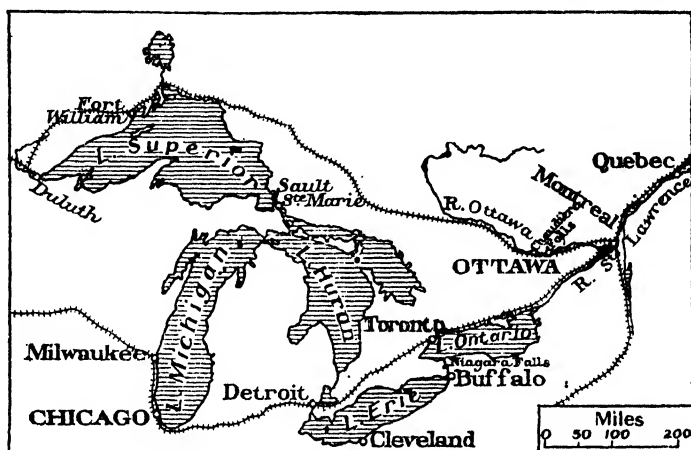


FIG. 17. The Great Lakes of North America. Two important railway routes are shown. Notice the positions of the chief towns marked on the map. Measure the lengths and widths of the different lakes.

loaded with iron ore, which is smelted at Pittsburg in the coal and oil district farther south.

Lakes Huron and Michigan. From the western end of Lake Erie we pass northwards through a river with a small lake in the middle to a third great lake, Lake Huron. The banks are wooded, for we are still in the forest area. A broad strait at the northern end leads to Lake Michigan which projects southwards. At its southern end is Chicago, one of the largest and busiest cities in the world. Like St. Louis on the Mississippi, it is a great business and industrial centre, and a great meat market to which cattle and pigs are brought to be slaughtered and preserved. It also ships much wheat

to Europe, by way of the Great Lakes. Over fifty different railway lines enter the city, so that it is in close touch with all parts of the continent.

The Soo and Lake Superior. If instead of turning west and southwards from Lake Huron we kept on a north-westerly course we should enter a rapid river. Passing up this we should reach two canals which allow ships to avoid the rapids between Lake Huron and still another lake, Lake Superior. These rapids are called the Sault Ste. Marie (St. Mary's Fall), generally shortened to 'the Soo'. Their waterpower is used to supply electric power to the great lumber and other manufactures which have sprung up.

Lake Superior is a vast lake as large as Ireland. On its southern waters are steamers laden with ore from the iron mines. In the west and north they are carrying wheat from the western prairies, which we have already crossed by the Red River valley. Duluth at the west end in the United States and Fort William on the north side in Canada are the chief ports of Lake Superior.

Summary. We have not yet passed out of the forest belt since we left the Atlantic, though here and there large clearings have been made. Lumbering, sawmilling, pulp-making are the forest industries. Agriculture, dairy farming, and fruit growing occupy the farmers. The land between Lakes Ontario, Erie, and Huron, is called the Lake Peninsula. It is extremely fertile and has a mild climate. Apples, grapes, apricots, and many other fruits are grown and farming is important.

The waterfalls of the Lake Region supply power for saw-mills, flourmills, and others. The coal and oil found south of Lake Erie are used to smelt the iron ores brought from Lake Superior through the Soo canals. Coal from the south of Lake Michigan is sent to Chicago, where iron is smelted, and where the rails, carriages, trucks, and engines needed for its fifty railway lines are made, as well as the many thousands of implements required by the western farmers.

There is much shipping on the Lakes and on the St. Lawrence, and canals have been made to avoid the waterfalls and rapids. For nearly five months in winter all goods are carried by rail.

Railways. From the east coast or St. Lawrence ports we might take one of the two great railway routes across the continent, the Canadian Pacific, or the Canadian National, across a region of forests, rivers, and small lakes northward of the Great Lakes. The same kind of country would be traversed for four hundred miles farther, to Winnipeg, which we passed on our journey from north to south. Winnipeg is

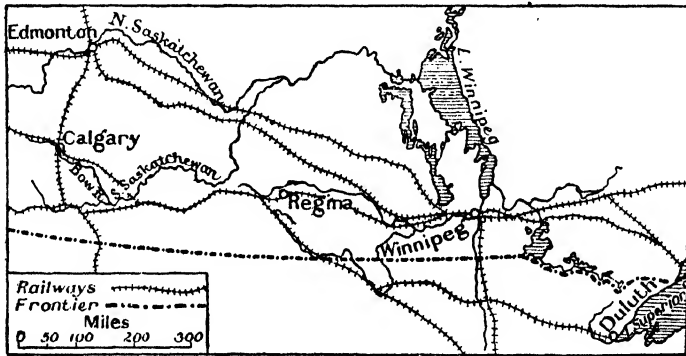


FIG. 18. South-Central Canada, showing rivers, railway lines and towns.

built where the river Assiniboia enters the Red River, and the railway continues westwards across a grass or prairie land now covered with wheat fields. Still farther west the wheat fields grow fewer, and we cross the great grass region of Alberta, with sage bush looking blue in the distance. Cattle have taken the place of wheat. Near the mountains where water can be had wheat fields are seen again.

The Grass Lands. It is easy to move over the vast grass lands, which are broken only here and there by the line of trees where a stream flows. Here in olden days the American bison roamed and was hunted by the Red Indians. Nearly all the bison have been killed by white hunters armed with guns. Now there are vast herds of cattle, sheep,



FIG. 19. Physical Features of Western Canada.

and goats, looked after by men on horseback who are called cowboys. The eastern and moister parts of the grass lands or prairies are now cultivated and across them many railways have been built.

The Western Mountain System. A faint blue line on the western horizon grows more distinct, and at last the train reaches the Rocky Mountains and passes up a valley towards their heart. They rise steeply 3,000-5,000 feet above the plains, with peaks 10,000 or 13,000 feet above the sea. As the railway climbs the steep-sided valley, the air grows cooler. Crossing deep ravines, rushing through grassy glades with an occasional saw-mill, and surrounded by trees and steep-sided mountains, we plunge into a great gorge, and at the summit we see the distant peaks of other ranges beyond. For many miles we pass through the same

kind of scenery until we reach the summit of the last range and run down the narrow gorge of the Fraser River, which

gradually widens to a valley. We cross the upper part of its delta and steam into the station of Vancouver on the western coast of the continent.

The Vegetation Zones of the Mountains. Even in summer the higher slopes of the Rocky Mountains are covered with snow. Great snow-fields fill the hollows between the peaks, and rivers of ice, or glaciers, descend from them into the valleys, melting at the lower end, from which flows a torrent of dirty grayish water. If we climb one of the mountains, we first pass through a pine forest which covers the lower slopes. As we rise higher this becomes more and more stunted, till it resembles the forest round Hudson Bay. Then comes a scrub of low berry-bearing bushes, above which we pass through a tract of mosses and lichens, recalling the Barren Grounds. At last we reach the snows, which we may compare with those of Greenland.

As we descend we pass again from snow to moss and lichen, through scrub and low trees to pine woods, and at last look back on the great wall of mountains from the grassy plain.

Why, we ask, should we find the same differences of vegetation in descending a high mountain as in coming southwards from Greenland to Lake Winnipeg?

Horizontal Belts and Vertical Zones. As we came southwards the days grew warmer, and as we climbed the mountain the air grew colder and colder. The higher we go the colder it gets. The farther north we go the colder it gets. When we climb high enough in the mountain it is so cold that snow remains on the ground all the year round. When we go far enough north perpetual snow is also found. Notice that we had only to go a few thousands of feet up the mountain at the head of the Saskatchewan to touch the snow-line, but we should have to travel some hundreds of miles northwards from the same place to find snow on the plains in summer.

We may expect as we go south to find it grow warmer and warmer. How will this affect the snow-line on the mountain sides? Far north perpetual snow was found at the sea-level.

At the source of the Saskatchewan, over 1,200 miles farther south, it is found at a height of about 9,000 feet.

***Snow and Glaciers.** The snow in the higher parts of the mountains is swept by the wind off the exposed sides, or slides by its own weight down the very steep ones. This gathers in the hollows, where it may accumulate to a great depth. The surface snow melts during the hours of sunshine, and freezes again in the cold night. As the snow grows deeper the weight of the snow above presses the lower layers more and more closely together till they become transformed into ice. This ice is not solid like the ice on a frozen river, but is formed in grains of different sizes. The pressure of the upper layers of snow and ice causes the ice grains of the lower layers to move onwards down the valley. This moving mass of ice is called a glacier.

Rocks and stones from the mountains on either side fall on the glacier and form an embankment or moraine along either margin of the glacier. Where two glaciers join two of the side or lateral moraines coalesce, and continue as a middle or medial moraine down the middle of the united glacier.

Many glaciers do not now reach so far down the valleys in which they flow as they did fifty years ago. When we look at the parts formerly covered by glaciers we find that many of the rocks on the up valley side are smooth with many scratchings, but they are rugged as if parts had been torn away on the down valley side. The old moraines are to be seen below the present termination, or snout, of the glacier, where they were left when the ice which once carried them forward melted. We can identify regions where ice has once covered the surface by such polished and scratched rocks, and by such morainic deposits. There are many in the British Isles.

***Mountain Valleys.** Most of the higher valleys in the Rocky Mountains have flat floors, and very steep and often almost perpendicular sides, which at a varying height above the valley floor suddenly become much less steep. If we

make a section across such valleys they look like Fig. 20. The main stream flows at the bottom, in the U-shaped trough. Its tributaries often fall in abruptly over the steeper cliffs of the U-shaped trough, forming waterfalls. This is a different type of waterfall from Niagara. In addition to the waterfalls formed by a tributary stream plunging abruptly into a valley trough to join the main stream there are many others which, especially after rain, rush down the steep-sided mountains in no very definite valley.

In these mountain valleys are many long narrow lakes, as if some barrier had dammed up the valley and prevented the water from flowing away as a river. These barriers are often old moraines left by a melted glacier. Such lakes may be called glacial or morainic lakes.



FIG. 20. Section across a valley in the Rocky Mountains. The vertical scale is four times the horizontal scale.

Western Fjords and Islands. When these valleys reach the coast, the sea is often found far inland between the steep cliffs of a narrow inlet. These steep cliffs are a continuation of the walls of the valley, the lower part of which has been covered by the sea. Such inlets are called fjords. Have you heard of any fjords on the west coast of Scotland? They are found all along it, and in Norway and New Zealand too.

If we sail along the west coast of North America northwards from Vancouver, we find many of these fjords, and many islands separated from the mainland by deep steep-sided straits, or sounds. The whole coast is forested, but as we go northwards the snow line descends lower and lower, though it never reaches the coast. Here the rivers are not frozen in winter. Far in the north, however, one or two very large glaciers do actually reach the sea, and we can watch the ice break off and float away as icebergs. As ice is much lighter

than water these float, but nearly six-sevenths of each iceberg is below the water. Some of the loftiest mountains of North



FIG. 21. Western Canada and neighbouring lands. British Columbia is a province of the Dominion of Canada.

America are found in this north-west corner of the continent, the highest being Mount McKinley, over 20,000 feet high.

Occupations in the Western Forest Flords. These western forests contain magnificent trees, chiefly pines of many kinds. Of these the tall Douglas pine sometimes attains a height of 300 feet.

Do you know of any hills as high as this near your school? What is the highest tower or steeple you have seen? How many of them would have to be set one above the other to reach the height of a tall Douglas pine?

In such a country lumbering is of course important. Some agriculture is carried on in the flat valleys, and fruit trees do well where there is not too much rain. The rivers and fiords are full of fish, especially salmon, which is caught in enormous quantities, cooked, and canned for export. You will see tins bearing the labels of this distant region in many a grocer's window.

The mountains contain gold, silver, copper, and other metals, as well as coal. Mining and smelting are very important.

Summary. In a journey from east to west, across nearly the middle of North America, we passed through (*a*) a hilly forest belt succeeded by (*b*) a flat forest belt in the east, with farms and orchards in the clearings; (*c*) a flat or undulating grass belt with great wheat farms on its eastern part, and (*d*) little or no cultivation on its western part; (*e*) a mountainous belt in the west, with snow-fields and glaciers, and lower zones of moss, grass and forest, with here and there clearings in the valleys cultivated or planted with fruit trees.

The forest belt occurs where the rainfall is abundant; the grass belt where the rain is scantier.

IV. THE WEST OF NORTH AND SOUTH AMERICA.

From Vancouver to San Francisco. To reach the Pacific from Vancouver we must pass round Vancouver Island, at the south of which is the port of Victoria, the capital of British Columbia. In the harbour of Vancouver we may see great steamers ready to sail for Japan or New Zealand, as well as smaller steamers for the ports of the United States on Puget Sound and to the south. Turning southward along the coast we notice that the mountains form a great wall parallel

to it. After seven or eight hundred miles we come to a wide opening and enter by the Golden Gate into San Francisco Harbour. San Francisco is the largest city on the Pacific coast. It was partly destroyed by an earthquake in 1906.

Making a short excursion inland we find that behind the coastal mountains is a long narrow valley, with wheat fields in the north and vineyards in the south. In the surrounding mountains gold and other minerals are found. As San Francisco is the outlet from this very fertile region, as well as the best harbour on the Pacific, it is a very important port. Many railways from Eastern America converge at San Francisco. They have all to cross a western mountain barrier, even wider and higher than the one we crossed in going from Montreal to Vancouver. In the harbour of San Francisco we find vessels

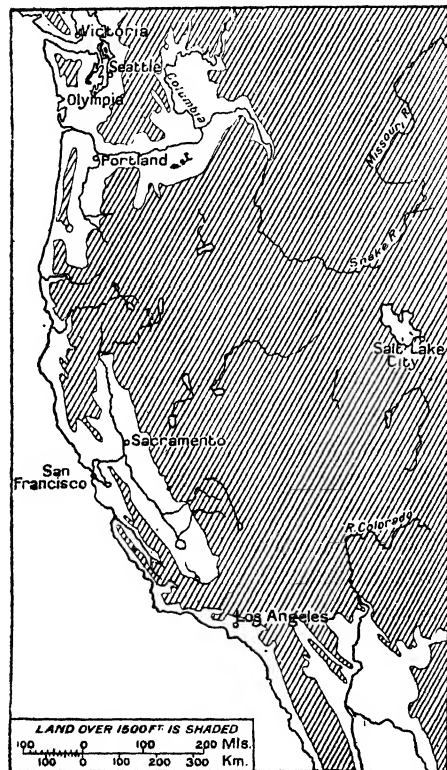


FIG. 22. From Vancouver Island to the Californian peninsula.

from Europe, Asia, and Australia. If our visit is in winter we shall have a good deal of rain, for this half-year is the

wet season. Hardly any rain falls in summer. This is quite different from the climate of the other parts of North America which we have visited.

The Arid Desert. As we sail southwards from San Francisco the mountains still rise close to the coast, but the trees become scantier and scantier until at last the hills are bare and desolate. In the arid or hot dry deserts the traveller is scorched by day by the blazing sun, shining out of a cloudless sky, and heating the sands till they glare like molten metal. Here and there a spring or a well is found in some green valley. Elsewhere there is no water, and permanent homes are an impossibility except in such favoured spots. Round the few springs which never run dry, sheep, goats and a few horses are kept, which supply food and wool. The wool is made into blankets. Many useful things are made of finely plaited desert grass, which is tough and stringy. Here and there there is enough water for a little maize to be grown, but this is rare. It need hardly be said that the desert has very few inhabitants.

From San Francisco to Panama. We pass the wide opening which, we are told, is the Gulf of California, and then see on our left a range of great volcanoes, the volcanoes of Southern Mexico. Trees begin to reappear, and as we pass farther and farther south the vegetation becomes richer and richer. If we enter any port we find a damp jungle of great trees, among which gay birds flit and monkeys chatter, and below dense undergrowth difficult to cross. The coco-nut palm and the vanilla orchid are common in these forests. If we make a longer journey from the coast inland we gradually rise above this wet jungle, and pass through plantations of cacao and coffee grown under the shade of banana palms. Higher still are fields of maize and wheat, with little villages of mud houses, often only a story high. Pineapple fences surround meadows in which are herds of cattle. Still higher we pass into cooler regions where wheat and other temperate cereals can be grown.

Returning to our ship we at last turn into a bay which is bordered on the north by low hills, and enter the port of Panama. Here we find that it is only thirty-one miles across



FIG. 23. San Francisco to Panama. The grass lands are dotted, the unshaded parts are desert. The crosses indicate forests on the mountains, the trees the warm wet forests of the lowlands.

to the Atlantic, and we see the end of a great canal which has been cut to enable ships to pass from one ocean to the other.

From Panama to Lima. Leaving Panama we pass through a region where rain falls very frequently. The mountains are close to the sea and their bases are covered with dense forest. As we go south the mountains become higher and higher. At last we come to a great opening called the Gulf of Guayaquil, which we enter. Here we find the same wet jungle with the cacao and coffee plantations, maize, wheat, and other fields succeeding each other on the slopes of great volcanoes in the same order as in Central America.

South of Guayaquil the rain ceases, and the coast and the mountains become arid. For fifteen hundred miles we steam

along past barren land, seeing very few plants or trees except here and there where a river comes down from the mountains and forms a green strip across the desert. Fogs, however, are not uncommon, and clouds gather on the sides of the mountains. Where they exist a belt of vegetation is found. From the port of Callao we can visit Lima, the capital of Peru, in one of those valleys. Water is brought by numberless canals from the river to the cultivated land round the city. This is called irrigation. Even where irrigated the vegetation looks dusty and burnt up, owing to the hot sun and the dust.

A Trip into the Andes. Farther south we can land at the port of Mollendo, whence a railway has been built high up into the mountains, which are called the Andes. After crossing the plain the line climbs the bare mountain side of the

volcano Misti, with no vegetation except here and there a withered-looking cactus and small green patches irrigated by water from the mountains. In such a valley, where sugarcane, cotton, maize, wheat, potatoes, melons, and all kinds of vegetables and fruits grow in the green patches, the town of Arequipa is built. Here we see the llamas, resembling dwarf camels, which are used to carry hardware, cloth, and other merchandise over the higher mountain roads, and to

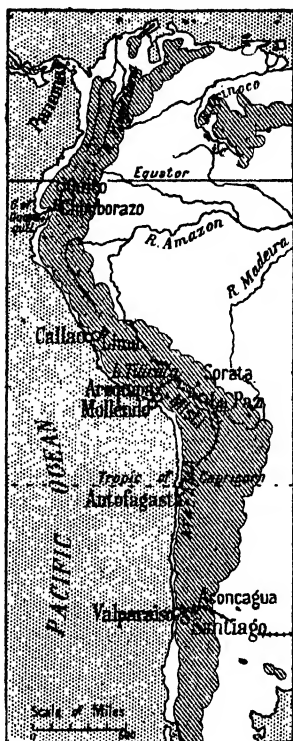


FIG. 24. The West Coast of South America. The mountainous land is shaded. Notice that it is unbroken along the west.

bring back wool, and hides, and ore. The mountains are so high that some of the passes are between two and three miles above the sea, and the air is so rare that horses, and even mules, cannot get enough for breath. The railway climbs higher and higher until it reaches nearly 14,700 feet above the sea. We have not yet reached the snow-line although we are higher than any of the mountains we saw when crossing the Rockies. Water freezes every night. Even through the day the ice will remain in the shade while men a few yards away are sweating as they work in their shirt-sleeves in the hot sun. The inhabitants are mostly railwaymen, and the families of the shepherds who feed their flocks on these high pastures.

Travelling eastwards we descend to the great plateau of Bolivia which lies two and a half miles above the sea, and is bordered by snow mountains, many of them volcanoes, both east and west. In the centre is a great lake, as large as Lake Erie, called Titicaca, from which a river runs southward to enter another lake which has no outlet. In this plateau the rivers do not reach the sea. As much water is evaporated as falls in rain or snow. If this were not the case the waters would rise above the surface of the lakes until they flowed over some mountain pass, or col, into the Pacific in the west or to the plains in the east. A region which has no river running from it to the sea is called a region of inland drainage.

A little wheat and barley and vegetables are raised on this plateau, but its chief wealth is its silver mines, from which many million pounds' worth of silver have been extracted. We may take the train southwards across the plateau and then descend to the coast to the port of Antofagasta in Chile. To do so we must cross the Atacama desert at the base of the Andes, in which rain seldom or never falls. The soil contains nitrates which are shipped to act as fertilizers on farms in our own country.

Continuing our voyage south from Antofagasta we notice that gradually the land becomes less desert-like. At last

we steam into the horseshoe-shaped harbour of Valparaiso, surrounded by hills.

From Valparaiso to Cape Horn. From Valparaiso we can take a train inland to Santiago, the capital of Chile. The railway traverses the valley of Chile, lying between the coast range and the main chain of the Andes. This central valley of Chile reminds us of the valley of California with its wheat and maize, vineyards and orchards. We find another point of resemblance in the fact that in both the rain falls in winter and the summers are dry.

Returning to Valparaiso and steaming southwards we find that the forests become thicker and thicker. At Valdivia we enter a region where the rain falls at all seasons. Here the coast is bordered by many islands and pierced by numerous fiords which recall those of British Columbia. Lumbering and fishing are the chief occupations.

The boat now either turns into one of these fiords and passes by the narrow Strait of Magellan into the Atlantic Ocean, or takes the more southerly course round Cape Horn, the southernmost point of South America.

Summary. In our journey along the west coast of America from north to south we cannot fail to notice certain similarities. In the extreme north and in the extreme south stretches an island-bordered coast, with many fiords, where rain falls at all seasons of the year. Magnificent forests clothe the base of the mountains, which rise high above the snow line and send down great glaciers to the coast. In North America this region is British Columbia, in South America it is Southern Chile. Next to these comes a different region, represented by California in North America, and by the valley of Central Chile in South America, which has winter rains and dry summers, and which produces the vine and other fruits of warm lands. Next to these is a region of rainless desert. In North America this desert is near the Gulf of California. In South America it extends from near Guayaquil almost to Valparaiso. Between these two desert

areas is a region where rain falls abundantly at all seasons, but especially when the Sun is highest in the heavens at noon. All this region is covered with dense, hot, moist forests.

V. THE EAST OF SOUTH AND NORTH AMERICA.

From Cape Horn to the River Plate. Steaming 300 miles

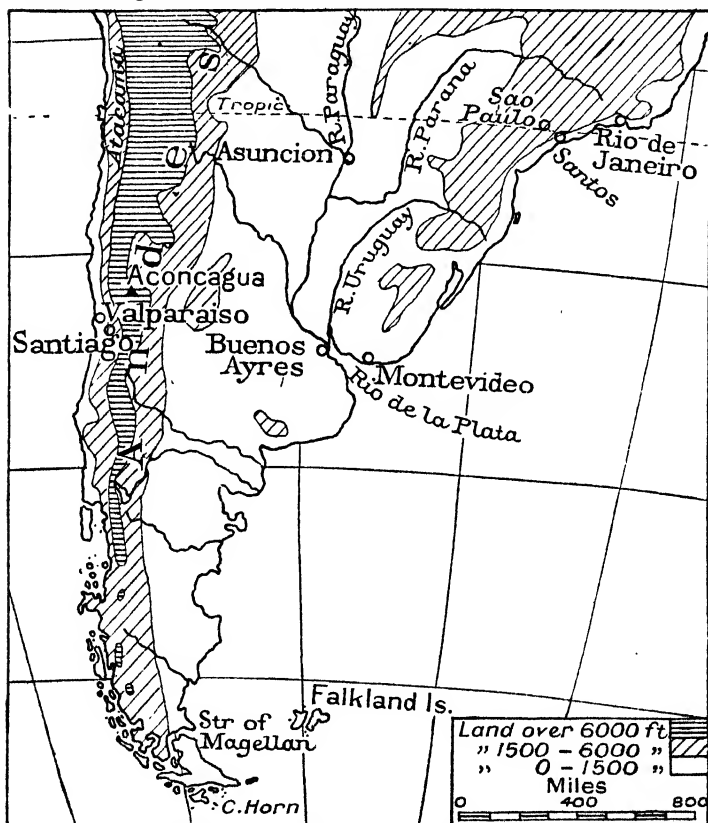


FIG. 25. The South of South America. The mountainous land is shaded. Compare Fig. 24, and notice that it is unbroken in the west.

to the north-east from Cape Horn we reach the Falkland Islands which are British. They are very rainy islands,

covered with peat-mosses and grass on which many sheep are fed. Running northwards we come into warmer and less stormy regions and enter the wide but shallow estuary of the River Plate, anchoring off Montevideo in the north, the capital of Uruguay, or off Buenos Aires in the south, the capital of the Argentine Republic.

Across the Pampas. From Buenos Aires railway lines diverge in all directions across a flat plain. If we go due west for 200 miles we cross a region of wheat and maize fields and then enter a country with long grass on which millions of sheep and cattle are fed. This region is called the Pampas and is very similar to the southern prairies of North America.

Here the cattle-herd, or gaucho, spends most of his life in the saddle, breaking in horses, and rounding up his cattle which he catches with a long flying noose, the lasso. He may remain away from his hut for days at a stretch, sleeping on the ground, and living mainly on beef and water, not even using the milk which he could get with little trouble.

Crossing the plain, which gradually rises, we find ourselves at last approaching the eastern base of the Andes. Here there is no forest but low groves of evergreen shrubs. The country is very dry and the waters of the rivers have to be used for irrigation. Vines, olives, peaches, and many other fruits are grown, and cotton is cultivated.

The railway is carried far into the heart of the mountains through which a long tunnel is cut into Chile. This trans-continental railway joins Buenos Aires to Santiago and Valparaiso, and greatly shortens the time taken to reach Chile from Europe. On Fig. 25 measure the distance from Buenos Aires to Valparaiso by land and then by water and compare the two. The surrounding mountains are very lofty and many are volcanic. Aconcagua, the highest mountain in South America, over 23,000 feet, over five times the height of Ben Nevis, is seen from the railway.

Notice that in crossing this part of South America from east to west we find the same succession of cultivated land,

grass land, mountain land, that we found in crossing North America, but there are no eastern mountains or forests in south-eastern South America.

Up the Parana and Paraguay. If we wish to go northwards from the Plate we can follow one of two great rivers, the Uruguay and the Parana. Steaming up the Parana we pass through wheat and maize fields before we enter a wooded region in which the forests become thicker and thicker as we go farther north. Still following the main stream of the Parana, our route lies north-east through a hilly as well as a wooded land. Navigation is frequently interrupted by great waterfalls. If we travel due north by its great tributary, the Paraguay, the land is flat, and covered with luxuriant forests. A few miles from the source of the river are the sources of other streams which flow north. These are tributaries of the great Amazon, up which we shall sail later. (See Fig. 27.)

From the Plate to Rio de Janeiro. Returning to the Plate estuary our course is along a coast bordered by heights which become higher as we go north. Calling at the port of Santos we find that a railway climbs the mountains to the town of San Paulo in the centre of a coffee-growing region, which extends for several hundreds of miles parallel to the coast. From Santos we sail eastward to Rio de Janeiro, which is built on one of the most beautiful bays in the world, surrounded by mountains. This is the capital of Brazil, one of the largest countries in the world. We have now reached a region where the Sun is overhead at noon in December. The days and nights are nearly equal, and it is never cold. The rainy season occurs in summer. We are in fact at the tropic of Capricorn.

The Highlands behind Rio. Around the towns are gardens, orchards, and fields of sugar-cane, maize, and manioc, from which tapioca is obtained. Beyond Rio, rises ridge above ridge of hills. The climate of these highlands is mild and healthful; the soil is fertile and capable of yielding the most valuable products. From the forests fine timber, drugs, and

dye-woods are obtained. On the grassy uplands, innumerable herds of cattle and some flocks of sheep are pastured. Minerals, especially gold, silver, and copper, are found, and this highland region is a rich one.

After calling at Pernambuco we round Cape St. Roque, the eastern apex of South America, and steer west-north-west. The land becomes lower and the forest more dense. Now we enter the Para, which is one of the mouths of the Amazon, and anchor at the town of the same name.

The Amazon. Para is the port of the Amazon, up which we shall now sail. We first pass the southern end of the great island of Marajo and enter the main stream, which here forms a vast estuary. An estuary is the widening mouth of a river up which the tides come, mixing fresh and salt water.

Onwards we go up the great wide river, through a dense forest larger and more unbroken than any other in the world. The river flows in many streams separated by dense glades. Nearly 900 miles from the sea we enter a vast expanse of water like a great lake. This is the meeting-place of the Amazon and its main tributary the Madeira, which has come from the south-west. Another hundred miles brings us to Manaus, a city in a forest clearing, where the Rio Negro enters the Amazon from the north.

Onwards through the forest for 1,500 miles more an ocean steamer can make its way to Nauta. From thence a smaller vessel can go as far as the base of the Andes. High up in the mountains the river rises, leaping down to the plains in great rapids and waterfalls.

On the lower slopes of the mountains, cacao, sugar, and tobacco are grown, and higher up, the quinine tree. The latter yields a medicine for the fevers which are common in the hot swampy forests. In the forest clearings themselves almost anything could be grown, but rubber-collecting is the chief industry. The rubber trees grow on the low grounds near the rivers, which are regularly flooded, and only in well-shaded

regions. The rubber is brought down the river to Manaos or Para and there exported.

Heavy rain falls at all times of the year along the Amazon.

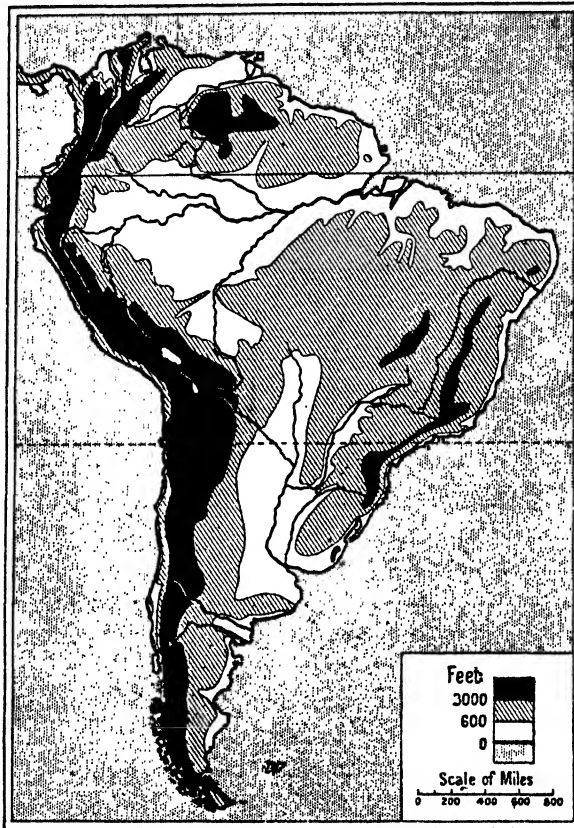


FIG. 26. Plains, Hills and Mountains of South America. The land over 600 feet is shaded, over 3,000 is black. This shows how the lowland stretches across the heart of the continent, and how the mountains are continuous in the West. Compare Figs. 24, 25.

The temperature varies little and the air is always hot and moist, feeling like that of a hot-house.

Notice in Fig. 26 how large an area of South America is lowland and so crossed by sluggish rivers. Great forests cover

these lowlands wherever rain falls frequently and heavily. Compare Figs. 27, 31, and 33.

The Hot Wet Forests. Here there are huge trees with wonderful roots, part of which are above the ground, forming twisted festoons of air roots. Round their massive and rugged trunks twine creepers with thick twisted stems. Below is a dense undergrowth with stagnant marshes where mosquitoes breed. All is green and moist, the air is hot and oppressive,

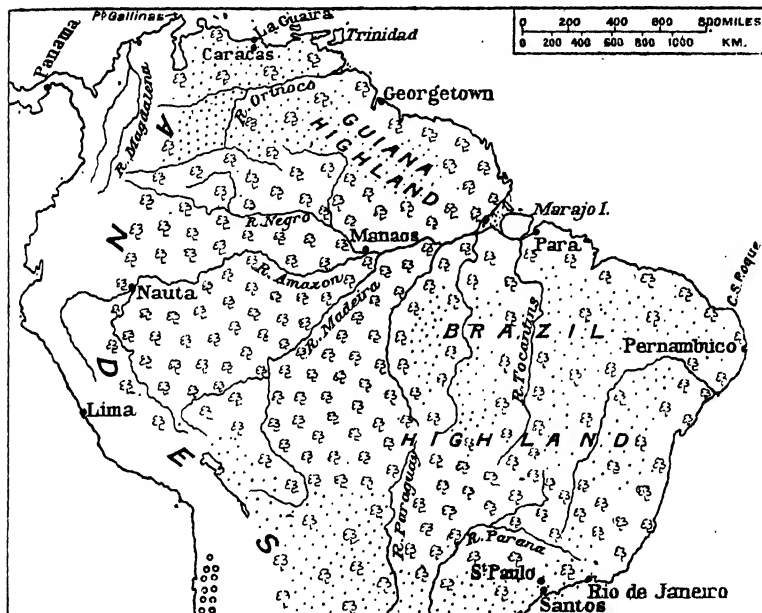


FIG. 27. The Centre and North of South America. The small circles indicate desert lands; the dots, grass lands; the trees, woodlands; the mixed dots and trees, regions where the valleys are usually wooded but only clumps of trees are found elsewhere surrounded by grass.

and among the trees dart gaily-coloured birds and insects. The only large animals are the monkeys. The human inhabitants of the forest are few and primitive. Many have little food beside the wild fruits to be had for the gathering. Others obtain alligators, turtles and fish from the rivers, often shooting them with bow and arrow. Others clear patches in the forest

and plant the manioc palm, the root of which is poisonous till it is washed. From it tapioca is made.

From the Amazon to the Delta of the Orinoco. Leaving Para we steam past densely wooded coasts with highlands rising in the distance. This region is Guiana. We cast anchor opposite Georgetown, the capital of British Guiana. To reach the town we must cross a mangrove swamp, half sea, half land. Beyond is an alluvial tract, above which the land rises in a series of densely forested terraces to a high grassy tableland with many clumps of trees, which has been compared to an English park. This park-like land is commonly called 'savana', and is similar to that on the higher part of the Brazilian Highlands.

The Orinoco. Sailing onwards we come to a vast deltaic region which is formed by the mouths of the river Orinoco. If we sail up this river we find it flows through a savana-land round the base of the Guiana Highlands, receiving great tributaries from the Andes far to the west. Near its source the Orinoco divides into two branches, one up which we have come, and the other, called the Cassiquiare, running to the south. If we follow the Cassiquiare it leads us to the Rio Negro, and then back to Manaos on the Amazon. (See Fig. 27.) This bifurcation of the river makes the Guiana Highlands an island. How does it differ from an ordinary island?

Northern Venezuela. Opposite the mouth of the Orinoco is the island of Trinidad, which has a wonderful pitch lake from which asphalt is obtained. We follow the mountainous coast of the mainland with woods on the lower slopes, westwards to the port of La Guaira.

From this port a railway winds up the mountains to a pass which leads down on the other side to Caracas, the capital of Venezuela. The distance between the two places is not much over six miles in a straight line, but the railway has to climb up and down twenty-three miles. Coco-nuts and cacao grow near the coast, bananas and sugar-cane above, and

still higher wheat, oats, potatoes, beans, and other temperate cereals and vegetables. About 10,000 feet above the sea the forest gives place to rich mountain pastures, on which many cattle are grazed. The highest peaks are covered with snow.

From La Guaira to Panama. From La Guaira our boat passes the Dutch island of Curaçao, from whose oranges a famous liqueur is made. Passing by the great Gulf of Maracaibo and round the point of Gallinas, the most northern point of South America, we turn south-west to the isthmus of Panama. Shortly before reaching the eastern end of Panama we pass the mouth of the Magdalena River, flowing in a densely wooded valley, above which are lofty mountain ranges. In the savana lands in the mountains the people live by cultivating cacao.

Eastern Central America. From the Panama Canal northwards our steamer skirts a flat wooded coast, above which rise thickly wooded mountains. From Belize in British Honduras and other ports mahogany and other timber is exported. The trunks are put on strong trucks and drawn by teams of twenty or thirty oxen to the rivers, down which they are carried by the flood waters. On this side of Central America there is very little cultivated land.

From the Gulf to the Plateau of Mexico. Beyond Honduras the climate becomes drier, and we pass the low Yucatan peninsula on which sisal hemp is grown for its fibre. Crossing the Gulf of Mexico we reach Vera Cruz, the chief port of Mexico. Far in the distance is the blue line of the mountains with the snow-capped cone of a great volcano called Orizaba. We land, and enter a train which is bound for Mexico City. The line crosses a narrow sandy waste, and then plunges suddenly into the tropical forest. The eastern lowland contains many oil-wells. Our railway winds upward through banana and coffee plantations round the base of Orizaba, passing by rushing torrents and through many tunnels, till it is nearly 10,000 feet above the sea. On this high plateau lies

Mexico City, built close to a beautiful lake. We have passed from the hot, moist climate of the coast to the cold, dry, dusty climate of the plateau. Round Mexico the land is green with irrigated fields and orchards; but beyond is an arid region, above which rise great volcanoes.

The Mexican Plateau. If we go north across the Mexican plateau the climate becomes drier and drier. The chief plants are prickly cacti. Here and there some cattle and sheep are kept, but the chief wealth is in the rich silver mines.

The West Indies. Descending to the coast we sail round the gulf, which is fringed with many lagoons, past the delta of



FIG. 28. The Gulf of Mexico and the Caribbean Sea. Compare the western part with Fig. 23.

the Mississippi and along the low Florida peninsula. A little to the south lies the island of Cuba, the most western of the West Indian islands. These islands lie between Florida and the Orinoco delta. Most of them are mountainous, and densely forested on the north-eastern side, which is the wettest one. Sugar, cacao, spices, bananas, tobacco, and many kinds of fruit are grown. In addition to Cuba, with Havana as

capital, we might touch at Jamaica, the largest of the British West Indies, with Kingston as capital, and the islands of Hispaniola and Porto Rico.

The smaller West Indian islands or Lesser Antilles are lofty volcanic islands such as Martinique and St. Vincent, or low-lying coral limestone islands such as Barbados.

A Volcanic Eruption in the West Indies. The wonderful beauty of most of the Lesser Antilles, which surpasses that of any garden we know, is constantly at the mercy of volcanic forces, which may at any moment turn the whole into desolation. At the beginning of May, 1902, the city of St. Pierre in Martinique, at the base of Mont Pelé, was as bright and gay as Paris. The slopes of the mountain were densely clothed with rich tropical forest. Almost without warning the volcano began to give signs of life. Vast columns of steam and ash were blown into the air. Boiling mud began to flow down its sides, and terrific noises were heard. Lurid lights hung round the summit at night, and a heavy pall of smoke was continually rent by lightning.

On the morning of May 8 there was a short lull, and then the noise of explosions was heard again. The town clock showed exactly ten minutes to eight when dark clouds were seen to issue from the summit of the mountain and rush downwards towards the sea. In two minutes the dark cloud had reached the city. A blinding flash of light shot through it, and St. Pierre was ablaze. The clock stopped at eight minutes to eight. The slopes of the mountain were covered with the charred remains of what had been a forest, and one-sixth of the population of Martinique lay dead in the ruins of St. Pierre.

The Crater of the Volcano. Many days afterwards explorers made their way to the top of the mountain. They peered over the edge into a yawning bowl-like chasm, the crater of the volcano, which led down to the narrow vent or chimney in which molten rock and steam boiled together. Puffs of steam and sulphur vapour poured out and hid all

but the nearest part of the walls of the crater or vent up which the hot gases and ashes had come. The noise of the explosions in the vent was terrific ; and showers of hot ashes made it necessary to turn at once and seek safety.

Volcanoes are adding to the Land. Although volcanoes may destroy both people and property, we must not think of them as merely destructive. They help to build up the land. Melted rocks are brought from the Earth's interior and added to the surface, forming conical mountains, and sheets many feet thick, sometimes covering hundreds of square miles. On this new surface weather and rain act, wearing down irregularities and carrying the particles in the muddy waters of the flooded rivers to the sea. Volcanic soil is very fertile.

The South of the East Coast of the United States. Sailing northwards from Florida we pass a lowland with many forests of pine trees. Landing at the port of Charleston, we notice the great bales of cotton gathered from the cotton fields. Rounding Cape Hatteras, a sandy spit with lagoons inside, we enter a long gulf with many arms, called Chesapeake Bay. To one of these arms comes down the river Potomac, on which is built the city of Washington, the capital of the United States, with its great domed Capitol, in which meet the Houses of Parliament or Congress. At the head of the bay is the city of Baltimore, an important port to which wheat and other produce of the western plains is brought by railways which cross the Eastern Highlands. North of Chesapeake Bay is another smaller bay of the same type, called Delaware Bay, at the head of which is Philadelphia, a rival of Baltimore, and the chief shipbuilding and locomotive manufacturing city in America. The coal used comes from the mines of the Eastern Highlands, and the iron is brought from Pittsburg and the upper Ohio.

The Hudson Valley and New York. Still farther north is an opening which narrows to a deep river, the Hudson. On an island at the mouth of the Hudson is built New York, the largest city and greatest port in America. The Hudson

valley runs northward from New York, opening a lowland route across the highlands to the St. Lawrence and Montreal. Half-way between these two cities the Mohawk Valley enters the Hudson from the west, affording an easy route

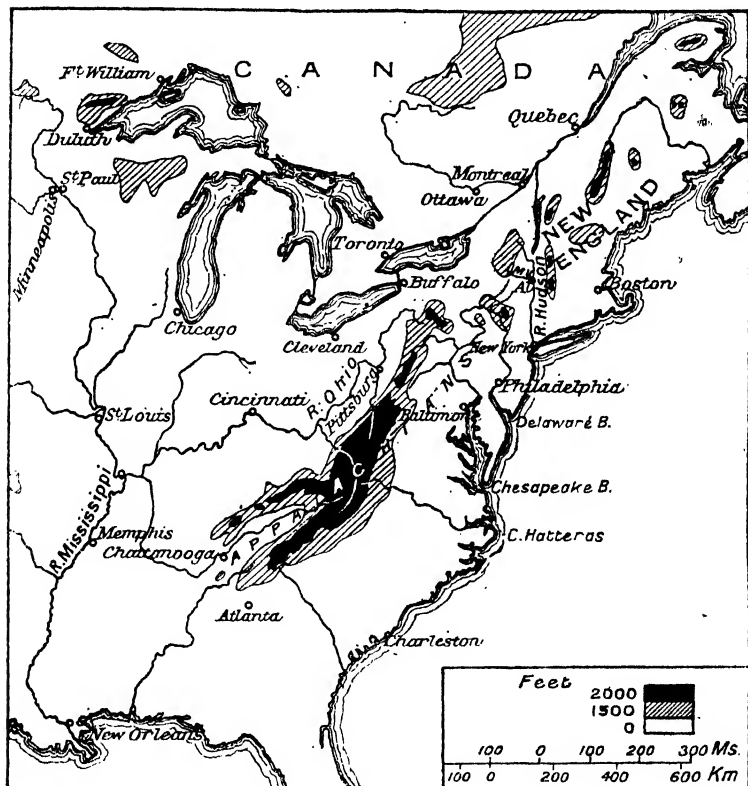


FIG. 29. Eastern United States and Canada. The mountainous land is shaded. Notice how complete a barrier it forms—except between New York and Montreal, and between Albany (Al.) and Buffalo by the Mohawk Valley (M.V.). Cf. Figs. 10, 11, 13, 14, 17.

to Lake Ontario and the western plains. These two routes across the forest-clad Eastern Highlands converge at New York and give it much of its importance.

New York, Boston, and St. John, New Brunswick. From

New York we might sail between Long Island and the mainland, and passing round the sickle-shaped Cape Cod enter the

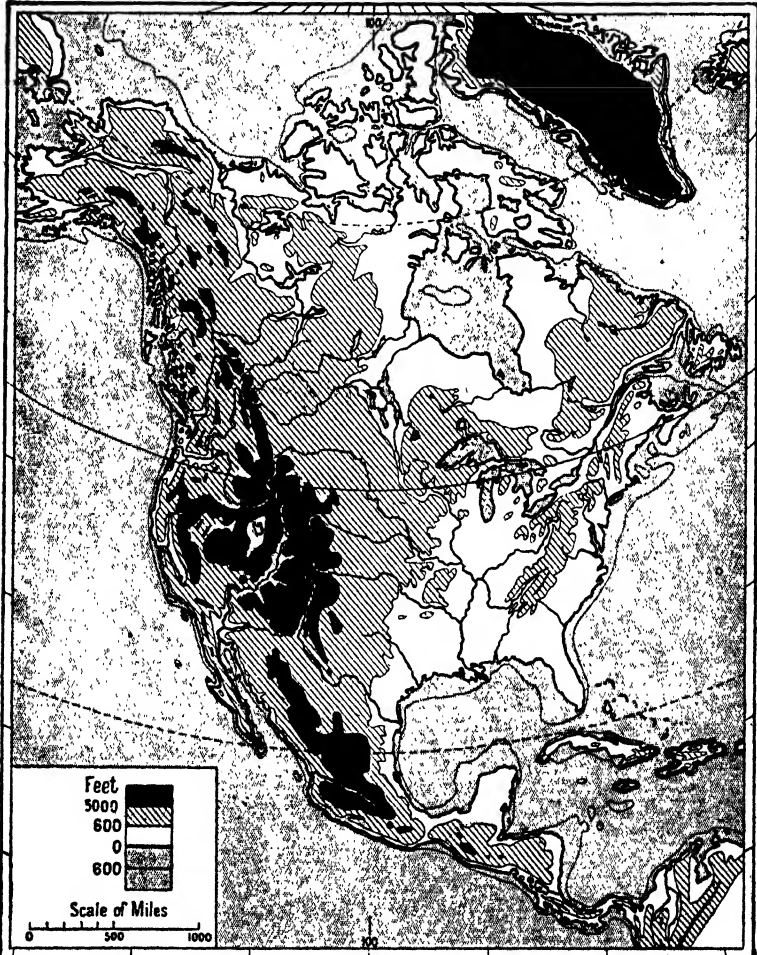


FIG. 30. Plains, Hills and Mountains of North America. The land over 600 feet is shaded. This shows that the lowland stretches into the heart of the continent. It should be compared with the similar map of South America.

harbour of Boston, the chief town and port in New England. Not far from Boston are many industrial towns which obtain

water power from the highland streams. Still farther north we should reach the port of St. John, on the Bay of Fundy, a starting-point on our first journey across North America.

The Bay of Fundy Tides. In the Bay of Fundy, on which St. John is built, the waters rise and fall about fifty feet twice a day and flood the low-lying ground.

The Reversible Waterfall of the St. John River. At the mouth of the St. John river is a remarkable waterfall. 'Through a gorge with angry black cliffs the river at low tide hurls itself in a mighty waterfall into the harbour, while the incoming tide, when it gets sufficiently high, pours back over the rocky wall into the river. At certain states of the tide there is no fall at all, but a smooth river navigable by boats and rafts.' The explanation is that there is a wall of rock running across the bed of the river in a closely shut gorge. When the tidal waters rise they pour inwards over it, when they fall the river waters rush outwards to the bay.

VI. COMPARISON OF NORTH AND SOUTH AMERICA, WITH EXPLANATIONS OF THEIR CLIMATES.¹

Configuration. We can now compare North with South America. Look at Figs. 26 and 30, and notice that both are broad in the north and taper to the south; that in both a long mountain belt runs from north to south along the west coast; that great plains stretch from their eastern base, eastwards across the continent, to the base of lower and less continuous highlands which run parallel to the east coast. In both continents these Eastern Highlands are separated by a great east-flowing river into two masses. In North America this river is the St. Lawrence, which separates the Labrador Highlands from the Eastern or Appalachian Highlands. In South America it is the Amazon, separating the Guiana Highlands from those of Brazil. We may further compare the Saskatchewan-Nelson of North America with the Orinoco

¹ The whole or parts of this section may be omitted if found too difficult on a first reading.

of South America, and the Mississippi with the Parana. There is thus a considerable likeness between the physical features of the two continents.

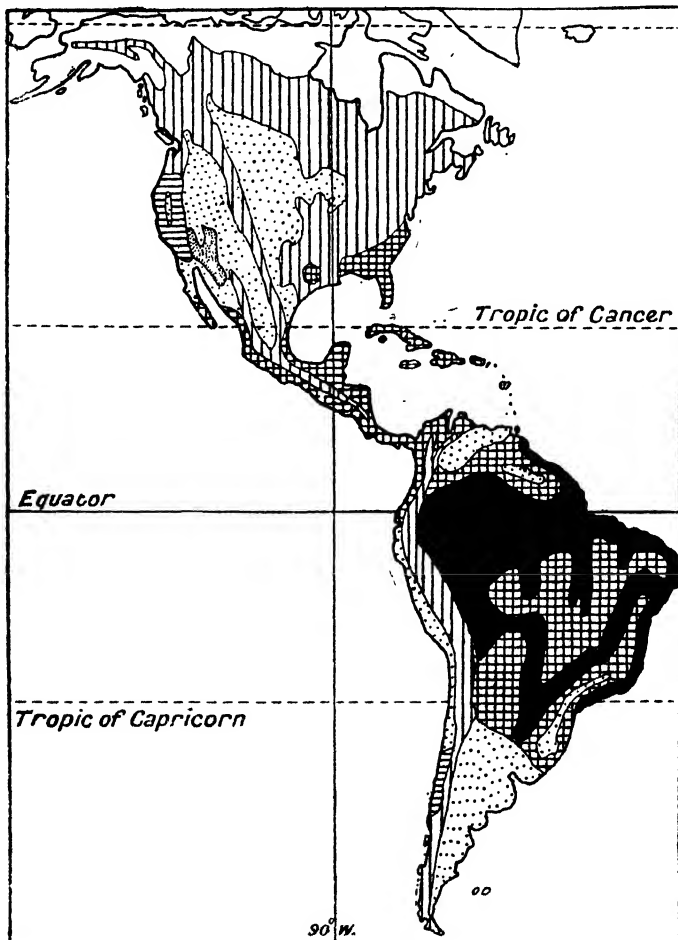


FIG. 31. Surface-covering of America. The white part is tundra, the vertical lines show the temperate and mountain woodlands, the black area is covered with hot wet forests, the cross ruling shows the regions of mixed forest and grass land, the horizontal lines shade the evergreen forest areas with winter rains, the dots wide apart indicate grass lands, and the dots close together the desert lands. Compare with Figs. 32, 33, 34, 35.

Surface Features. We can also fix the position in both continents of the natural regions already described. In North America both the tundra and the temperate forests which succeed it to the south occur where the continent is broadest, and are, therefore, very extensive. This is also true of the grass lands which succeed the temperate forests to the south and west, passing gradually into desert in the south-west. Still farther south are dense tropical forests, covering the regions on either side of the equator, which crosses the northern part of South America. Beyond these, as we proceed south, that is, from the equator towards the south pole, are belts corresponding to those found in North America, first, grass lands, passing into desert on their north-west or equatorial margin, and south of these, in the apex of the continent, temperate forests like those of Canada, but of course much smaller. The tundra can hardly be said to occur on the mainland of South America.

Temperature. To explain this distribution of vegetation we must make a new kind of map. In Fig. 32 the regions which are always cold are shown in black. Those which have cold winters but moderately warm summers are distinguished from those which are mild both in winter and summer, and from those where both winters and summers are hot. Notice that the north of North America resembles the south of South America, and that in both continents, if we travel from the equator towards the pole, we pass through a similar series of temperature regions.

Rainfall. Look at the map in Fig. 33. Notice that regions with (1) heavy, (2) moderate, and (3) slight rainfall or none are distinguished from each other. Compare the arrangement of these rainfall regions in North and South America. Along the west coast of South America the different rainfall regions succeed each other in the same order from the equator towards the pole as they do along the west coast of North America. The same is true for the centre and the east coasts of both continents. Notice in what respects

COMPARISON OF NORTH

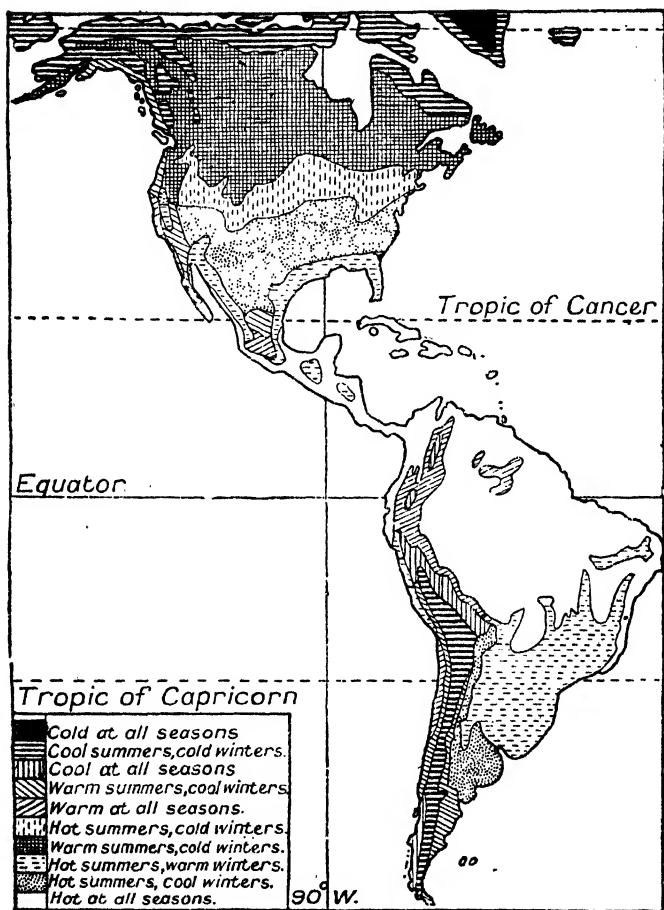


FIG. 32. Actual Temperature regions of America (not reduced to sea-level).

the rainfall of the east coast differs from that of the west coast in both continents.

Winds. Fig. 34 shows the average direction of the winds

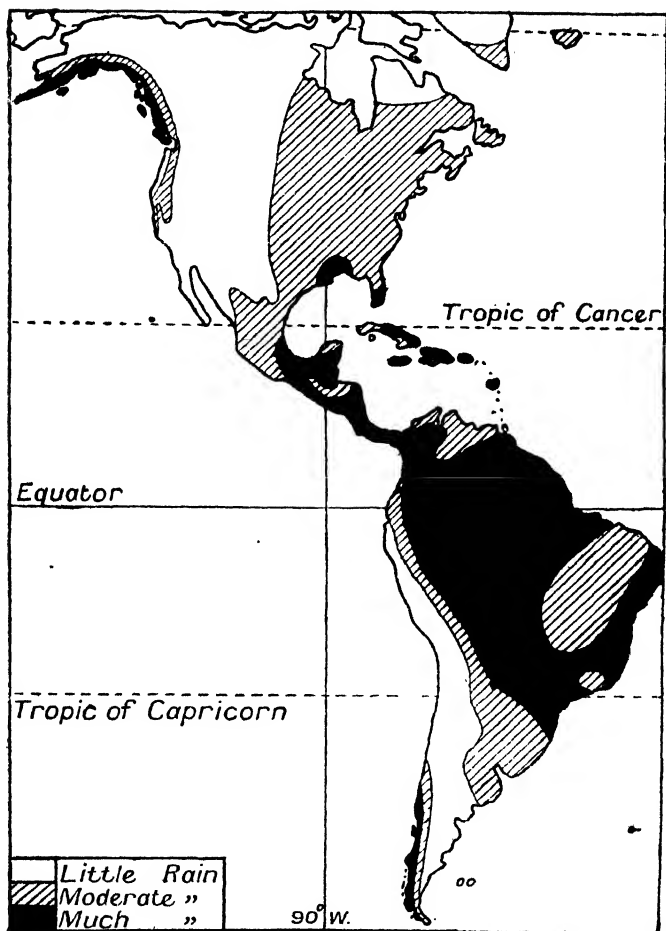


FIG. 33. Rainfall of America. Compare this with Fig. 31.

and the rainfall in December, January, and February. Fig. 35 shows the average direction of the winds and the rainfall in June, July, and August. Compare these and notice that in

COMPARISON OF NORTH



FIG. 34. Rainfall and Winds of America in December, January, and February. The shading shows the regions receiving a fair rainfall during these three months. Contrast the areas north of the equator with those south of the equator. Compare with Fig. 35.

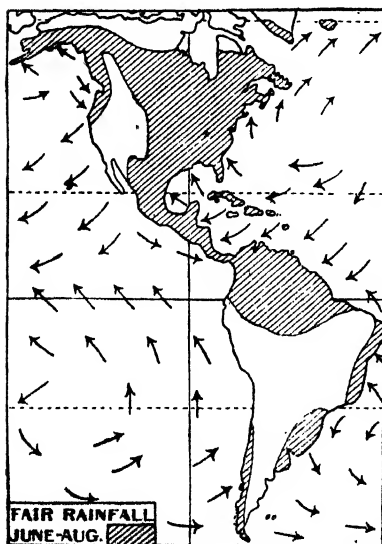


FIG. 35. Rainfall and Winds of America in June, July, and August. The shading shows the regions receiving a fair rainfall during these three months. Compare North and South America with each other in this figure, and compare also with Fig. 34.

South America the winds from the sea prevail in Fig. 34, that is, in summer, and in North America in Fig. 35. That is, in both continents the winds blow from the sea toward the land and most rain falls in the summer months. In the winter the winds blow more from the land to the sea, and the climate is drier than in summer.

That winds from the sea should bring more rain than those blowing from the land is easily understood. The air becomes more damp when passing over the sea. Next, we must try to see why winds should blow from sea to land in summer and from land to sea in winter.

Land and Sea Breezes. If we stay at the seaside in summer we often notice that in the afternoon the wind blows from the sea to the land, while late at night or very early in the morning it blows from the land to the sea. The breeze from sea to land is a day breeze, the breeze from land to sea is a night breeze. Compare this with the winds from sea to land in summer, and the winds from land to sea in winter.

Winds blowing from Cooler to Warmer Regions. The illustration in the last paragraph gives us a hint of the explanation. When it is warmer, whether in the day or in the summer, winds blow from sea to land: when it is colder, whether in the night or in the winter, they blow from land to sea. A little later we shall learn the full explanation, but here we may say that land is much more easily heated than water, and that the air above the land is therefore much more quickly heated than the air above the sea. When air is heated it tends to expand and rises. We can see this any day by looking at a smoking chimney. As the warmer air rises, heavier colder air comes below to take its place.

By day or during summer over the heated land the air is warm and rises, and cooler air comes from the sea to take its place. At night or in winter the air over the land is cooler than the air over the sea, and the wind moves from the land to the sea.

Forms of Water. If we put a pan of water on the fire and leave it long enough the water completely disappears. If we

put a saucer of water in the open air, provided no rain falls, the water also disappears if it is left long enough. Where has it gone? It has been changed from liquid water into invisible water-vapour.

If we put a piece of ice into a tumbler of water in a warm room, the outside of the tumbler gradually becomes coated over with water, which begins to run down it in drops. The water which gathers on the outside of the tumbler comes from the water-vapour in the air, which has been cooled by contact with the cold surface of the tumbler. Thus by very simple experiments we can show that water if sufficiently heated becomes an invisible vapour, which, when sufficiently cooled, is changed once more into a liquid which we can see.

Every winter we see more or less of another change which water undergoes. This happens when there is a frost, that is, when it is so cold that water turns into solid ice, and solid snow falls instead of liquid rain.

We are therefore familiar with water in three forms: a visible solid, a visible liquid, and an invisible vapour. Which of these forms it assumes depends on the degree to which it is heated or cooled.

Fog and Cloud. If we take a walk in autumn immediately after sunset we may see near a river a small bank of fog, which may last for days. This is due to the moist air over the river being chilled, so that the invisible vapour is changed into visible drops which form a fog. This fog is often formed over the surface of the sea, and even over the low-lying lands in a hilly district.

In sailing along the coast of South America we should have noticed the cloud belts which form at certain heights on the sides of the mountains, veiling their summits. Even in our country, where the hills are so much lower, the tops are often hidden in clouds. If we live in a hilly district it is no difficult matter to climb into the clouds. If we do so we find that they look and feel like a fog in the low valleys. A cloud is water in the air gathered into small visible particles.

Humidity. On a clear winter day, when we breathe we see the hot water-vapour of our breath as a little cloud, but on a bright summer day this never happens. The water in our breath and the temperature of our breath are the same in summer and winter. The water condenses into a visible cloud in winter because cold air cannot contain so much water in the form of vapour as warm air can. Think of this and you will understand why the water-vapour in the air which rises from the low grounds becomes condensed into clouds at higher elevations. It has passed from a warmer into a colder region where the air cannot hold so much vapour. The highest clouds are in so cold a region that they are probably formed of snow-flakes or little crystals of ice.

The Cause of Rain. If air is rising from below it passes from warmer into cooler regions, as we have already seen, and as the air is cooled the water-vapour becomes cooled and condenses into cloud. If the amount of water condensed is great enough the small particles of water in the cloud grow bigger and bigger until they grow so heavy that they fall through the atmosphere as rain. Rain, then, is due to the condensation of the water-vapour in the air by cooling.

Wherever air is rising over a region where it can obtain a supply of water from the surface of the ocean, or from a river, lake, or moist ground, clouds are formed, and rain is abundant. This happens over heated lands in summer where the air is coming from sea to land, or is rising over a moist surface, such as the Amazon basin.

The Wet Windward and Dry Leeward Slopes of Mountains. Turn back to Figs. 34 and 35 and notice that the rains are heavy on the windward side of the great mountains where the winds blow from sea to land. The windward side is the side against which the wind blows; the leeward side is the opposite side. When the wind blows against a mountain side the air in front is forced upwards, and, becoming cooler as it rises, the water-vapour in it condenses into clouds and rain. If the wind passes over the mountain and descends on the leeward

side it has, in the first place, less water-vapour, because most of it has been condensed on the windward side as rain, and the air is descending from colder into warmer regions, and so is capable of holding more water as vapour and not less. The windward side of a mountain system is therefore wet, and the leeward side of the mountain system is dry. This is the case in South America, where, in the south, the western side of the Andes is the wet or windward side, while farther north the eastern side is the wet or windward side.

Wet and Dry Winds. In studying winds we must be careful to notice whether they blow from warmer to colder or from colder to warmer regions. If they are blowing from warmer to colder regions, like the westerly winds of South America or the south-westerly winds of North America, they tend to be rainy, especially on the windward side of any mountains. The winds which blow from colder to warmer regions, like the winds of the centre of South America and of the West Indies, tend to be dry winds, unless they blow against high land which makes them move into higher and colder regions, as do the high lands of Brazil and Guiana.

Trade Winds. Those winds which blow steadily all the year round are called 'trade winds', which means steady winds. In winter they bring much less rain than in summer, even to the highlands. This is due to the fact that in summer, owing to the heating of the land, the wind is drawn into higher altitudes as it reaches land. There it is cooled and the water is condensed and precipitated as rain. In winter the air is not rising, owing to the land being cool. Only where the winds are forced into higher altitudes by encountering highlands do they bring rain in winter. Compare the Brazilian and Guiana Highlands in January and July (see Figs. 34, 35).

Rainfall and Vegetation. It is very important to understand the distribution of rainfall and its causes. When we understand this we know what will be the distribution of

forest, grass land, and desert. Compare the rainfall maps of Figs. 33, 34, 35 with the vegetation map of Fig. 31. Notice that the regions of heaviest rainfall are the regions of forest; that the regions of lowest rainfall are the regions of desert; and that the intermediate regions are grass lands.

Rainfall, Temperature, and Vegetation. All forests, however, are not of the same type. To explain this temperature had to be taken into account. We all know that plants grow most rapidly in summer, and very little, if at all, in winter. The difference between the rate of winter and summer growth is due to difference of temperature. We can easily understand that in the hot moist forests growth is much more rapid than in the forests of cold regions.

There is another point. During a spell of drought the plants in our gardens begin to wither unless we water them. Dryness, therefore, as well as cold, arrests growth. In many regions of the World part of the year is rainless and part of the year rainy. In such regions plants grow in the rainy season, but do not grow in the dry season unless artificially watered.

There is, we saw, little difference in temperature between the southern part of North America and the northern and central part of South America. Yet plants grow all the year round in the wet forests of the Amazon, but they stop growing during the dry season in the regions north and south of these forests. This occurs in winter.

The Natural Regions of America. We can now divide America into a number of regions which have the same kind of climate and the same kind of vegetation.

Round the equator we find a region where it is always warm, always wet, and where the surface is covered with dense forests.

To the north and south of this are regions where it is always warm, but where the summers are wet and the winters dry.

North and south of this again we find in the centre regions which are very warm in summer but cold in winter, with the

60 COMPARISON OF NORTH & SOUTH AMERICA

rain falling in the summer. These are the pampas of South America and the great prairie lands of North America.

To the east of this the summers are warm, the winters cold, and rain falls all the year round. This forms the forest areas of eastern North America. The corresponding region in South America is very small.

Farther north still in North America, comes a region where the winters are excessively cold and the summers cool or cold, where little rain falls and the ground is frozen nearly all the year round. This is the region of the barren grounds or tundra.

Still farther north the snow and ice never melt.

In the west of South America we find beyond the tropical forest and savanas a region of desert, narrow but extending for a long distance along the coast. In the west of North America there is a similar desert region which extends much farther inland than in South America, but does not stretch so far from north to south.

Then comes a region of warm summers and cool winters with rain in winter. Turn to the maps of Figs. 34 and 35. Notice that this region is in the stormy west wind belt in winter, but in the trade wind belt in summer. Here evergreen forests are found on the windward sides of the mountains, but deserts extend along the leeward side.

North of Central California and south of Central Chile there are cool summers and mild winters with rain at all seasons. These regions are heavily forested.

So far we have considered the natural regions of the lowlands; the highlands, however, in each region may rise high enough to make both summer and winter much colder than in the lowlands. There we find a colder type of region rising like an island out of a warmer region. The savana lands of the Brazilian Highlands rise above the wet hot forests. Even the perpetual snow and ice of the high Andes rise above areas where these forests skirt the base of the mountains. The mountain slopes have belts of temperate grass and wood land between the ice desert and the wet jungle.

VII. ACROSS THE NORTH OF THE OLD WORLD.

The Old World. Turn back to Figs. 2, 4, 6 and notice again the shape of the Old World. It is composed of two great land masses, Eurasia¹ and Africa, joined by the narrow isthmus of Suez. The western part of Eurasia is broken up into many peninsulas and islands. So is the eastern part, but there the islands form festoons, which shut off the coastal seas from the Pacific Ocean. Many islands rise between Eurasia and Australia. The Indian Ocean, in which is the large island of Madagascar, stretches between Australia and Africa.

From Britain to Scandinavia. If we desire to see something of the Old World we should leave the British Isles by a southern or an eastern port. Choosing one of the latter, probably Leith, Newcastle, Hull, or London, let us start across the North Sea for the coast of Norway, the mountainous western part of the Scandinavian peninsula. It is approached through a fringe of islands, with a stretch of calm water beyond. The high coast of the mainland is cut by many deep openings, which run far inland. These fiords, as they are called, are shut in by steep mountain walls, with farms on the lower slopes and snow-fields above. High up on the sky-line we see the houses, looking like mere dots, so high are these hill farms above the waters of the fiord. The life lived there must be both lonely and hard, for approach is difficult from either above or below, and the mountain sides look bleak, even in summer. If we are sailing up the Sogne Fiord it will take us more than 100 miles inland, but we shall not find the interior of the country much richer in appearance. Norway, indeed, is naturally a poor country, and if her people grow rich it is by their own energy. The forests keep many men busy in the cutting and preparing of timber, and waterfalls supply power to sawmills and factories. There is, as we saw, some farming, but the great resource of the Norwegians is the sea. They are fearless sailors, and their ships carry

¹ Eurasia is the name for Europe and Asia combined.

the goods of other countries to many parts of the world. The fisheries, either of cod, herring, and other food fishes off the islands, or of the whale and seal, hunted for oil and furs in the Arctic Seas, provide many with a livelihood.

The Midnight Sun and the Polar Circles. In the extreme north of Norway at midsummer we may see the wonderful sight of the Midnight Sun, for at midnight in midsummer the Sun does not sink below the horizon. In midwinter, on the

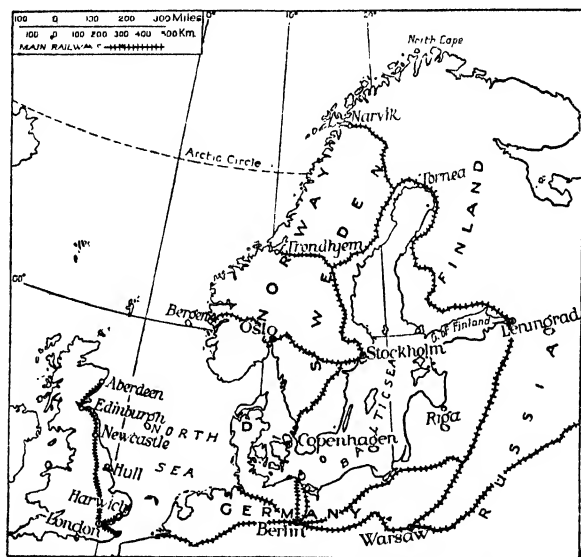


FIG. 36. From Britain to Russia by Scandinavia. D. = Denmark.

contrary, it does not rise above it for several days. This shows that we have crossed the Polar Circle. If we tried to go much farther north our way would be barred by the ice of the Arctic Seas.

From the North to the Baltic Sea. Returning south along the coast of Scandinavia and rounding its southern point, we should run into an ocean avenue fringed with pines and walled with mountains—the fiord of Oslo, the capital of Norway. From Oslo we turn southwards, and passing

through the Sound, a strait between a small island and the mainland, enter the harbour of Copenhagen, the capital of Denmark, a low country of islands and peninsulas lying to the west. Pine woods and pasture lands cover Denmark, which is famous for its dairy farming.

Copenhagen to Leningrad. We now enter the Baltic Sea and turn northwards to Stockholm, the capital of Sweden, built on islands at the mouth of a lake.

The Swedish or gentler eastern slope of Scandinavia has immense forests of fir and innumerable lakes, which remind us of those of eastern North America. Here, as there, lumbering is a very important occupation. Next to lumbering iron mining is the principal occupation of the people outside the towns.

Sailing eastwards from Stockholm we enter the great Gulf of Finland and reach Leningrad, one of the chief cities of Russia. The city is built on wooden piles driven into the swamps round the river Neva which drains Lake Ladoga, the largest in Europe.

The Russian Forest. We are now in the heart of the forests of Eastern Europe. If we take the train to Moscow, the old capital, in the centre of the country, we pass through forests all the way. The land is wonderfully flat. There is hardly a hill and none over 1,100 feet high (compare this with the hills you know). Here and there in the clearings are fields of flax or hemp or rye, but most of the country is still forest.

The Russian Steppes. From Moscow we should go eastwards by the great Siberian railway. We gradually pass out of the forest and enter great grass lands like those of central North America. These are called steppes and extend from Russia right across Asia. As in the prairies of North America the more fertile parts are cultivated and produce excellent wheat. At last we reach a great river with steep banks on the west and flat banks on the east. This is the Volga, the largest river in Europe. Trace its course on the map (Fig. 37). Notice that it flows into the Caspian Sea, a great inland lake, the largest in the world. It has no outlet. If

we sailed down the Volga we should pass from the richer grass lands into a region covered with shallow salt lakes, the beginning of a vast desert which stretches far across Asia.

Steppes and Steppe Dwellers. On the Steppes the contrast between season and season is very vivid. In winter all is buried in snow, but by the middle of April this begins to



FIG. 37. European Russia. Notice the pine forests in the north, the woods with green leaves which fall in winter in the centre and on the hills of the south, the grass lands shown by dots, and the desert area indicated by little circles.

disappear from the valleys. A wonderful carpet of flowers clothes the bare earth. First come tulips of every hue, then blue and yellow lilies, which are soon hidden in a sea of grass. As the summer advances the beauty of spring fades. The hot sun soon withers the grass into dry hay. Autumn comes and goes, and soon all is again hidden beneath the winter snow.

The people of the steppes breed camels, sheep, oxen, and horses. They are forced to live a wandering or nomadic life. As soon as the grass is eaten up, in one part, say, in about five or six weeks, they must move on to new pastures. Times of scarcity are not uncommon, and nature has provided some of their animals with a curious provision against them. Camels store up reserves in their humps and some breeds of sheep in their immense fat tails. When food is scarce such animals do not easily starve, but the humps of the camels and the fat tails of the sheep gradually disappear.

In winter the steppe dwellers usually live near some river or lake, but in summer they move up to higher ground. Like all pastoral people they live very frugally. They eat meat and milk and beans, and drink tea, which they boil with milk and pepper and salt. Bread they never taste. They usually live in tents made from the skins of the animals, and on the ground they spread carpets made from their wool and hair. All these are easily packed and carried when it is time to move on.

The Climate of the Steppes. The steppe climate is very different from ours. In Britain we have an equable or uniform climate, never intensely hot in summer and never intensely cold in winter. The winters are mild, the summers are cool, and rain falls at all seasons. In the Russian steppes the climate is extreme. The winters are bitterly cold, with long severe frosts, and the summers are intensely hot, so that vegetation is dried up. The little rain that falls comes in early summer, when it is quickly evaporated from the dry soil. Thus the steppes of Russia resemble the prairies of North America in their climate as well as in their surface covering. The resemblance in their surface coverings is due to the resemblance in their climates.

Land and Sea Climates. Our own climate is rendered equable by the neighbourhood of the sea, which is cooler than the land in summer, thus cooling the winds that blow over it, and warmer in winter, thus warming the winds that blow

over it. It is also the neighbouring sea that supplies us with abundance of rain. Such a climate is called an insular or a sea climate. Lands at a great distance from the sea are cut off from the winds which cool the summer heat and from these which reduce the cold of winter, while they naturally receive less rain. They are said to have a continental or a land climate, examples of which we have already seen in the interior of North America and in the interior of Europe. Other examples will meet us as we continue our journey. (The facts of climate are explained at great length in the *Clarendon Geography*, Part I.)

A Russian Fair. In one town of the Upper Volga, Nizhni Novgorod, on the border of the forests and steppes, a great fair is held every year. Thousands of merchants flock to it

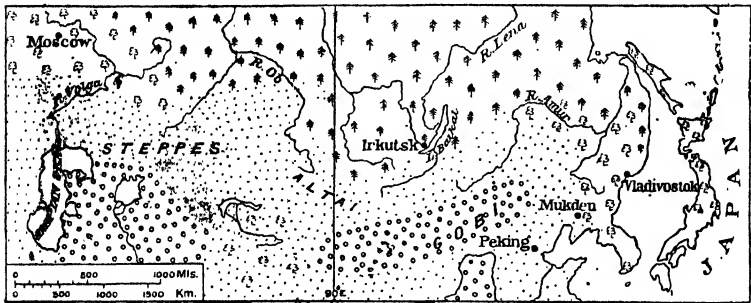


FIG. 38. Forest, Grass, and Desert Belts of Northern and Central Asia. The grass lands are dotted, the deserts shown by circles. This continues Fig. 37, but is on a smaller scale. The eastern part is shown on Fig. 40 on a larger scale.

from all parts of Europe and Asia. Many strange faces and stranger costumes are seen, and a babel of languages is heard. Shawls from Persia, carpets from Georgia, furs from Siberia, tea from China, manufactured goods from Europe, dried fruits and wines from the Caucasus, are a few of the innumerable commodities offered for exchange.

Across Southern Siberia. Leaving the Volga the line climbs the belt of forested highlands known as the Urals; and enters the flat marshy plains of Western Siberia. Our

train crosses many great rivers, by bridges a mile or so long. Here and there, as we go eastwards, we notice that the land is cultivated. Gradually we leave the marshy country and catch a glimpse of the wooded Altai Mountains far on the

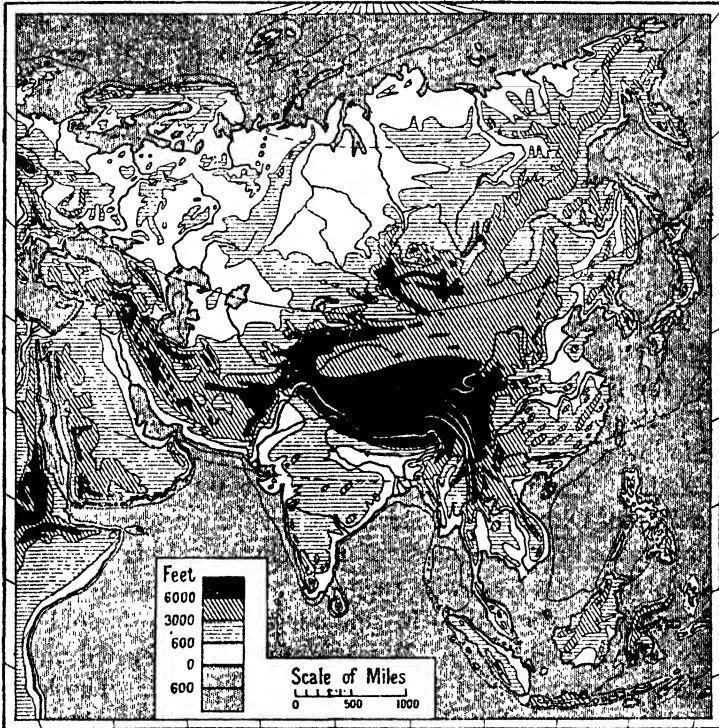


FIG. 39. Lowlands and Shallow Seas of Asia. Notice how the land below 600 feet is mainly in the west and north-west, where it is continuous with the lowlands of Europe. It also is found in patches round the margins. Come back to this figure and notice more particularly the lowlands of China, India, and Mesopotamia when studying Figs. 41, 48, and 49.

horizon. We have crossed the Ob and now we cross the Yenisei and reach its tributary the Angara, on the banks of which is built Irkutsk, the largest town in Siberia. We have crossed the steppes and entered the forest again.

From Irkutsk to the Pacific. From Irkutsk we ascend the

river till we come to a great lake called Baikal, frozen for months in winter as are all the rivers we have crossed, but in summer navigated by many steamers. It is surrounded by lofty hills. In those to the west is the source of the Lena, the great river of Eastern Siberia. The train runs round the southern end of the lake through many tunnels, and gradually climbs the wooded highlands to the east. From them it descends to the valley of the Upper Amur, a river which flows from these highlands to the Pacific. One branch of the railway runs near it through a forest region to Vladivostok on the Sea of Japan. Another turns south-east into the plain of Manchuria, which is treeless in the west. Here the fields are sown with wheat and millet and beans. The railway again divides, one branch running eastwards over wooded mountains to Vladivostok. The other goes southwards across a hilly region past Mukden, the capital of Manchuria, connecting with the lines of China and Korea.

North-east Asia. If we sail northwards from Vladivostok we follow a high wooded coast until we reach the island of Sakhalin. Passing through the strait to the south we enter the Sea of Okhotsk and skirting the volcanic Kurile Islands come to the great peninsula of Kamchatka. It is a wonderfully picturesque land, with rugged coasts and giant volcanoes. Except for a short time in summer the climate is cold and very stormy and foggy. Wheat does not ripen, and only a little rye, potatoes, and turnips can be cultivated. The lower parts are covered with alder, willow, birch, and some pines, but of no great size.

The People of Bering Strait. Still farther north we reach the Bering Strait which separates the Old World from the New. Here the people live like the Eskimo we found in similar regions in North America. The land is almost treeless, but stunted birches occur farther north than any other tree. The birch is to the inhabitant of northern regions very much what the bamboo is to the native of the south. Without it he would indeed be badly off. The stem is used in the

construction of sledges, and the inner bark is said to be cut green and used for food. From the knotty parts of the wood good spoons are made, while the smooth and pliant bark is used in the construction of dishes, cups, and vessels of all kinds. To the European traveller the tree is equally useful. Cups and other articles can be made; fires can be lighted in the wettest weather with the thin inflammable bark, and the inner layers of the bark can be used instead of writing-paper, and wet will not injure the writing on it.

VIII. THE EASTERN PART OF ASIA.

Japan. Returning southwards and again passing the Kurile Islands we pass Yezo, the most northern island of Japan proper, and reach Honshiu, the main island. Both islands are rugged, mountainous, and volcanic. The mountains are covered with forest up to six or eight thousand feet. As we turn into the great Bay of Tokyo, the capital of Japan, and anchor in its port, Yokohama, we see in the distance the beautiful Fuji-san, a volcano shown in many Japanese pictures.

Fuji-san or Fujiyama is nearly three miles high and 120 miles round at its base, and was built up of the lava and ashes which it threw out, but it now has only one small steam-hole. The sides of the mountain up to 1,500 feet are cultivated. Tea, cotton, rice, wheat, barley, beans, mulberries, which supply food for silkworms, tobacco, and fruits are among the crops cultivated by the Japanese farmer. For the next 2,500 feet there is a rough moorland dotted with flowers. From 4,000 to 7,000 or 8,000 feet is a zone of forest which higher passes into a dwarf scrub of larch and juniper. This too disappears as we climb. Still higher up the ground is bare, with here and there yellow lichens. What a magnificent view one gets at the top! In the distance we can see the great volcano of Asamayama, which is still active.

Altitude and Temperature. A climb up this or any other lofty peak takes us as it were polewards. To climb several

thousand feet into the air produces much the same result as a journey of some thousands of miles towards the poles. At the summit of Fuji we find a region resembling the tundra, below that a poor stunted forest, below that a fine forest,

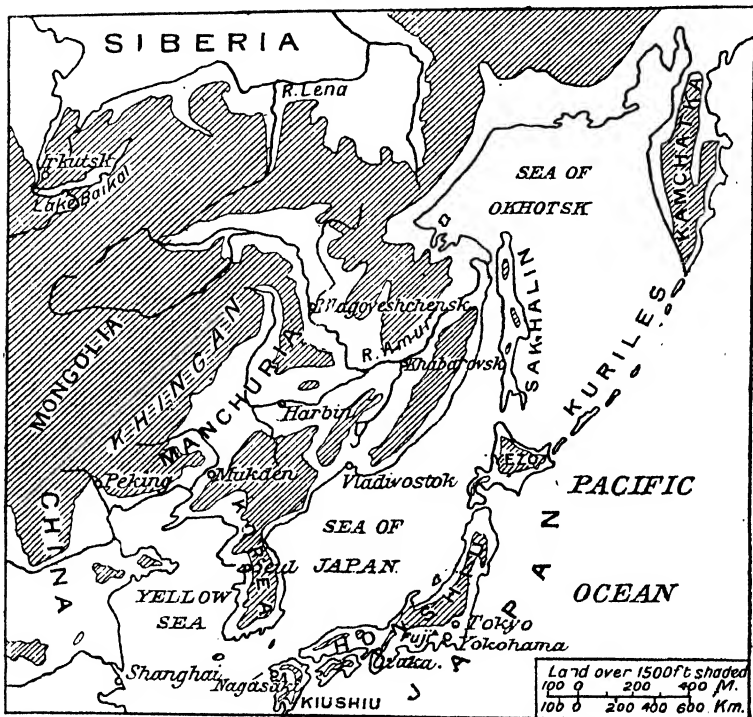


FIG. 40. Eastern Siberia, North-eastern China, Korea, and Japan.
The shaded parts of the land are highlands.

below that rough pastures or steppes, and at the base tea, tobacco, cotton, and other crops of warm regions.

Tokyo. Many houses in the capital are low, one-storied wooden buildings. This surprises us till we learn that earthquakes are very common and that tall or strongly constructed buildings are sometimes wrecked.

Southern Japan. From Yokohama we sail along the south coast of Japan and pass into an inland sea dotted with

many islands, whose shores curve into innumerable bays. Picturesque junks ply from port to port. The land rises in terraced hills covered with dark forest trees. Patches of growing crops surround the innumerable little villages.

We land at Ozaka. Its many factory chimneys show that it is a great industrial city. Thence we go by train to Kyoto, the old capital of Japan, surrounded by hills and close to a picturesque lake. Before leaving Japan we call at the port of Nagasaki, on the eastern side of the island of Kiushiu at the head of a narrow bay surrounded by wooded hills. The lower slopes are terraced, and each terrace is bordered by the wax tree, while great camphor trees are found in nearly every village.

The Climate of Japan. Japan has a pleasant climate, where the winters are cool. In the north and in the west the winters are cold and much snow falls. The summers are warm and rainy. This makes the vegetation luxuriant. The Japanese are very fond of flowers, and every year, when the cherries are in blossom, they take a holiday to visit the cherry groves. They are highly skilled workmen, making many beautiful objects in lacquer, inlaid metal, and porcelain.

Korea and Northern China. From Japan we sail across a strait to Korea, which is a rugged and mountainous peninsula covered with forests. On the lower land in the west are great rice and maize fields. Sailing westwards we pass the small British territory of Wei-hai-wei, nearly opposite the Japanese peninsula of Port Arthur, and enter the Gulf of Chili. The sea through which we are passing is the Yellow Sea. We disembark at the port of Tientsin and make our way by train to Peking, the capital of China.

Peking and Mongolia. Leaving Peking and travelling north-westwards the country becomes more and more hilly. At last we reach the Great Wall. This wall, which is nearly 30 feet high and 20 feet thick, was built 2,100 years ago and is nearly 1,600 miles long. It is faced with granite and defended by many towers. It was built to keep out the horsemen of

the steppes and deserts beyond, and forms the northern boundary of China and the southern boundary of Mongolia. Mongolia is one of the deserts of the Old World. Little rain falls, so that vegetation is scanty, although after a shower everything may be green for a few days. Cold blasts come from the north, and the winters are bitterly cold. The country

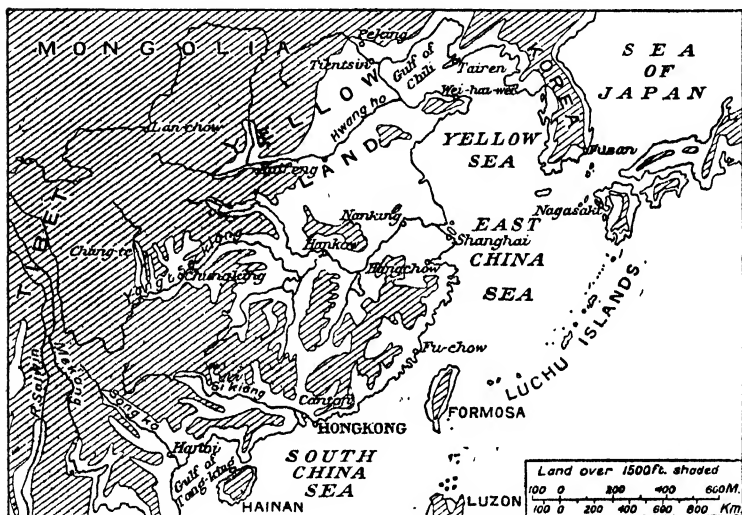


FIG. 41. China. The highland is shaded.

is undulating, cut up here and there by ravines, dry except after the infrequent rains. Here and there yellow sand-hills or dunes are found. Round the margin of the Mongolian or Gobi desert is a bare scrub land with some grass which becomes richer as we pass into regions with more rain. Here we are back in the steppes again among a nomadic pastoral people.

The Yellow Lands of Northern China. In winter the winds blow out from the desert towards the south-east, carrying with them great clouds of fine dust. In the course

of many thousands of years this has drifted over vast areas of Northern China, filling up the valleys and hollows and covering the whole region with a loose fertile yellow soil called loess. Its fertility appears to be inexhaustible. Millet, barley, and beans are the chief crops grown, for the summers are not warm enough or long enough for the cultivation of rice except in favoured spots.

The Yellow River or Hwang-ho. Across the loess plains flows the Hwang-ho, or Yellow River. In its lower course, like the Mississippi, it flows above the level of the plain, and often breaks through its banks and floods the country, thus forming a new channel. If you look at the map you will find an old course of the Hwang-ho which entered the sea at least 300 miles south of its present mouth in the Gulf of Chili. The havoc wrought by its ever-recurring floods has earned it the name of China's sorrow. (See Fig. 41.)

The Yangtse-kiang. This loess plain is crossed by a railway from Peking to Hankow, on the Yangtse-kiang, the great river of Central China. This great river flows through a mountainous land and is navigable for ocean-going steamers up to Hankow.

We have now entered a region of rice fields and tea plantations, shaded by mulberry groves on the leaves of which the silk-worms are fed. All the plains and the lower terraced hillsides are cultivated. Irrigation canals are found everywhere, the water often being pumped into them by buckets fastened to an endless chain and passed over an axle turned by men or by oxen. The hill streams are carried by aqueducts to supply the fields with water. When the fields are flooded the rice plants are put in, one by one, for the agriculture of China is very laborious and more like market gardening than the agriculture which we know. Down the Yangtse-kiang we sail past Nanking, once the old capital of China, and enter Shanghai, the busiest port in China.

Southern China. From Shanghai we sail along the rugged mountainous coast of Southern China. Good harbours are

numerous. Sailing through the Straits of Formosa we reach the island of Hongkong, which is British. From Hongkong we sail up to Canton, the capital of Southern China, at the head of the great delta of the Si-kiang, or West River. Canton is one of the largest cities in the world, with miles of streets and hundreds of thousands of inhabitants.

The Monsoon Climate. Canton lies almost on the tropic of Cancer, so that the Sun is overhead for a few days in summer. The summers are intensely hot, and the winters are as warm as our summers. The year is divided into two seasons, the wet season and the dry season. The rain is brought in summer by the south-east monsoon. The monsoons are seasonal winds between the tropics. The land in summer becomes intensely heated, so that the in-blowing winds from the cooler sea acquire immense strength. They may be compared to the strong draught set up by a heated furnace. Violent storms of rain with terrific thunder and lightning mark the beginning of the monsoon; and rain falls almost daily while it lasts. The winter months are dry, for the winds are blowing outwards to the warmer sea.

The Equatorial Wet Belt. The regions round the equator are always hot, and the air is always rising and cooler air is always being drawn in below from the cooler seas. Rain therefore falls all the year round, making the forests of the equatorial regions of extraordinary luxuriance. Twice a year, when the Sun crosses the equator, at the spring and autumn equinox, the heat and consequently the rainfall are greatest. The equatorial regions can hardly be said to have a wet and a dry season. What they have is two very wet seasons at the equinoxes, and two less wet periods in the intervals between the equinoxes.

Indo-China and Siam. Our course now lies along the coasts of French Indo-China, where dense populations cultivate rice in the fertile river deltas. Entering the Gulf of Siam we reach the kingdom of that name. The richest part consists of the delta of the Menam river, up which we might sail

between banks fringed with forest to Bangkok, the capital. The Siamese are a civilized people, with considerable skill in architecture and other arts.

Borneo. South-east of the Malay peninsula lies the great mountainous island of Borneo. It is covered with dense forest or jungle, the home of wandering tribes who live on what plant and animal food the forest supplies. For their other wants they barter with traders, for whom they collect cam-



FIG. 42. South-east Asia, Northern Australia, and the Islands between them.

phor, beeswax, &c., in the forest. Other tribes are more civilized. They build long houses, holding from fifty to five hundred people, generally near a river, and cultivate the cleared lands round their villages.

The Philippines. Sailing north-east from Borneo we should reach Manila, the capital of the Philippine Islands, belonging to the United States. They are mountainous, with many volcanoes, and densely forested. The coco-nut

palm grows near the coast. India-rubber is gathered in the interior, tobacco is cultivated in the fertile valleys, the so-called Manila hemp-plant is grown for its fibre, and bananas for their fruit. The bamboo is one of the most useful plants. 'It is put to an infinity of uses, from the construction of bridges and dwellings, to the manufacture of furniture, domestic utensils of all kinds, pipes for conveying water, musical instruments, mats, fences, and scaffolds—in fact, the roots, trunks, branches and leaves are all utilized.'

The Spice Islands. Sailing southwards we reach the Spice Islands, or Moluccas, which produce the little dried flower-buds called cloves, nutmegs, vanilla, and other spices.

IX. AUSTRALIA AND PACIFIC ISLANDS.

New Guinea and Fiji. New Guinea, which we easily reach from the Moluccas, is nearly 1,500 miles long, with mountains rising over three miles above the sea. Leaving it we pass many volcanic and coral islands, and finally reach the Fiji Islands, which are British. These islands are old volcanoes girdled by a belt of coral. Millions of coco-nut palms fringe the coast. From the timber in the dense forests the natives make outrigger canoes, which are sometimes 100 feet long. They are a dark, frizzy-haired, bearded, muscular people, who cultivate tobacco, maize, sweet potatoes, beans, sugar, and many vegetables. The product most in demand by traders is copra, or dried coco-nut, which is used in soap and other manufactures. On the low coral islands practically nothing but the coco-nut grows.

Coral Islands. The Pacific ocean is dotted with many small islands, lofty and low. The lofty islands are volcanic, the low islands are of coral limestone. This limestone is made by a small polyp called a coral, which lives only in warm, clear salt water. Such waters are rarely found outside the tropics. One kind of coral island consists of a more or less continuous belt of coral limestone surrounding a great

expanse of calm shallow water, called a lagoon. This kind of coral island is known as an atoll. In other cases an island rises out of the middle of the lagoon and the outer belt of coral limestone bordering the lagoon is then known as a barrier reef. The longest barrier reef is that off the north-east coast of Australia (see Fig. 44). Many volcanic islands are bordered by coral limestone, and the limestone belt is then called a fringing reef. Most coral islands have many coco-nut palms, and the dried white of the coco-nut, or copra, is the chief produce.

New Zealand. We now sail south from Fiji to Auckland in the North Island of New Zealand. It is built on a hilly isthmus, and has a harbour on both sides of the island. Much of the North Island is volcanic. If we visit the interior we can see active volcanoes, and the hot springs of the Hot Lake District. The waters discharged by these springs may once have fallen as rain. This passed through porous rock below the ground, dissolving some of it in the process. As it sank deeper this water became heated, for in mines and tunnels the temperature rises about 1° Fahr. for every 60 or 80 feet we go down. This hot water, laden with sulphur, iron, and silica, of which quartz is composed, at last reached a layer through which it could not pass, and along the surface of which it trickled, till rock and water at last found a way out at the surface where the water issued forth as a spring. As the water escapes, some of the heavier sulphur is left behind, and round the sulphur springs the ground is tinted all the colours of the rainbow.

The Geysers. In parts of this volcanic region the underground water is so deep down that it reaches the boiling point, and is changed into steam. This causes it to expand, and, to make room, the water above is jerked out violently at the surface in great spouts called Geysers. In the same region volcanoes which eject mud are also common.

The North Island of New Zealand. The climate of North Island somewhat resembles that of California. It is never cold, and camelias and azaleas bloom in the open air. North-west

and south-west winds bring rain which, of course, is heaviest on the north-west and south-west sides, where forests consequently abound. The valuable forest tree is the kauri pine, which yields a resin used in making varnish. The grass lands of the drier eastern side feed many sheep.

The South Island of New Zealand. Leaving Wellington, the capital, in the south of North Island, we sail along the east coast

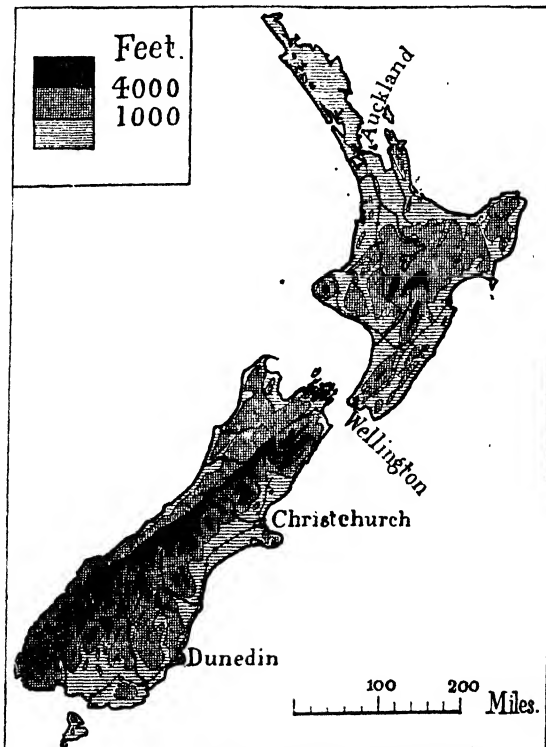


FIG. 43. New Zealand, showing high and low land.

of South Island. The temperature grows cooler. The land is in grass. Innumerable sheep are grazed on the Canterbury Downs behind Christchurch. Their carcasses are frozen and sent for many thousand miles to the London market. Rounding the south-west we are reminded of British Columbia and Norway. We enter great fiords and admire the beautiful waterfalls. Above dense

forests, we see glaciers descending from the vast snow-fields of the Southern Alps, as the mountains of Southern New Zealand are called. Here, as in North Island, the wettest western region is forested. In the clearings we find cattle-farms, and here and there a gold-mining town.

Tasmania. From New Zealand we sail westwards to Tasmania, a land which reminds us of the mountainous parts of our own island. It produces wheat and other cereals, excel-

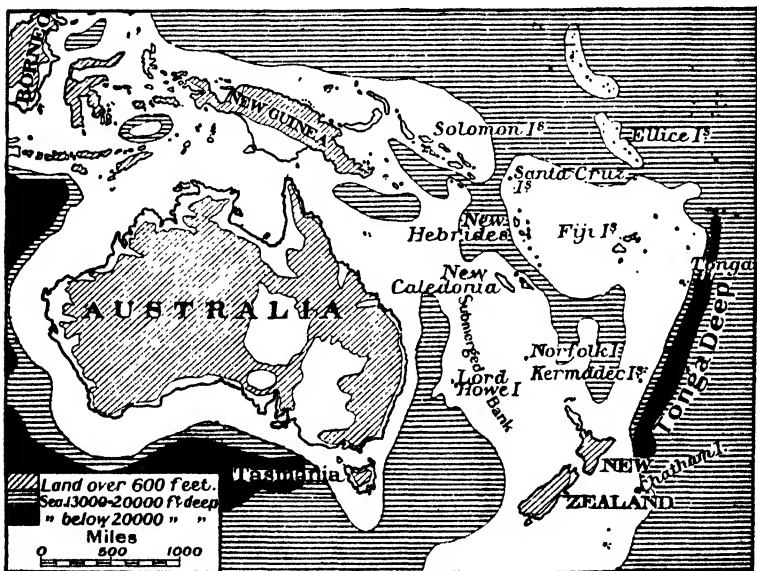


FIG. 44. Australia.

lent apples and other fruits, and grazes sheep and cattle. The capital is Hobart, from which it is no great distance to Melbourne in Australia, the capital of the State of Victoria.

South-eastern Australia. The south-east part of Australia is divided between the states of Victoria and New South Wales. The climate is very warm in summer and never very cold in winter. New South Wales has some rain at all seasons, but over most of Victoria and the south of South Australia, about Adelaide, most rain falls in the winter months,

which correspond to summer in Britain. The climate therefore is like that of California. The northern slopes of the hills, which in the southern hemisphere are the sunny slopes, are planted with vineyards and orchards of peaches, apricots, oranges, and other fruits. In the south-east there is

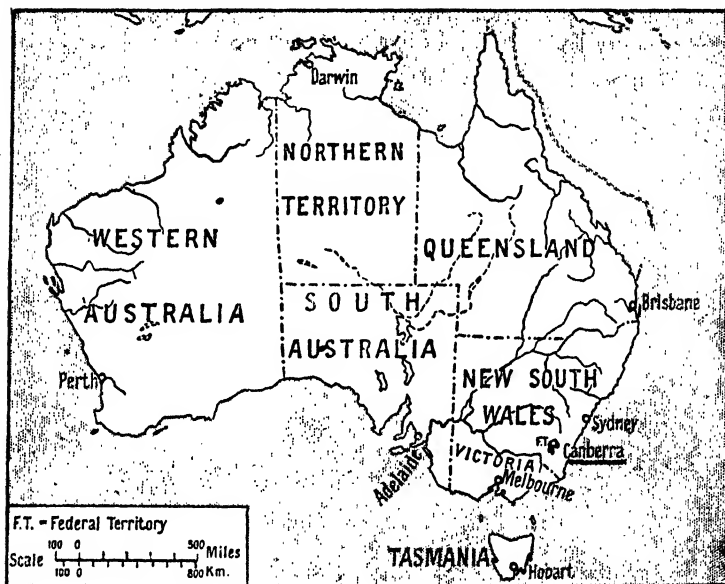


FIG. 45. The Political Divisions, Chief Towns and Routes of the Australian Commonwealth.

forest close to the coast, where the rainfall is heaviest. The eucalyptus or gum tree is most common in Australian forests. Some grow very tall. The leaves are turned edgewise to the sun. Inland, where there is less rain, the trees become fewer, and there are open savana lands and prairies. Here, when there is enough rain in the growing season, very large crops of wheat are grown, and even where it is too dry for wheat, grass still flourishes, so that there is plenty of room for millions of sheep to be pastured. In some dry parts, as along the Murray river, water is drawn off into canals, which water orchards of fruit. Sheep thrive on drier pasture than suits cattle or horses

(though these are important too in Australia), even on land covered not with grass but with salt-bush, so long as there is enough water for them to drink. Sheep, wheat, and fruit, then, are the chief farming products of the south-east. In Victoria and New South Wales there are also many rich gold-fields, and other minerals are found.

Journeys in the South-east. Many railways radiate from Melbourne, which is the busiest town and port in the south of Australia. We follow that which runs west, crosses the Murray, the only large Australian river, near its mouth, and runs to Adelaide, the capital of South Australia, on St. Vincent Gulf. From Adelaide the railway runs northwards, first through wheat fields and vineyards, and then through poorer and poorer lands, stocked with fewer and fewer sheep. At last it reaches a region covered with spiny porcupine grass, and dotted with shallow salt lakes, the largest of which is Lake Eyre. These lakes vary much in size. After rains they cover vast areas, but the water soon evaporates, leaving a salt-covered surface which is often mistaken for water as it glistens in the sunshine. Beyond the railway the land is very dry, except here and there where springs or small freshwater lakes occur.

If we sail east from Melbourne, we round Cape Howe and follow the east coast. Not far inland is Canberra, the site for a new city, the capital of Australia. We next enter Port Jackson Harbour, one of the most beautiful in the world, on the southern side of which is built Sydney, the capital of New South Wales. Sailing northwards we pass Newcastle, famous, like its English namesake, for coal, and anchor in the harbour of Brisbane, the capital of Queensland.

Interior of Southern Queensland. If we take a train inland from Brisbane we find that the line climbs rapidly from the coast to the undulating, grassy Darling Downs, which are so high that occasional ground frosts occur in winter. The prevailing wind is south-east, and the eastern slopes have a considerable rainfall. As we go inland the rainfall diminishes and the country becomes drier and drier.

On the edge of this eastern highland, wheat, maize, and fruits, and the vegetables of warm countries are grown, including grapes. Higher we find apples, pears, cherries, and English fruits. As we leave the forest region the trees become fewer and the train crosses grassy downs. As we

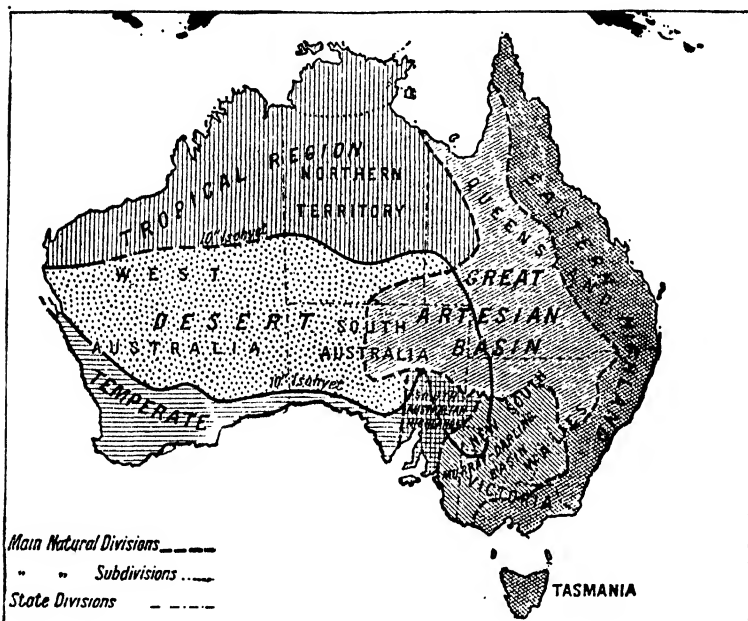


FIG. 46. Australia.

pass westwards the grass becomes scantier and cattle give place to sheep. The grass, though coarse, is hardy, and even in dry seasons is available for sheep. The salt-bush, so prized by the sheep-farmer, grows abundantly, and in many places forms the staple food of the sheep. It is a low bush with light-green smooth leaves, which have a peculiar briny taste. Where no salt-bush grows, sheep need a substitute in the form of rock salt. After the last blade of grass has withered, the salt-bush remains and keeps life in the sheep. More sheep die of thirst

than of hunger, thousands perishing from this cause in each recurring drought.

Artesian Wells. To obtain water, artesian wells have been sunk to great depths. A hole, a few inches in diameter, is bored by means of a diamond drill, and is continued for hundreds or even thousands of feet until water is reached. Often this water is confined to rocks lying between two impervious layers of rocks, one above and one below. Then the pressure on the imprisoned water is very great. When it is suddenly released the water often rushes up the shaft of the well with great violence, sometimes forming a fountain at the surface. A similar result from a sudden release of pressure is seen when we open a soda-water bottle quickly. Such wells are called Artesian wells, from Artois, in France, where they were first used.

The Queensland Coast. Returning to Brisbane we sail northwards to Rockhampton. Here, every December, the Sun is overhead for a few days. We are on the southern tropic, and find tropical products. Along the coast are fields of sugar-cane and arrowroot, pineapples, bananas, mangoes, coconuts, and other tropical fruits. The railway passes inland across this belt towards the grassy downs of the interior, where many cattle are reared.

Here we may visit one of the famous Queensland gold-mines. The Mount Morgan mine was accidentally found by two brothers. When they first visited it a shower had wetted the rocks, and one of them thought that he saw gold-bearing rock. They bought the land for a pound an acre, and since then it has produced millions of pounds' worth of gold. The top of the mountain is now quarried away, and the rock is crushed in running water until it becomes a fine mud. Gold, being very heavy, sinks to the bottom, while the lighter particles are carried away.

The North of Australia. From Rockhampton we sail round the north of Australia through Torres Strait, between New Guinea and the mainland. These seas contain many coral

islands, and pearl fisheries are important. Turning westwards we still pass a densely-forested tropical land. As we go south-westwards, the forests become thinner and at last disappear, giving place to grass lands which, in turn, pass gradually into

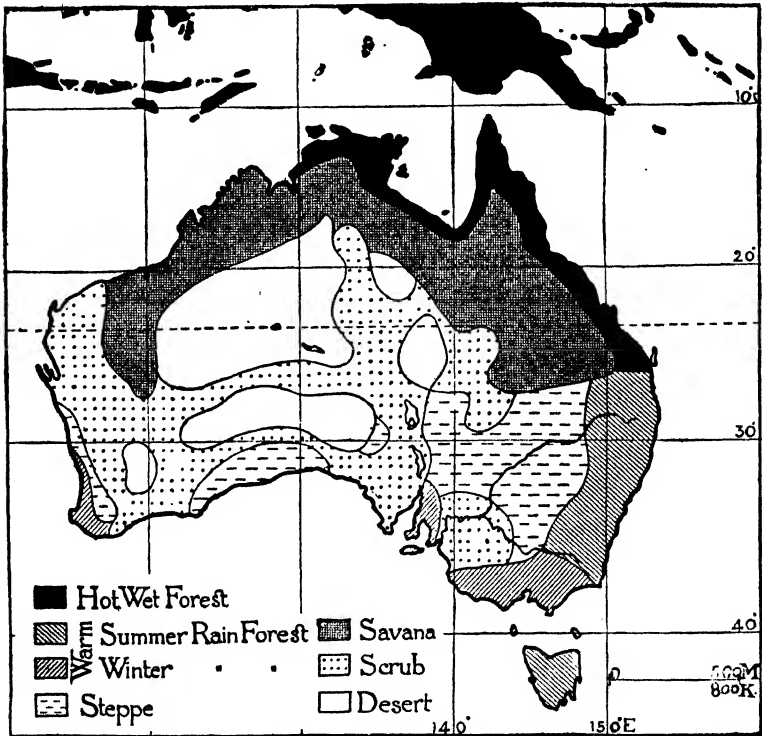


FIG. 47. Vegetation of Australia. Compare with South America, Fig. 31.

a desert region near the tropic. South of the tropic the grass reappears, and we reach the harbour of Perth, the capital of Western Australia, which is built some miles up the Swan River, at the mouth of which is Fremantle.

South-western Australia. Here rain occurs in winter, and wheat and vines and many fruits are grown. A railway journey into the interior soon carries us beyond this fertile belt into poor grass land with desert beyond, and connects with

Adelaide in South Australia. No railway would have been built in such a country but for the rich goldfields. Water is pumped to them in pipes 400 miles long.

Summary. Australia, as we have seen it, is not everywhere a fertile region. The north and east have forests, but the west and south coasts are bordered by poor grass land or desert, except in the extreme north-west and in the extreme south-west, which are forested. The interior is in parts desert, passing gradually, in the north and east, first into grass lands and then into forest. There are no high mountains except along the east coast, so that vegetation is not much affected by altitude. In no part of the lowlands is it very cold, and differences of climate are largely due to rainfall. The south-east trade wind is the prevailing wind for most of Australia, but in summer, in the north, air is drawn from the north-west to replace that rising over the heated land. In winter westerly storm winds blow over the extreme south.

The natural regions of Australia may be compared with those of South America north of the River Plate, if we leave out of account the Andes. When we do this the desert area in Australia is seen to stretch for a shorter distance along the coast, but very much farther into the interior.

X. SOUTHERN ASIA.

The Sunda Islands. If we sail northwards from Australia we reach a great chain of islands lying east and west, called the Sunda Islands. The most important are Java and Sumatra, separated by the Sunda strait. As we sail through the strait we pass the island of Krakatoa. This volcanic island exploded, in the year 1883, with a great eruption, blowing half the island into the air and leaving deep water where was formerly land, and land where was formerly deep water. Vegetation soon covered the surface of the new land, so rapid is growth in these warm, moist regions.

We turn eastwards and enter the harbour of Batavia, in Java, the capital of the Dutch East Indies. Java is bordered

by mangrove swamps in the north, and rocky cliffs in the south, from which the land rises in a long line of volcanoes running east and west. The island is near the equator, and the days and nights are always hot. Rain falls at most seasons, but most heavily in December and January. In the mountains a day seldom passes without a thunderstorm.

As we ascend the mountains the temperature decreases and the vegetation changes. Coco-nut palms, sugar-cane groves, and cotton plantations give place to coffee and quinine plantations, maize, wheat, and rye fields. Higher than this rise the bare summits of volcanoes, some extinct, some still smoking. One crater has the enormous width of five miles.

From Java to Burma. From Batavia we sail north to Singapore, an island at the southern end of the Malay Peninsula. Here is a great British port; all routes to eastern Asia pass it, and it exports tin from the Malay Peninsula and some of the islands, and also rubber. Sailing north between the Malay Peninsula and Sumatra we ultimately reach Rangoon on the delta of the Irawadi, the river of Burma, still in the land of bamboos and rice fields. As we sail up the river we pass northwards into a more mountainous region. The forests become dense the farther north we go. This is the home of the stately teak tree, which yields strong, hard timber, which is floated down stream to the teak yards at the river mouth.

The Ganges Delta. From Rangoon we sail to the head of the Bay of Bengal and enter the river Hugli, one of the tributaries of the Ganges. Calcutta, the capital of Bengal, built on low land round the river, is a busy port. Steamers bring goods from Europe and carry back the jute fibre, which grows on the flooded land of the delta, and many other products of the plains of India.

The Plain of the Ganges and Lower Brahmaputra. If you look at Fig. 48 you will notice that these rivers form a great plain, surrounded by highlands in the south and by still higher lands in the north. The latter are the Himalayas, the loftiest mountains in the world. They rise three, four, and

the highest over five miles above the plain, which is nowhere more than a few hundred feet above sea-level.

The climate of these low-lying plains is always hot, and very heavy rain falls in summer. The view is broken by clumps of mangrove and palm trees bordering the canals, which carry water to the fields where millet, poppy, indigo, castor-oil, rice, linseed, and many other crops are grown. The land is as carefully tilled as in China, and the peasants draw water all day from wells or canals to irrigate the rice fields.

As we go towards the mountains we first cross the cultivated land and then reach a belt of dense jungle. This skirts the base of the mountains through which the rivers have cut deep gorges by which they make their escape. Occasional clearings have been made in the jungle for tea plantations. The district is very unhealthy for Europeans.

Climbing the Himalayas. The railway climbs gradually into less dense forests. The air becomes cool and fresh; familiar oaks, maples, magnolias, chestnuts, and willows appear; while raspberries, strawberries, and brambles grow in the woods. Gorgeous fields of crimson rhododendrons flourish to a great height. Higher still are mountain pastures, and then vegetation becomes very scanty. About three miles above the sea we reach perpetual snow, but not the end of the Himalayas. Giant peaks tower above us, the highest being Mount Everest, 29,000 feet, over $5\frac{1}{2}$ miles, in height.

Up the Ganges Valley. Descending to the plain, we follow the canals past many great towns with magnificent temples and palaces. Benares, the sacred city of the Hindus, is built on the north side of the Ganges, to which pilgrims descend to bathe in the sacred river. Higher up, where the Ganges receives its tributary Jumna, Allahabad is built, a great junction for river and railway traffic. Following the Jumna we come to another ancient and beautiful city, Agra. Here is the Taj Mahal, the most beautiful building in India, erected by a sultan in memory of his beautiful wife. Still farther up the Jumna is Delhi, the great Mahommedan centre, with

magnificent mosques and other buildings. Everything impresses us with the riches of the rulers and their high civilization, while the industry and poverty of the people are equally apparent. It is built on the margin of a great desert which stretches far to the west, and is now capital of India.

This desert lies rather north of the tropic. We have already

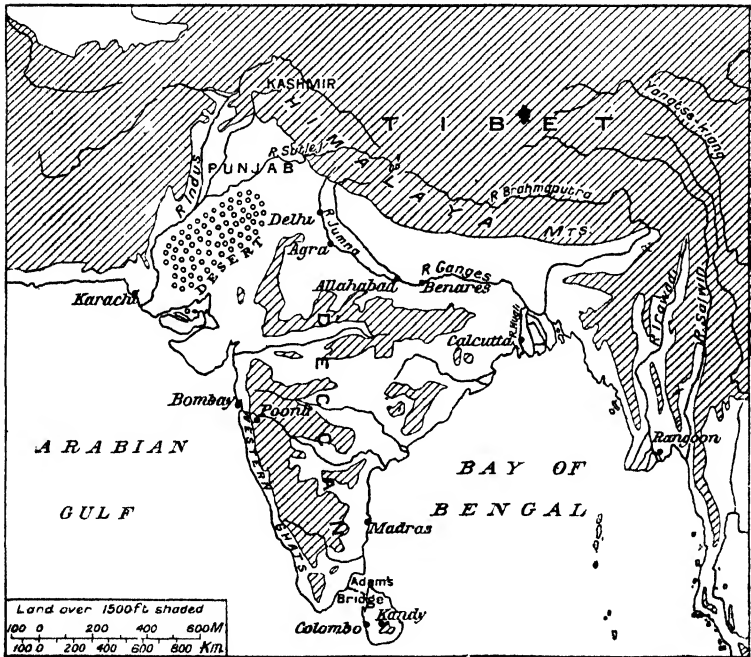
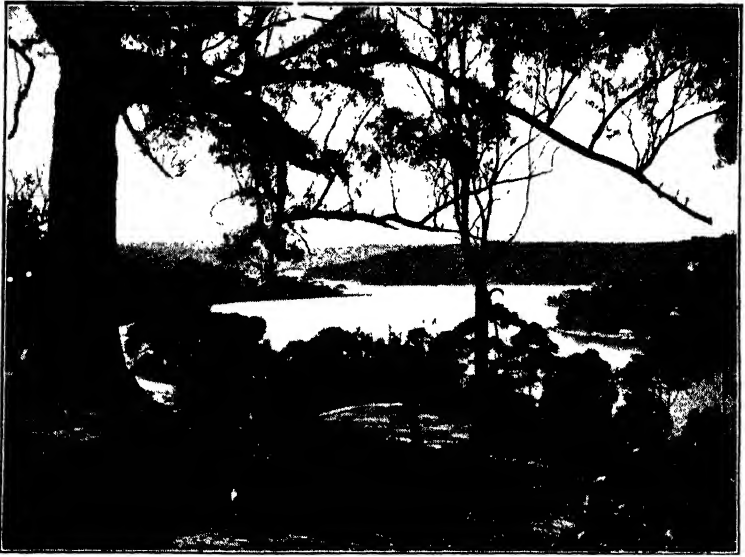


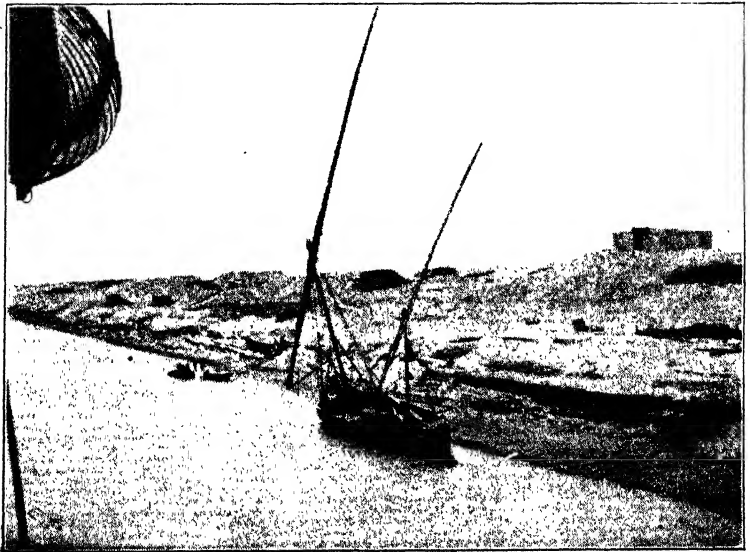
FIG. 48. India and surrounding lands. The lowlands are left white, and the desert area is shown by little circles.

found deserts, in corresponding latitudes, in North and South America and in Australia.

Kashmir and the Punjab. North of the desert five great rivers, tributaries of the Indus, descend from the mountains. They pass through the mountain land of Kashmir, reached by lofty passes. The vale of Kashmir has cold winters, rainy



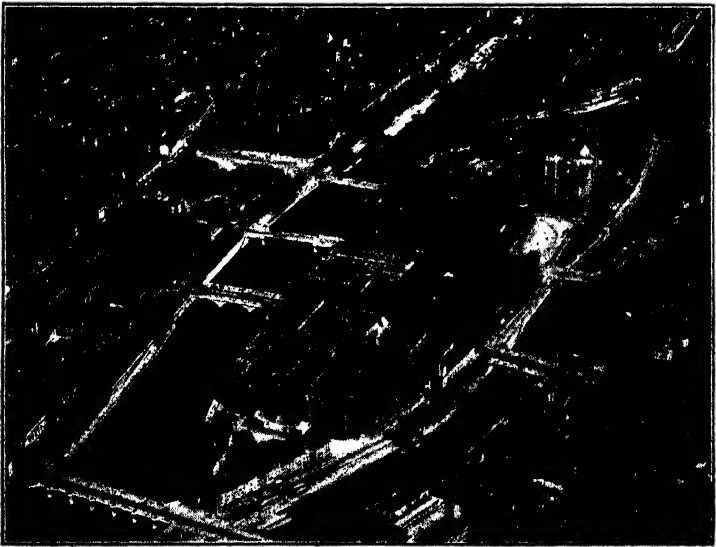
XIII. Port Jackson, Australia (p. 81).



XIV. Suez Canal (from an Australian mail steamer), p. 94.



XV. Ostriches on the Karroo (p. 102).



XVI. Paris from the air: the islands in the Seine (p. 129).

springs, and wet summers not much warmer than those of southern England. In autumn snow falls on the mountains, and in winter covers the valleys. What a contrast this is to the plains of the Punjab, south of the mountains! These Punjab plains are crossed by the Indus and its tributaries, of which the Sutlej is the largest. They are intensely hot in summer, and warm even in winter. Their waters feed irrigation canals, which supply moisture to the crops of wheat in winter, and of millet and oil-seeds in summer. The Punjab wheat is sent down the Indus valley to Karachi, whence it is shipped to England. West of the Punjab lie bare limestone mountains, forming the eastern end of the Iran plateau.

Central and Southern India. South of the Indus and Ganges plains the land rises to a table-land, which is highest in the west and slopes to the east. This you can see by looking at the map, which shows that all the long rivers flow east except in the extreme north. The high western wall of this plateau is called the Western Ghats.

The Northern Deccan. Let us sail from Karachi to Bombay, and then cross this table-land, the Deccan, by train to Calcutta. Bombay is built on an island which protects a magnificent harbour. A railway zigzags up the Ghats, climbing through magnificent scenery, and reaching at last the wide plains and rocky flats of the Deccan.

The coastal plain and the Western Ghats receive heavy summer rains and are densely forested. Leaving Poona, in the Western Deccan, for Calcutta, we pass vast fields of cotton, the staple crop grown in the rich black soil. Farther east the line crosses a rugged forested region, flat-topped, but cut by many steep-sided valleys. Here and there in the north wheat is grown in the winter months.

The Southern Deccan. Sailing from Calcutta we pass a flat coast with great deltas and lagoons, and flat-topped heights, lower than those in the west, rising in the distance. The sea beats in great waves against the coast, forming a surf dangerous to cross. An artificial harbour has been made at

Madras, the port of this south-eastern part of India. The climate is always hot, and the rainy season is in winter. This is because the winds blow from the south-west in summer, and Madras, being on the eastward side, is on the leeward side in summer. Towards the end of the year, as the south-west monsoon is changing into the north-east monsoon, rain is brought from the Bay of Bengal to this south-eastern land.

Inland from Madras the land rises in flat terraces, which the rivers cross in deep gorges. The seaward edge of these terraces is sometimes called the Eastern Ghats. Beyond them the air is cooler and the rainfall lower than round the coast. Much of the land is naturally too dry for cultivation, but it is dotted with water reservoirs.

Ceylon. Sailing southwards from Madras we reach Ceylon, separated from India by a strait too shallow for navigation. In the middle is a great sandbank called Adam's Bridge, which almost joins the island to the mainland.

Rounding the southern end of Ceylon, we reach Colombo, the capital. Behind it mountains rise to 8,000 feet. The railway takes us in a few hours into the heart of them, to Kandy, four hours from Colombo, through magnificent forest and mountain scenery. On many mountain sides are great tea plantations.

Monsoons. India and Ceylon well illustrate the seasonal changes of sea winds. In winter, when the lands in the north are cooler, the wind blows to the warmer south from a north-easterly direction. This is a dry wind, for it passes over the land.

In summer when the land of north-western India, especially in the desert, is intensely heated, much more so than the land farther south, the wind blows from the cooler sea to the warmer land, is deflected upwards by the western slopes of the Deccan, and causes very heavy rains in the summer months. Between the Deccan and the Himalayas in the north the wind, in passing from the Bay of Bengal by the Ganges valley is forced upwards by the Himalayas, and as it cools deposits much rain

on the southern slopes. The region immediately north of the Ganges delta is the rainiest in the world. One place in the hills of Assam receives about 40 feet of rain in the year, and most of this in July and August.

These seasonal monsoon winds blow in India, in Northern Australia, and in China. They are of immense importance to the inhabitants, who can depend on alternate dry and wet seasons and thus plan their seedtime and harvest. In the basins of the Ganges, Yangtse-kiang, and Hwang-ho, where the soil is constantly renewed by river floods, the land has long been cultivated and supports the densest population in the world. Except in the north of China these plains have warm winters, and if water can be obtained for irrigation agriculture can be carried on all the year. Winter as well as summer crops are grown and, in some places, three crops can be raised in a year. It is therefore not surprising that India and China are densely populated, containing two-fifths of the inhabitants of the whole world.

Persia and Mesopotamia. From India we follow a barren coast and enter the Persian Gulf. On the eastern side barren limestone mountains rise above the low coastal plain. If we travelled to Teheran, the capital of Persia, we should cross those mountains, and pass great deserts, with here and there a vivid patch of green irrigated by water brought in underground channels from the mountains.

At the head of the Persian Gulf is the delta formed by the rivers Euphrates and Tigris, which cross a great sandy plain called Mesopotamia. The rivers receive their waters from the mountains in the east and north. At one time great irrigation canals crossed the plain. Then it was cultivated as carefully as that of the Ganges to-day. Then it supported an enormous population. Then prospered the great empires, of which we read in the Bible. Babylon was built on the Euphrates and Nineveh on the Tigris. To-day Bagdad is the most important town, surrounded by groves of date-palms, and orange and pomegranate gardens. The rest

of the plain is a dreary barren stretch of baked clay. Here and there some cattle and buffaloes are to be seen and the brown tents of the Arabs who tend them. If well governed, irrigated and cultivated, this will again become a fertile and prosperous land.

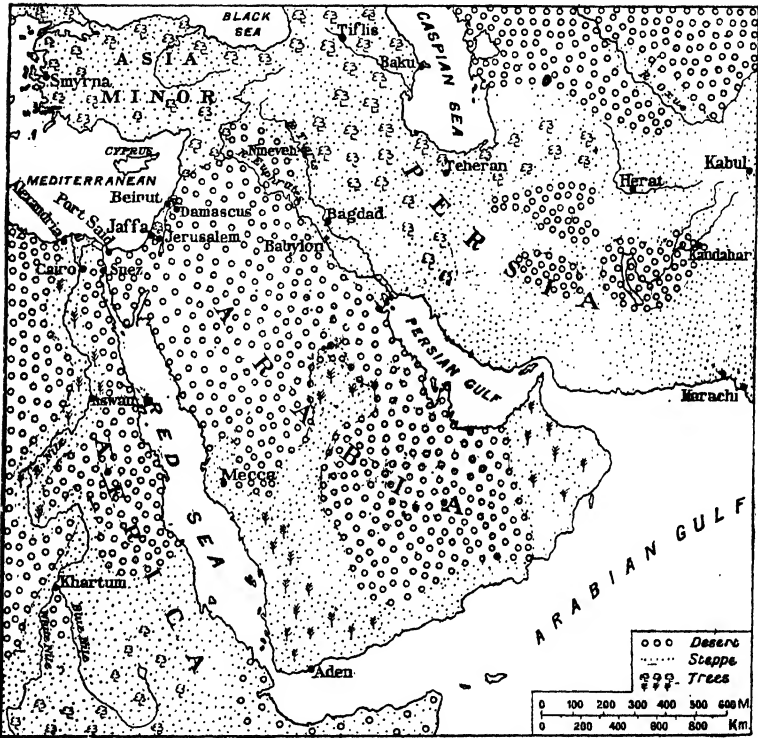


FIG. 49. Persia, Arabia, and Egypt.

Arabia and the Red Sea. Arabia is a great peninsula between the Persian Gulf and the Red Sea, separated by the Persian Gulf from Persia and by the Red Sea from Africa. Its rocks resemble those of the Deccan; but as it lies in an almost rainless region it is very barren, except on the border

of the mountains where the rainfall is just sufficient to provide moisture for the plantations of coffee and spice trees. Sailing along its coast we pass near its southern point, a great

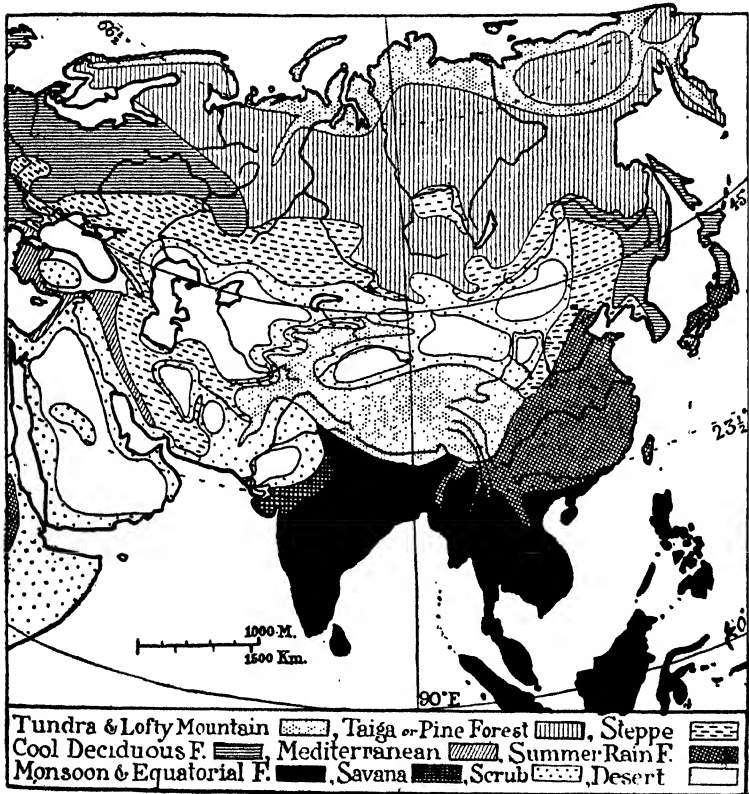


Fig. 50. Vegetation of Asia. Compare Figs. 31 and 47; and notice the relationship of the different kinds of surface-covering to equator, tropic, and polar circle, and also to the east and west sides of the continent.

volcanic cone, on which is built Aden, a British fortress guarding the entrance to the Red Sea.

Sailing northwards along the Red Sea we enter the hottest region in the World. If the wind is moving in the same direction as the ship the heat is so unbearable that the ship sometimes turns backwards to relieve the intense heat by travelling for a short time against the wind.

About fifty miles from the eastern coast is Mecca, the holy city of the Mahommedans, visited by thousands of pilgrims every year.

The Suez Canal. At the northern end of the Red Sea is Suez, at the southern end of a canal leading across the desert to Port Said, on the Mediterranean.

Summary. Asia is thus a very complex continent. Much of it is mountainous, but it also contains vast areas of lowlands (see Fig. 39). As in North America, there is a fringe of tundra in the north, succeeded by a belt of forest, south of which are vast grass lands (see Fig. 50). In the heart of the continent, widening towards the west, disappearing in the east, are great deserts. South and south-east are the rich savanas and dense forests of the monsoon and equatorial regions (see Fig. 50). Thus we may compare the natural regions of Asia with those of America north of the Amazon. The different arrangement of mountains, lowlands, and great gulfs or seas makes the outlines of these natural regions different in Asia and in America north of the equator. It will be found that the same kinds of natural regions are found in similar positions, although their shapes differ in two areas.

XI. EASTERN AFRICA.

Egypt and the Nile. From Port Said we sail along the edge of the delta of the Nile to Alexandria, the port of Egypt. A hundred miles south-east, at the head of the delta, is Cairo, the capital. Except on the delta and close to the Nile Egypt is a desert, but wherever the river water can be carried in canals the land is cultivated. In early summer the delta is green with fields of cotton, maize, sugar-cane, millet, and rice; in late

fall, rapidly in November and December, and more slowly afterwards. The winter season lasts from December to March. The lands covered by water in the flood season bear winter crops of wheat, barley, clover, lentils, and beans. Egypt has been called the gift of the Nile, for the very soil has been carried down in the course of centuries by the flooded river and built up grain by grain as the waters subsided. The prosperity of the country depends on its fertilizing waters, and without it Egypt would soon be swallowed up by the desert.

Up the Nile. Every traveller to Cairo visits the famous pyramids of Gizeh, the largest of which is 480 feet high. Over 2,300 years ago these pyramids were described by a Greek traveller, Herodotus. This gives us some idea of the great age of civilized man in Egypt. For several thousands of years at least the waters of the Nile have been used to fertilize the land.

As we sail up the Nile we pass through a narrow flat belt of green, beyond which rise the steep sides of the valley to the desert on either side. We pass pyramids and ruins of magnificent temples, all pointing to the greatness of Egypt in the past. At last we come to the Nile rapids at Aswan. Here the river has recently been dammed by a great barrier which holds back the water. At high Nile the flood is allowed to pass through numerous sluices, but when the river begins to fall the sluice gates are shut, and the water is retained in the reservoir for use during the dry season. These rapids form the first of six cataracts between Aswan and Khartum. (See Fig. 49.)

Khartum is built where the Blue Nile joins the main stream, or White Nile. The White Nile has much the same level all the year round, but the muddy flood-waters which fertilize lower Egypt are brought down by the Blue Nile. At Khartum a little rain falls in summer, and as we go south the summer rainy season becomes longer and wetter. The Blue Nile comes from the mountain land of Abyssinia, where

heavy rains fall in summer, sweeping the loose soil down to the rivers, which carry it to Egypt. We travel up the White Nile for hundreds of miles through flat country, before we reach more cataracts, and we climb to the great Lake Albert. East of this lake we still follow the river Nile, which we trace to a larger lake called the Victoria Nyanza. From the Mediterranean to Lake Victoria we have come over 2,000 miles in a straight line, or over 3,000 following the river. We have risen from sea-level to nearly 4,000 feet above it. The rise has been very largely at the cataracts, where we have passed up a series of steps from the sea to the lake. We are still in a table-land region like that of the Deccan, and at the steep edges of each terrace the river flows over cataracts. This is characteristic, we shall find, of all the rivers of Africa. Lake Victoria Nyanza is about as large as Scotland, and lies half-way between the North and South Poles. When is the Sun overhead? At what seasons of the year would you expect the greatest rainfall?

Uganda. North of the lake is Uganda, covered with tall grasses round the lake and with forest on the gentle slopes beyond. Here the banana is the chief food and serves many other purposes. The native uses the fibre for all kinds of wickerwork, and for tying up and fastening his work; the leaves serve him as tablecloths; from the viscous sap of the trunk he prepares a kind of soap; and a valuable drink, something like lemonade, is obtained from the fruit, of which there are not infrequently 150 to 200 in a single cluster.

Ruwenzori. The land rises in the west, where a mountain mass, called Ruwenzori, with magnificent snow peaks, reaches about 17,000 feet. Here again, at the equator, we find land so high and cold that snow lies all the year round.

From Lake Victoria to the Indian Ocean. A railway has been made from Lake Victoria to the coast. The line gradually rises from the lake, but suddenly comes to a very steep slope which descends to a flat-floored valley, on the other side of

which is an equally steep slope up which it has to climb. This valley, with steep and roughly parallel sides, can be traced through East Africa from south to north. It is called the Rift Valley, and was probably formed by the sinking of the valley floor.

Beyond the Rift Valley the land descends by a series of terraces. Though we are close to the equator rain is scanty, except near the sea, and the land is covered with a scrub vegetation of mimosa and euphorbia. On the way from Lake Victoria to the coast we pass three giant volcanoes, of which Kenya and Kilimanjaro are the highest, rising $3\frac{1}{2}$ miles above the sea. The coastal plain is flat, marshy, hot and moist, producing coco-nut palms and mangoes. Here we may join the steamer at Mombasa.

From Mombasa to the Zambezi. Sailing southwards from Mombasa, we call at the small coral island of Zanzibar, one of the most fertile in the world, producing everything that can be grown within the tropics. It is specially noted for its cloves. Farther south we pass through the Mozambique Channel between the great island of Madagascar and the mainland, and reach the delta of the Zambezi. The distributaries of this river are so shallow that it is difficult to find a channel, but at last we find one and reach the main stream. We sail up the river but soon turn northwards by railway up the valley of its tributary, the Shiré. This brings us to the Shiré Highlands, close to the southern end of a long lake called Nyasa. Coffee and cotton plantations on the lower ground, and wheat on the higher ground, remind us of Brazil.

We cannot travel far up the Zambezi without being stopped by rapids, where the river descends from one terrace to another. Some 700 to 800 miles in a straight line from the coast we reach a deep gorge at the head of which is the grandest waterfall in the world, the Victoria Falls. Above the falls, the stream, a mile wide, moves with very gentle current. Suddenly the waters plunge over the edge of a narrow chasm 350 feet

deep. From both sides they dash boiling towards the middle of this chasm and rush down the deep and narrow gorge with a swirl of raging waters and a thunder of sound impossible to

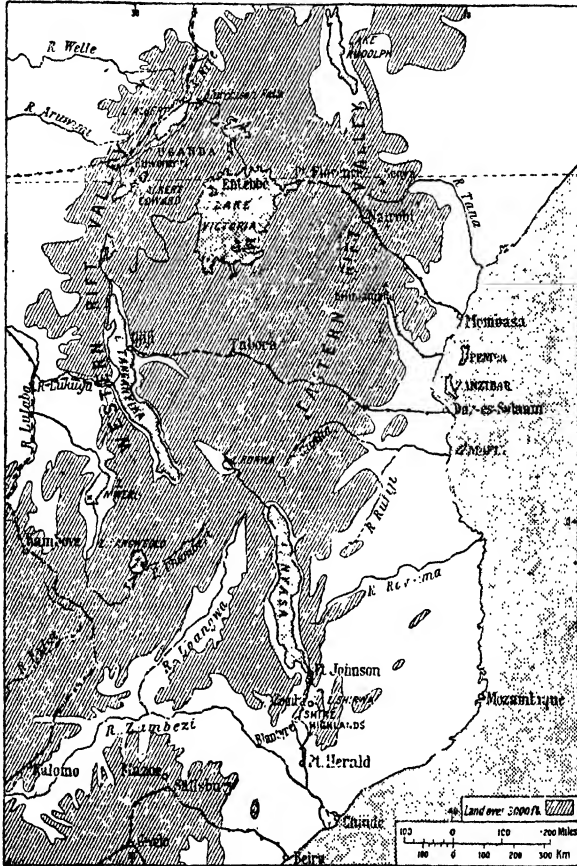


FIG. 52. East Africa.

describe. This gorge has been formed by the waterfall retreating up stream as in the case of Niagara, but there is no softer rock at the base to explain the fall.

XII. SOUTH AFRICA.

South Africa. From the Victoria Falls we take the train for Beira. The first part of our journey lies through forests which thin out as we go south. We pass through Bulawayo and reach Salisbury, the capital of Rhodesia, as this British territory round the Zambezi is called. From Salisbury we descend to the coastal plain at Beira and once more embark. Passing Delagoa Bay, where a railway runs up country to the Transvaal, we sail along a well-wooded coast to Durban, the port of Natal. If we take the train from Durban to the Transvaal, we pass through fields of maize, pineapples, and sugar-cane, plantations of coffee, and groves of oranges, lemons, mangoes, and other fruits near the coast, and climb steadily until we reach Pietermaritzburg, the capital of Natal, in a hollow surrounded by grassy highlands. As we ascend farther the vegetation gets poorer and the trees are found only along the water-courses or close to the few farmhouses. We pass through Ladysmith and near coalfields; and at last, in front of us, see the high, flat-topped edge of the tableland. The train climbs round the foot of Majuba Hill and crosses the frontier between the Transvaal and Natal. It runs west through undulating land covered with reddish grass, not forming a continuous carpet as at home but growing in tufts. The air is cool, fresh, and very dry. We pass a few small towns surrounded by eucalyptus trees. Then great chimneys and the heads of mining shafts in the distance show that we have reached the Rand, or Witwatersrand, the centre of which is Johannesburg, the largest town in South Africa. Here are many gold mines worked by black men from all parts of South Africa and white men from all parts of Europe, America, and Australia. Johannesburg was only founded in 1886; before that not a house was to be seen on the bare, dusty ridges along which the town is now built, nearly 6,000 feet above the sea.

A short railway journey carries us down 1,000 feet to Pretoria, built in a hollow, with its suburbs on the hillsides. It is the seat of the government of the Union of South Africa.

From Johannesburg to Port Elizabeth. The line from Johannesburg to the south coast passes through an undulating grassy land with grass like the Eastern Transvaal. Crossing

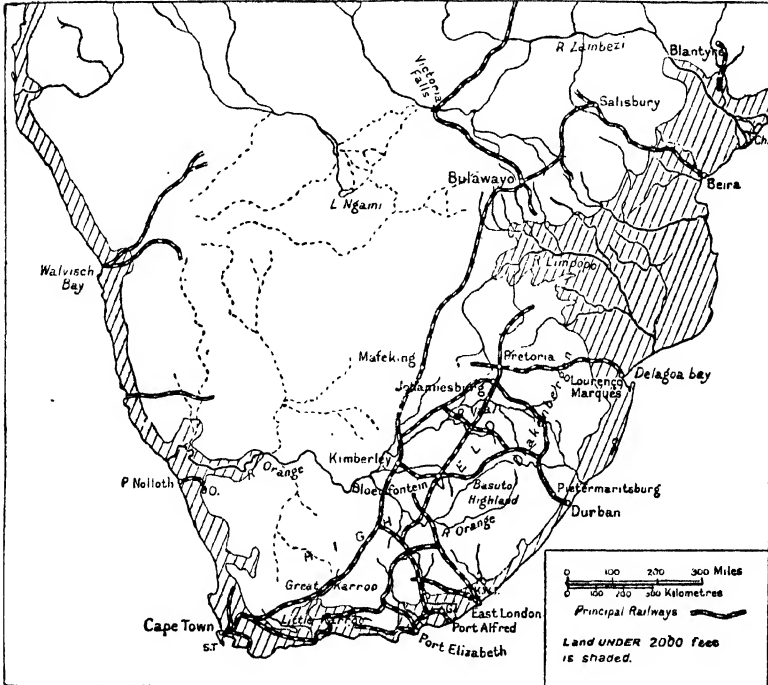


FIG. 53. South Africa. In this map the low ground is shaded.

the Vaal river we enter the Orange Free State, in the centre of which is Bloemfontein, with the Union Law Courts. Hour after hour we travel through the same scenes.

Isolated grass plants, green after rain, but yellow or brown or red in the dry season, are dotted over the surface. They give food to the flocks, mainly of sheep or goats. Here and

there we see ostriches running about. A greener spot, with some trees and a house, shows where the farmer has made his home near some brook or spring. We realize that stock-rearing is the chief occupation of the people.

Crossing the Orange River we enter Cape Province, but the scenery changes little. A branch line runs west and joins another which passes northwards, parallel to that by which we have travelled, to the diamond mines of Kimberley. We, however, go southwards over the edge of the tableland into richer, better wooded regions to Port Elizabeth on the south coast.

In the regions we have traversed, the rains fall in summer, and the winters are comparatively dry, but round Port Elizabeth the rainfall is more uniformly distributed.

As we sail westwards the coast is bordered by mountains, with patches of forest here and there. We round the southern point of Africa, pass the Cape of Good Hope and anchor in Table Bay.

The South-west of Cape Province. Here we are in a different world. Behind Table Bay rises the great flat-topped Table Mountain, often covered with clouds. Between this and the sea is built Cape Town, the seat of the Union Parliament.

Many of the trees are familiar in our own country, but others are quite new. The eucalyptus has been freely planted. Nowhere else in the world is such a collection of brilliantly coloured heath-like plants to be found as round Table Mountain. The climate differs from that in the east. The summers are dry and the winters are wet, as in California; of which we are reminded by the vineyards on the lower mountain slopes.

The railway from Cape Town to the interior of Cape Province crosses two narrow gorges and two broad valleys with many orchards. It begins to ascend to the tableland, across the terrace known as the Karroo. This is almost a desert, with a little thorny scrub on which a few sheep, goats, and ostriches are reared. The line is continued through Kimberley to

Bulawayo, with a branch to Johannesburg, which is also reached through Bloemfontein.

Summary. In the north-east a desert extends from the Red Sea beyond the Nile. This is succeeded by a region of summer rains, with park-like landscapes dotted with trees. Near the equator are dense forests round the Great Lakes and along the coast, with park-like landscape in the higher parts. These forests continue south beyond the valley of the Zambezi. Inland, as we go higher, this forest, or wet jungle, gives place to the opener park-like landscape, and, still higher, to the grass-lands. Farther south, in Natal, the forest is no longer a dense wet jungle, but a low evergreen forest which disappears as we ascend to the plateau, where tufts of grass become rarer and smaller as we pass westwards. In all these regions rain falls mainly in summer. In the south-west we have a different type of climate and vegetation.

XIII. WESTERN AFRICA.

Along the West Coast. As we sail northwards from Cape Town, the land for considerably more than a thousand miles is a desert, or almost a desert. This region lies in the same latitudes as the west coast of Australia or the west coast of South America north of Valparaiso, in the lee of the south-east trade-winds. It is dry for the same reason. The southern part is British, the northern is Portuguese. As we rise to the tableland from the coast in Portuguese territory we pass into a region of woods, reminding us of the highlands of British Central Africa.

The Congo Basin. We now enter the estuary of the Congo, but we cannot sail far up the river because of the rapids where it descends from the tableland to the coast. The railway avoids these and carries us to Leopoldville, on Stanley Pool, from which we can sail for thousands of miles on the broad waters of the Congo and its tributaries. As in the case

of the Amazon the main stream forms many channels. The air is always damp and rain falls at all seasons. When there is no steady rain there are heavy mists and drizzles morning and evening. The heat is not so great as in the deserts of the north and south, but it is more trying, owing to the moisture of the air.

The heart of the forest is crowded with colossal trees from one to five feet in diameter and 200 feet in height, with their thick, glossy foliage so interlaced that the hot glaring sun is quite shut out. Each tree is lashed to the next by endless lengths of vines and creepers. Underneath is an impenetrable undergrowth. 'The forks of each tree are crowded with little conservatories of orchids and ferns, and the great horizontal limbs are burdened with grey-green lichens, and drooping epiphytes, or air plants. Here and there are great swaying masses of vines, around the flowers of which the wild bees hum, and the fierce wasps dart, and brilliant butterflies sail in myriads.'

The forest people live in small tribes in the clearings of the forest. All are agile, keen-sighted, expert hunters, and some also grow bananas and other tropical plants round their villages. Wild animals are less abundant than round the margin of the forest, where lions, leopards, elephants, zebras, and many beautiful antelopes abound. The forest creatures are mainly monkeys, birds, butterflies, and insects. In the forests immediately north of the Congo is found the great gorilla, an ape of almost human appearance.

The Guinea Coast. From the mouth of the Congo we sail along the coast of the Gulf of Guinea, where rain falls at all seasons. The shore is bordered by mangrove swamps, and beyond is a dense unhealthy forest in which rubber is obtained. In the clearings coffee and cotton are cultivated, but the chief product is the oil-palm. The country markets are very interesting. One traveller found on sale: 'cotton in the raw state; country cloths, made up; cloth in long lengths, about five inches wide, from the loom; spun cotton thread'

wound on spindles ; blue dyed thread in skeins ; indigo leaves, dried, for dyeing ; tobacco leaves, dried ; palm-nuts, palm-oil, palm-nut oil ; country made iron ; clean rice, rough rice, ground nuts, cus-cus, Guinea corn, bananas, pumpkins, jakatu (a kind of bitter tomato), boiled sweet potatoes, dried okra, cassada, fowls, dried flying ants, dried rats on skewers, dried fish, good country mats, native pottery, chiefly bowls, in large quantities ; a few cattle, sheep, and goats, and a small quantity of salt and gunpowder.' On the coast the surf is so dangerous that special boats have to be used to land passengers and

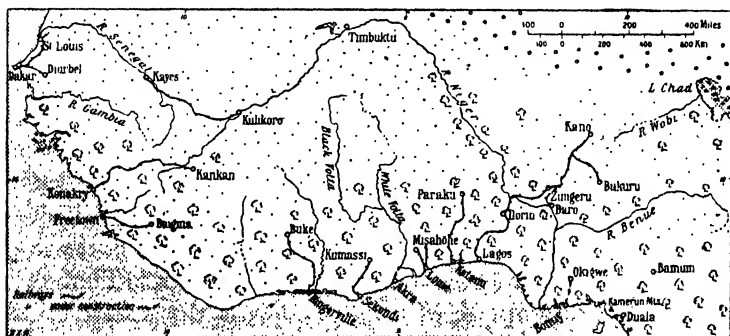


FIG. 54. Upper Guinea and Nigeria. The trees show the area of hot wet forests, the dots indicate grass lands, which have clumps of trees near the forest, and pass into scrub near the desert, which is shown by little circles.

goods, so that trade is carried on with difficulty. This coast is controlled by various European powers. We should probably call at the British ports of Lagos, near the western end of the Niger delta, Akra in Ashanti, and Freetown, the capital of Sierra Leone.

The Niger. For 120 miles the Guinea coast is bordered by the delta of the Niger. Along the margin and rivers of the delta are mangrove swamps flooded by the tides. The air is hot, moist, and fetid. Farther inland, towards the head of the delta, the oil-palm appears. Above the delta the river is **broad and deep**, bordered by dense and beautiful forests with

many villages. Crocodiles and hippopotami are seen on the banks. Further up country the land undulates, the rainfall diminishes, and the forest becomes less dense. The land becomes hillier and the river bed is broken by rapids. We leave the forest behind and enter a new region, a tableland with clumps of trees, fields of millet and maize, and many domesticated animals. The people live not merely in villages but in great walled cities. This is the Sudan, 'the land of the blacks,' the most fertile, prosperous, and populous part of Central Africa. Kano, the chief town, is surrounded by a wall 15 miles long, pierced by thirteen gates. The people manufacture cotton cloth dyed with indigo, and do an immense trade with merchants from all parts of Africa north of the equator. From it we could return by railway through Zungeru, the capital, to Lagos.

Hitherto we have been in British Nigeria. As we ascend the river and enter French territory, the land becomes poorer and almost a desert. Suddenly the river changes its direction and comes from the south-west instead of the north-west. Near the bend, some miles distant from the river, is Timbuktu, once the starting-place of caravans across the desert to the north of Africa. Now most of the trade passes up the Niger, and is carried by rail to the Senegal and the port of Dakar.

The Sahara. From Dakar northwards we skirt the desert coast. Of this desert we have already seen something at Timbuktu, in Egypt beyond the narrow fertile strip of the Nile valley, and along the banks of the Red Sea. The desert thus extends across Africa from east to west, and is over a thousand miles from north to south. It is called the Sahara. Caravans have found three different types of surface: the stony desert, the sandy desert, and the oasis. In all the climate is very extreme. In the desert no covering of vegetation protects the sand and rocks from the glare of the Sun's rays, and they become so heated that it is painful to touch them. For the same reason the surface cools rapidly after the Sun is down. In winter the nights are cold, the days are not so warm as in

summer. Rain never falls except in heavy thunder showers which may not occur for several years. Then for a few hours or days raging torrents rush down the watercourses, cutting them deeper into the sand. A few hours or days later they are dry again.

The Stony Desert. Some parts of the desert consist of rocky waste. The rocks are exposed to great extremes of temperature, expanding with the heat and contracting with the cold. This makes the exposed surfaces very brittle, and liable to crack and splinter. The strong desert winds often blow fiercely, whirling along clouds of sand so dense as to darken the air at noon. These sand-storms also help to wear away and polish the surface of the rocks, and the loose particles are carried away by the winds. The same causes are at work sculpturing and deepening the rare water-courses.

The Sandy Desert. Another result of wind action is seen in the long, regular sand-dunes, or sand-hills, of the desert, which many travellers have compared to the waves of the ocean. These dunes have their long slope to the windward side, up which the wind rolls the heavier particles of sand, and their shorter slope to the leeward side, down which the heavier particles slide. In this way ridge upon ridge is formed. Before the result of this action of the wind was understood, the Sahara was supposed to be the bed of a former sea. Now we know that the sand of the desert is not sea-sand, but sand formed by the wearing away of the rocks and spread by the action of the wind.

Sand-dunes at Home. When you next go to the seaside look for sand-dunes. Many parts of the British Isles are bordered by them. They differ from those of the desert in being made of sea-sand, but their ripple-like ridges are similar to those of the desert, although their height is not nearly so great. At low tide you will find the uncovered sands covered with ripples made by the retreating tide. Compare these with those made by the wind in the loose sands above tide mark.

Oases. The Sahara is not everywhere flat. A range of mountains over a mile high runs from south-east to north-west across the middle of it. Other parts of the desert are below sea-level.

All round the desert are lands which receive rain, and it sometimes happens that, in the lower parts of the desert, near the margin, or in the lower parts not far from the mountainous region of the desert, the underground waters come to the surface in springs. Wherever they do so the land becomes fertile and capable of cultivation. Such a spot is called an oasis. The oases are usually forests of date-palms, beneath which are grown wheat, barley, millet, lucerne (a kind of clover), and maize. In the gardens, vegetables, beans, and fruits, especially melons, are raised. But for oases, which supply food and water to caravans, it would be impossible to cross the desert. Even as it is only camels, which can go for several days without food or water, can endure the hardships of a desert journey. Egypt might be called a very long and narrow oasis.

The Canary and Madeira Islands. Leaving the desert coast, we see to the north-west volcanic mountains rising from the sea. These are the Canary Islands, with the lofty peak of Teneriffe. The lower part of the peak is generally clear, as the wind blows from the north-east, but the upper part is usually fringed with cloud, which streams out towards the north-east, indicating that a south-west wind is blowing in these high regions. A day's steaming north brings us to Madeira, another group of volcanic islands. In both groups the lower lands are terraced and planted with vines, oranges, olives, and many other fruits, as well as sugar-cane, maize, and vegetables. Flowers are abundant, and the valleys are filled with chestnuts, oaks, and cedars.

Summary. Africa reminds us in many ways of South America. The Congo forest resembles that of the Amazon. The south-west region is like that of central Chile in its climate and products, and the south-east recalls the east of Argentina and Uruguay.

The configuration of the two is very different. Compare Fig. 55 with Fig. 26. Africa is remarkable for the small area of lowland. The greater part of the continent is a lofty tableland. This is highest in the east and slopes to the west,

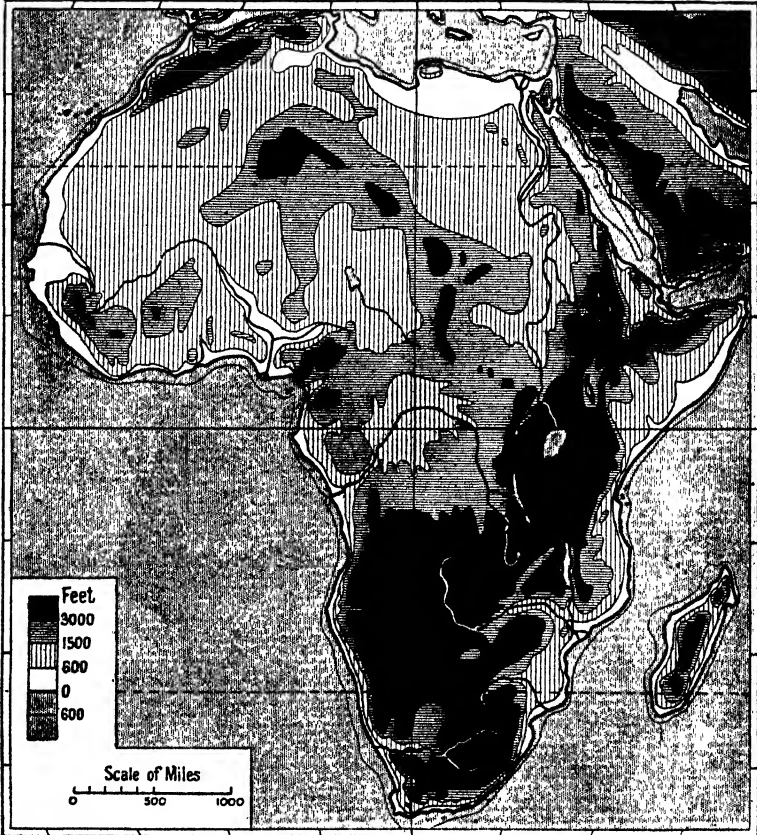


FIG. 55. Africa.

whereas South America is highest in the west, and has a great lowland between the western and eastern highlands. In the region of the trade-winds there is not the same obstruction to these winds passing inland in South America as there is in Africa. Further, in the north-east of Africa there is land, so

the north-east trade winds are dry. We can understand how the Sahara extends across north Africa into Asia. The high eastern lands in the south-east confine the rainfall to a belt

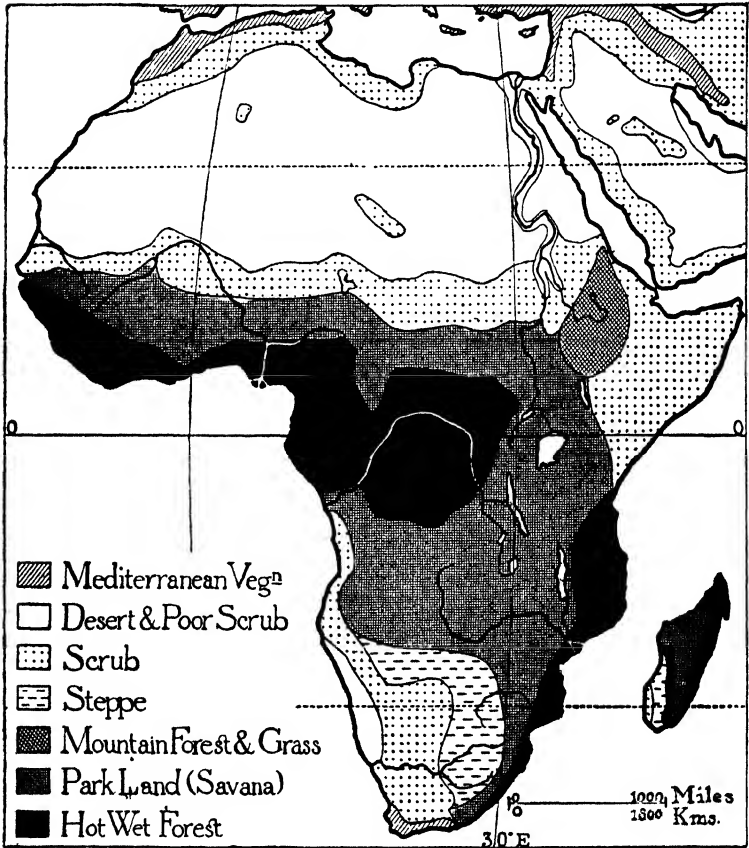


FIG. 56. Vegetation of Africa. Compare the parts at similar distances north and south of the equator. Notice the differences between the east and west coasts. Compare this map with that of Fig. 31. Notice the position of hot wet forests in Figs. 31 and 56, and then examine a map showing high and low land.

near the coast in South Africa. So the Kalahari desert of South Africa is much wider than the Atacama desert of South America.

Between the Congo and West African forests and the Sahara and the Kalahari deserts, are open woods and grass lands similar to those of Brazil.

South of the Kalahari and north of the Sahara, on the west, are the regions of rainy winter and dry summer, corresponding to Central Chile and California in America. The cooler parts of America are not represented in Africa, which is nowhere more than about 2,500 miles from the equator, whereas the south of South America is nearly 4,000 miles from it, and the north of North America is much more than that.

Compare carefully the vegetation maps of Figs. 56 and 31.

XIV. MEDITERRANEAN LANDS.

The Atlas Region. Sailing eastwards from Madeira we reach north-west Africa. The land rises gradually from the coast, and in the far distance we see high mountains. These are the Atlas, which extend for 1,300 or 1,400 miles across the north-west of Africa. As we cross from the sandy shore to Morocco City in the south, we first pass through fields of barley, and then cross a treeless plain which rises until the city is reached near the foot of the mountains. The mountains become more and more rugged and picturesque the higher we go. Our route would lie first through a forest belt, then through a treeless region, and finally we should reach the snow. The southern slopes are dry and barren, and the desert Sahara spreads to the horizon.

The Barbary Lands. Sailing northwards we reach the narrow strait of Gibraltar, separating Africa from Europe. After calling at Tangier we sail east to Algiers, the capital of Algeria, a French colony. A journey inland takes us first across a coastal range of mountains to a fertile valley known as the Tell. Here we find olive-yards, orange-groves, fields of maize, wheat, and barley. From the Tell we cross a range of mountains to the dry plateau of the interior, dotted with salt lakes. Some cereals are raised, but the chief crop is halfa, or

esparto grass, used in paper-making. A few cattle and more sheep and goats find a living. To the south of this plateau rises another range, at the foot of which are more salt lakes, or shotts, and, beyond, the Sahara.

At the eastern end of the Tell is the city of Tunis, the capital of the French Protectorate of that name. Here again we find the vine, orange, olive, and the other fruits which we found in the southern part of Australia, the south-west of Cape Province, and in California and Chile. Like them, it is a region where little rain falls, and that chiefly in winter. We have reached the Mediterranean region of winter rains and summer droughts; and that special type of climate, wherever

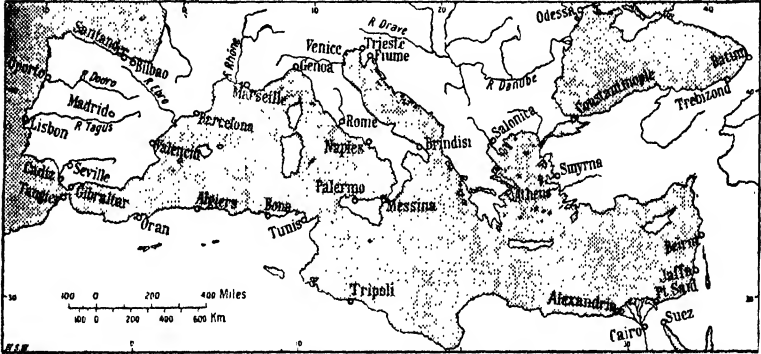


FIG. 57. The Mediterranean Basin.

it occurs, is generally called a Mediterranean climate. Wherever it occurs the Mediterranean fruits and cereals can be successfully cultivated.

Portugal. If we had sailed from Madeira, which is Portuguese, in a Portuguese vessel, it would have taken us to Lisbon, the capital of Portugal, the most westerly part of the mainland of Europe. Lisbon is built on heights above the bottle-shaped estuary of the Tagus. Whether we travel north or south from Lisbon across the plains, we find the same dry country that we found in Morocco. The olive, the cork, and other evergreen oaks are abundant in the moister

valleys, but the hill-sides are brown and bare. These hill-sides are laboriously terraced, to keep the soil from being washed away by the winter rains. Round the Douro is a region which produces the grapes from which port wine is made. This wine is named from Oporto, the port from which it is exported.

Andalusia. Sailing southwards from Lisbon we round Cape St. Vincent and enter Cadiz harbour, which exports sherry wine, so called from Xeres, near Cadiz. A railway crosses the flat plain of Andalusia to Seville on the Guadalquivir. To the north is a great mountainous wall, and to the south the land rises into a still more rugged mountain chain. Between the two is the fertile valley of Andalusia. For miles the country is covered with groves of olives, oranges, lemons, and pomegranates. The irrigated fields are planted with rice, wheat, and maize. Andalusia is one of the most fertile regions of Europe.

South-east of Spain. Sailing southwards from Cadiz, and passing Cape Trafalgar, we enter the Strait of Gibraltar, and see the great rock of that name, the British fortress which guards the route from Britain to India. From Gibraltar we sail east and north-east, calling at many ports between Malaga and Valencia. Everywhere along the coast the hill-sides are terraced as carefully as round the Douro. They yield grapes, for making wine and raisins, oranges, lemons, pomegranates, figs, and other Mediterranean fruit. In some sheltered valleys are groves of date-palms, which ripen nowhere else in Europe. The region around Valencia has been thus described: 'In summer the river beds are quite dry; every streamlet and summer spring aids in supplying the irrigation canals. The force of the winter torrents is plainly evident from the terrible disturbance of their rocky beds; indeed, one of the most interesting features is the picturesque scenery of the river channels. In the valleys all is luxuriousness, thousands of acres of orange trees, under careful culture, displaying trees white with blossom side by side with others bright with abundance of golden fruit.'

The Interior of Spain. If we wish to pass from any of these ports into the interior of Spain, we must climb to a lofty plateau, as we did in Africa. The land becomes drier and drier. The temperature is hot in summer, and cold in winter, as we get farther from the coast. At last we reach Madrid in the centre. 'The landscape, which is broken rather than hilly, stretches on every side with a uniformity uninterrupted, save by the dusty, chalky villages, which would hardly attract attention but for their square church towers. The noonday sky is of the colour of molten lead. The soil is of a powdery grey. There is not a clump of trees, not a shrub, not a trickle of water in the dry beds of the torrents, nothing to rest the eye or refresh the imagination.'

Madrid is built on low hills about half a mile above the sea. It is bitterly cold in winter, and oppressively hot in summer.

After crossing the mountains of Castille we again reach the Douro basin, with irrigated fields of wheat and lucerne. This rises in the north to the Cantabrian Mountains.

Northern Spain. Crossing these we find ourselves in another world. Much more rain falls, and the hills are covered with trees familiar in England. Coal, iron, and other minerals are worked, and much iron is exported from Bilbao and Santander.

The Ebro Valley and the Pyrenees. Travelling south-east we enter the valley of the Ebro, which drains the old kingdom of Aragon. It, too, is rather a barren region, except where irrigated. Far in the north we see the distant Pyrenees, which cut off Spain from France. Other mountains separate us from the east coast of Spain. Crossing these we reach Barcelona, the busiest town in Spain, where colonial produce of all kinds, especially cotton, is manufactured.

The South of France. From Barcelona we sail across the stormy Gulf of the Lion to the French port of Marseille. The coast is bordered by lagoons, and in the centre the Rhone forms a great delta. Not far from the coast the land rises to the distant Alps, which occupy so much of central Europe. Around the base of the mountains are vineyards and groves of

olives, cork oaks, and mulberry trees, on the leaves of which the silkworm is fed. Wine, fruit, and silk are the principal products of this region. A gap between the Pyrenees and the Central Plateau of France leads from the Mediterranean to Toulouse and Bordeaux, another great wine-producing centre at the mouth of the river Garonne. The Rhone Valley also leads from the Mediterranean to the north of Europe between the Central Plateau of France and the Alps.

The Riviera. The coast east of Marseille is very rugged, for the Alps and their continuation, the Apennines, come close to the sea. Through both railroads have been tunnelled parallel to the coast. This coastal region is called the Riviera. Mountains shelter it from the bitter north winds, and the slopes of the hills are turned towards the Sun so that its rays at noon strike them almost at right angles. Rain is not very heavy and the sunshine is constant, even in the winter months. This makes the Riviera one of the great winter resorts of Europe, and it is dotted with many towns of which Nice is the chief. The most important port is Genoa, at the head of the gulf of that name, built where the Alps and Apennines join and a low pass leads to the north.

Tuscany. Most of the Riviera is in Italy, a great peninsula, which juts south-eastwards into the Mediterranean from the base of the Alps. As we sail along its west coast we see the Apennines in the distance, running the entire length of the peninsula. We might enter Leghorn harbour, and go by rail through Pisa to Florence, on the Arno. Like many Italian cities, Pisa and Florence are noted for their ancient and beautiful buildings, and their exquisite pictures. We are now in Tuscany, a typical Mediterranean land. The hill-sides are planted with vines and olives, and the fields are cultivated with maize, wheat, and vegetables.

Rome. Instead of going inland we might sail southwards from Leghorn, keeping the islands of Corsica and Sardinia on our right, and anchor in the Bay of Naples in Southern Italy. Or we might have reached Naples by rail from Florence,

passing through Rome, on the Tiber, not far from its mouth, on our way.

Rome is one of the oldest cities in Italy. It is built on low but somewhat steep-sided hills overlooking the river. It is surrounded by an undulating plain called the Campagna, beyond which rise hills on every side except the west. Those to the south are the volcanic Alban Mountains, with circular lakes filling the craters of extinct volcanoes. Rome has well been called the Eternal City. It has been the capital of the Roman Empire; of the Roman Catholic Church; and of modern Italy. It has magnificent ruins more than two thousand years old, and splendid palaces and churches built in the middle ages. Round these the modern city has grown up.

Naples. Naples, also a very ancient city, is in an even more interesting region. It is built on land which rises gradually from the beautiful semicircular Bay of Naples, above which towers the active volcano of Vesuvius. All around Naples the land is covered with vineyards, orange-groves, orchards, and gardens. Monasteries and villas dot the landscape. Up the sides of the volcano and other heights are belts of forest with oak and chestnut trees. The ever-smoking volcano, however, with its remnants of larger, older craters, is the dominant feature in the landscape.

Vesuvius. Let us ascend Vesuvius. The crater resembles a great bowl nearly half a mile in diameter and several hundred feet deep. The ground is so hot that we cannot stand on the same spot for many seconds. The sulphur fumes catch our breath, and the rising vapours hide the hole at the foot of the crater. 'The eruption is not exactly what imagination paints it. It does not consist of a continuous shower, still less of a shower of black ashes shot out from a fire blazing on the top of the mountain. It consists rather of a series of explosions. The only thing that is unintermittent is the roar and glare of the great abyss. You look into that, and though you see no actual flame, yet its sides

are in a state of continuous incandescence. From the mouth there roars up incessantly a dense cloud of steam, and in the depths below you hear the crashing of the mighty preparations for the coming outburst. Then comes a sharper crackle, and without further warning a loud explosion, which shoots into the air a shower of white-hot missiles of every size and shape. This lasts perhaps a minute, and then there is a cessation of some seconds, with the noise of the internal preparations once more, after which the whole process is repeated again and again, as long as the eruption continues.'

Herculaneum and Pompeii. At the base of Vesuvius are two remarkable ruined cities. Vesuvius was long supposed to be extinct, and the cities of Pompeii and Herculaneum were built at its base. Over eighteen hundred years ago a great eruption took place similar to that of Mont Pelé (see p. 45). Hot ashes burned both towns, which were forgotten for centuries. In recent years much of this ash has been removed, and we can now see the ruins of the cities as they were in the days of their splendour.

The Lipari Islands and Sicily. Vesuvius is not the only volcano in Italy. If we sail due southwards we reach the Lipari Islands. If it is night, the sky is lit up by the red glare from Stromboli, an ever active volcano, on a small island of the same name. From the Lipari Islands we pass through the Strait of Messina, between Italy and the island of Sicily. In Sicily rises the great volcano of Etna, nearly two miles high, with a more beautiful cone than Vesuvius. If we sail round Sicily we find oranges, olives, lemons, and vines growing luxuriantly, for Sicily enjoys perpetual spring or summer. The cereals, fruits, and wines of Sicily are shipped from Palermo and other ports.

A wide strait separates Sicily from Africa, and joins the western to the eastern basin of the Mediterranean. South of Sicily where this strait widens, is Malta, another British fortress on the road to India.

Northern Italy. Sailing north-eastwards from Malta we

enter the Adriatic Sea, at the head of which is Venice. Venice is built on the sandbanks of a lagoon, and has canals for streets. It was built there because these lagoons and marshes protected it from attack. It contains the famous Cathedral of Saint Mark, and many palaces.

If we take the train from Venice westwards we cross a flat, irrigated plain, with fields of maize, and rice and wheat, bordered with mulberries and elms. 'On our right rise the Alps, sometimes melting into the blue of the sky, sometimes

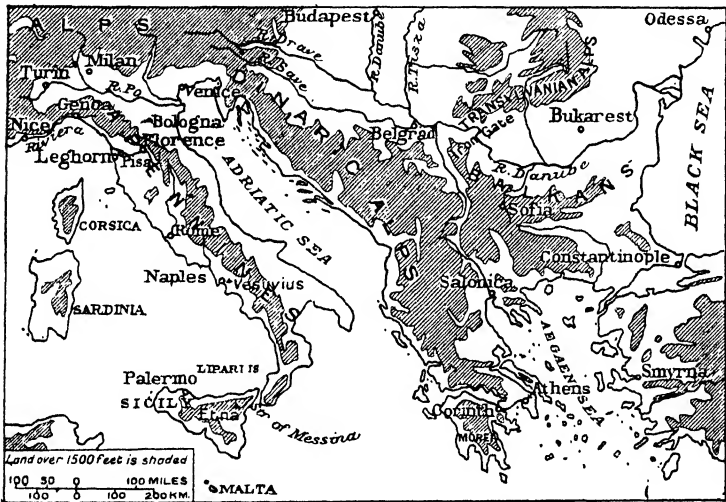


FIG. 58. The Italian and Balkan Peninsulas.

standing out in a sharp bright line of ice and snow. The white walls of many a town, with campanile and battlemented towers, gleam amid the luxuriant growth of corn, figs, mulberries, olives and peaches that cover the plain.' We pass by Verona and Milan, the great silk manufacturing centre of Northern Italy, to Turin. Both Milan and Turin owe much of their importance to their position at the end of great routes across the Alps.

If we cross the Po and go south, keeping the Apennines on our right, we reach Bologna, where a route crosses the Apen-

nines to Florence. From Bologna we can return to Venice, again crossing the Po, where it begins to form a delta and flows above the level of the surrounding plains.

The West of the Balkan Peninsula. Sailing along the eastern coast of the Adriatic, we pass many long, narrow islands stretching parallel to the coast. On the mainland the ranges are also parallel to the coast, and we can imagine this coast to have been formed by the sinking of part of the land, so that the water filled the valleys, and left the ridges standing above it as islands. The mountains are called the Dinaric Alps.

Leaving the Adriatic we pass the rugged coasts of Greece. We can either sail through the Gulf and Canal of Corinth, or southwards round the peninsula of the Morea to Piraeus, the port of Athens.

In the Aegean Sea. Athens was built over 2,500 years ago round a great rock called the Acropolis, on the summit of which are still to be seen the ruins of beautiful temples. The

modern city is built round its base, in a semi-circular plain, bordered by mountains to the north, and by the sea to the south. Greece is a mountainous land with many small plains like the plain of Athens. The islands of Greece are rugged masses of land rising above the sea. We sail between these islands, with their olive groves and vineyards, and make our way eastwards past the islands of Crete and Cyprus to the eastern shore of the Mediterranean, known as the Levant.

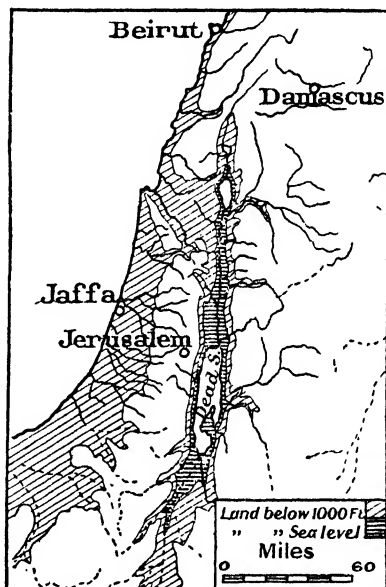


FIG. 59. Palestine. In this map the low ground is shaded.

Syria. The land we have reached is Syria. Behind the coastal plain, with its orange groves, the mountains rise steeply, their northern slopes covered with forests. From the port of Jaffa we take the train to Jerusalem, which is built on a bare plateau, with olive groves and cypresses round the town. East of Jerusalem the land sinks rapidly to the great steep-sided rift valley, with a flat floor, like that of East Africa, of which it is the northern end. Through this the Jordan flows to the Dead Sea, which has no outlet and is intensely salt. Farther east is a great desert, traversed by a railway which carries pilgrims southwards towards Mecca in Arabia. The route northwards leads to Damascus, an oasis green with orchards of figs, apricots, pomegranates, vineyards, date-palm groves, and rose-gardens. All this fertility is due to a river which comes from the mountains of Lebanon, which we must cross to reach the Mediterranean at Beirut.

Asia Minor and Europe opposite. From Beirut we follow the shores of Asia Minor. Here and there is a fertile coastal plain with forested mountains rising steeply above. In the west is Smyrna, from which railways have been built to the highlands beyond. These become extremely dry and barren away from the coast. We cross the Aegean Sea to Salonica, the terminus of a railway running northwards to Vienna and on to Paris. Then we turn east and pass through the Hellespont, the Sea of Marmora and the Bosphorus, into the Black Sea, with Asia on our right hand and Europe on our left.

Constantinople. On the European side of the Bosphorus is Constantinople, built on a series of hills, above the sea. Here Europe almost touches Asia. Constantinople also commands the sea route from the Mediterranean to the Black Sea and Russia. A railway runs from here to join that from Greece.

Wooded hills rise steeply from the southern shores of the Black Sea. At the eastern end we look to the highlands of Armenia in the south, and the icy peaks of the Caucasus in the north, with vineyards and forests on their southern slopes.

Sailing north-west along the northern coast we pass the strait leading to the sea of Azov and the peninsula of Crimea, the only genial part of Russia.

The Mediterranean Region. This is the end of the Mediterranean region with its winter rains, and its olives, oranges, and vines. In Europe it has a greater extension from east to west than in any other part of the world. Only in Australia are the eastern and western ends of a similar region approximately as far distant from each other.

XV. CENTRAL EUROPE.

The Lower Danube. After calling at Odessa, on the Black Sea, the great southern port of Russia, which ships wheat from the fertile steppe lands of Southern Russia, we enter the delta of the Danube, and pass a number of river ports, all exporting wheat. The Danube flows in a wide plain bordered by steep sides, steeper in the north than in the south. To the south is Bulgaria, to the north Rumania. To the south the Balkan Mountains of Bulgaria rise in the distance, and to the north the Transylvanian Alps of Rumania. As we sail upstream, these mountains approach each other, meeting at last at the Iron Gate, where the Danube has cut its way through in a series of rapids. Ahead of us we see the steep sides of the great gorge out of which the river is issuing. Through this gorge we pass between mountains which in places rise almost perpendicularly on either side to two thousand feet.

The Plains of Hungary. Emerging from the western end of the gorge, we enter the middle Danube plain, bounded by hilly land to the south. Opposite the mouth of a large tributary, the Save, is Belgrad, the capital of Yugo-Slavia, where the railway from Vienna to Constantinople and Greece crosses the Danube. As we continue our voyage up stream, the land on the right is flat, but on the left more undulating. Two great rivers, the Tisza (Theiss) from the north and the Drave from the west, join the main stream. At length we

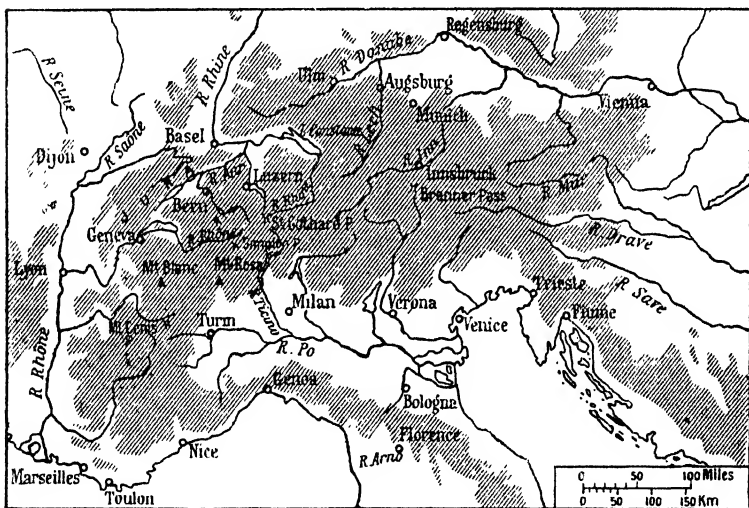
reach Budapest, beyond which mountains appear on either side. The immense plain resembles the wheat-growing prairies of North America, or the richer steppes of Russia, of which it is the western termination. Budapest is the capital of Hungary. Beyond the plain mountains rise on all sides; the Transylvanian Alps on the south, the Carpathians on the east and north, the Alps on the west.

The Upper Danube. The Alps on the left and the Carpathians on the right approach each other, and at the north-eastern end of the Alps we reach Vienna, the capital of Austria. Above Vienna the scenery of the Danube gorge is extraordinarily fine. Farther north is Prag, the capital of the state of Chekho-Slovakia, in the district of Bohemia, rich in minerals. The Alps gradually recede on the left, and an undulating plain slopes down from them to the Danube. Across it flows the Inn, the chief tributary of the Danube, which has risen in the heart of the Alps. On another tributary, the Isar, is Munich, the capital of Bavaria. We pass Regensburg or Ratisbon, the confluence of the Lech, on which is Augsburg, Ulm, with its cathedral, and penetrate at last into the pine woods of the Black Forest, in which the Danube has its source.

The Alps. If we go south from the head of the Danube we first cross the Rhine, which issues from Lake Constance. We traverse a hilly land to which open many beautiful, long, narrow lakes, with mountains rising above them. A steamer will take us across the Lake of Lucerne. Into it the Reuss flows from the south and by its valley we can pass far into the heart of the Alps at their narrowest. The floor of the valley is a narrow flat meadow. Mountains rise very steeply on either side, and at the height of a thousand feet or so follow a gentler slope, while the lower part of the valley is shaped somewhat like the letter U. The tributary streams fall over the steep walls of the valley in falls and cataracts. If we climb to the top of the steep sides of the valley we seem to be standing on the floor of a great mountain valley into the bottom of which an U-shaped

trough has been cut. As we ascend the valley the mountain slopes are covered with pine forests in the lower reaches, but as the floor of the valley rises we pass beyond the tree-line into the region of Alpine meadows. In early summer these meadows are gay with flowers of every hue. Near the snow-line grows the Alpine rose, a dwarf rhododendron, reminding us of the Himalayas. Higher still the last grass and flowers disappear and we reach the first patches of perpetual snow.

The mountain meadows are called by the peasants alps, but



M.S.H.

FIG. 60. The Alpine Regions. The mountainous area is shaded.

the name is now used of the mountains as a whole. In summer cattle, sheep, and goats are driven up to them to graze, each with a bell round its neck. These mountain meadows, which lie from a mile to a mile and a half above the level of the sea, are difficult to reach, and the best way to use up the milk is to make it into cheese. Each little meadow has its cheese-house. These Alpine pastures are charming in summer, but in winter when the valley is deeply buried in snow, cattle and shepherds return to the lower villages.

The St. Gotthard Pass. The valley narrows and becomes steeper as we near its head. The road zigzags along the mountain sides far above the deep rugged ravine down which the foaming river rushes. Here and there it is carried through a projecting spur in a tunnel. At other points wooden sheds are built over it, to protect it from the snow which collects on the mountain sides and, becoming too heavy, at last rushes violently downwards, increasing in volume and velocity as it goes. Such snow-slides, or avalanches, often do great damage, tearing away and burying the roads, and sweeping away whole villages and their inhabitants.

At last we reach the head of the valley and the summit of the pass, a saddle or depression between mountains. Here the Reuss, which we have followed, has its source, and quite near it, but flowing in the opposite direction, is the Ticino. Down the Ticino valley zigzags the road to Italy.

These are not the only routes which cross this central part of the Alps. A valley running eastwards contains the head waters of the Rhine; and another valley running westwards contains the head waters of the Rhone. Looking north we see the valley of the Reuss, leading to Luzern, the Aar and the Rhine; looking south we see the valley of the Ticino, which flows southwards to the Po.

Contrast between the Northern and Southern Slopes of the Alps. Ascending the Alps by one of the northern valleys, we pass through fields of maize, wheat, barley, and oats, pine forests, and alpine meadows to the snow-line. The southern valleys descend through those mountain meadows into a sunnier land. Forests of chestnuts are succeeded by orchards and groves of mulberries, with vineyards still lower. Finally we arrive at Milan and the plain of the Po with its maize and rice fields.

On the southern side of the Alps the midday sun throws its rays down almost at right angles to the slopes of the hills, whereas on the north side of the Alps the rays fall slanting, and are not nearly so heating. The plains at the southern

base of the Alps are warmer and more fertile because they lie lower and because they are farther south. The Alps separate two natural regions from one another.

The Rhone Valley. We shall now follow another of the great natural routes branching from the St. Gotthard. Near the head of the valley which runs westwards, is a great steep glacier, looking like a splendid frozen waterfall of enormous breadth and height. From a beautiful blue ice cave at the end issues the Rhone. It flows for many miles between mountains which gradually recede as the valley widens. Many side valleys open out, leading to some of the finest scenery of the Alps. We pass many villages and towns, and reach Martigny, where the Rhone turns abruptly north to Lake Geneva. Immediately south of this lake is Mont Blanc, the highest mountain in Europe, not quite three miles high.

Rivers and Sediment. Where it enters the lake the Rhone is a greenish-grey colour owing to the mud that it carries. So long as a river is flowing swiftly its carrying power is very great. When it enters the calm waters of the lake its flow is abruptly checked, and it is obliged to drop much of the sediment. This being heavy falls to the bottom, thus gradually raising the floor of the lake, especially round the confluence. The river itself emerges from the lake as a clear stream.

The work done by rivers in collecting sediment in one part of their basin and depositing it in other parts is very important. We have seen many examples of it in the building up of deltas. In flood every river does work of this kind. Swollen by rains and laden with sediment it crosses the low-lying lands, and as the waters subside the heavier sediment is left behind. In this way the flood waters of the Nile, which are loaded with mud from the mountains of Abyssinia, have in the course of ages built up the fertile valley lands of Egypt, and are still pushing the delta out to sea.

From Geneva to Lyon. Geneva is built where the Rhone issues from lake Geneva, between the Alps in the south and the Jura in the north. The river next rushes in gorges cut

through the ranges of the Jura and enters the plain of the Lower Rhone, joining the Saône, a great river from the north, the direction of whose valley is followed by the united river, which keeps the name of the Rhone. On the tongue of land between those two rivers is built Lyon, a great silk manufacturing town. From Lyon the Rhone flows south to the Mediterranean, forming the delta already described.

The Rhine Valley. Returning to the St. Gotthard we might follow the Rhine, the river which flows east. Its valley resembles that of the Upper Rhone. The Rhine also turns sharply north and breaks through the mountains in a narrow gorge to Lake Constance. Here it forms a delta with its sediment, and, emerging from the lake, flows east across the end of the Jura. It then turns sharply north, and at this bend is built the town of Basle. Below Basle, the Rhine enters a broad rift valley, over twenty miles wide, between the wooded Black Forest (German) on the east and the Vosges in Alsace (French) on the west. This plain is very fertile, and the lower slopes of the hills on either side are covered with vineyards and orchards. At the northern end of this plain the Rhine receives a great tributary from the east, the Main. Near its confluence is the important town of Frankfurt.

The Rhine next enters a narrow gorge cut through the Rhine Highlands, from the northern end of which it emerges into the plain of the Lower Rhine. Just below the northern end of the gorge is the great city of Cologne, with many manufactures, and a famous cathedral. The rest of its course is across the plain, in the south of which is a region of rich coalfields, and busy manufacturing towns. Finally, it turns west to form the great delta on which are built the ports of Rotterdam and Amsterdam.

Across Northern Germany. Rotterdam is the starting-point of many lines which radiate across Europe. If we travel due east our route lies through flat country. We cross many rivers and marshes, and run through great tracts of heathland broken here and there by clumps of trees. We cross

the Weser, and if we followed it to its mouth, we should reach the great port of Bremen. Farther east the land becomes undulating, with trees on the hills and fertile fields of rye and sugar-beet in the lower ground. We pass Hanover and cross the Elbe at Magdeburg. An excursion from Magdeburg to the mouth of the Elbe would take us to Hamburg, the busiest port of Northern Europe. Beyond Magdeburg the

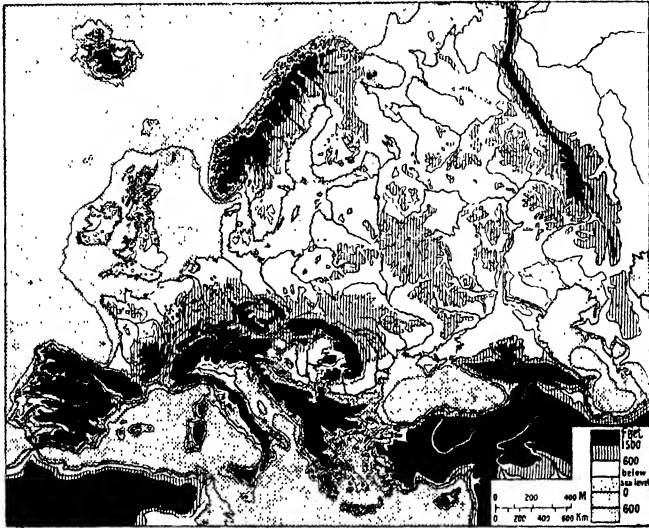


FIG. 61. Lowlands and Shallow Seas of Europe. Compare northern and southern Europe, the Northland Seas with the Mediterranean. Compare Europe with North and South America (Figs. 26 and 30), and Australia (Fig. 44), and contrast it with Africa (Fig. 55).

line crosses a barren plain, with few trees, in the middle of which is Berlin, the capital of Germany. The same monotonous scenery still continues. We cross the Oder and Vistula, the latter at Warsaw, the capital of Poland. Down the Vistula much timber is floated from the wooded highlands to the south. All these rivers carry the products of the industrial regions which lie at the base of the highlands.

Saxony. From Berlin a line runs south to the hilly land

of Saxony. Here we visit two great cities, Leipzig, on the plains, and Dresden, the capital, on the Elbe, just below its exit from the mountains which separate Saxony from Bohemia,

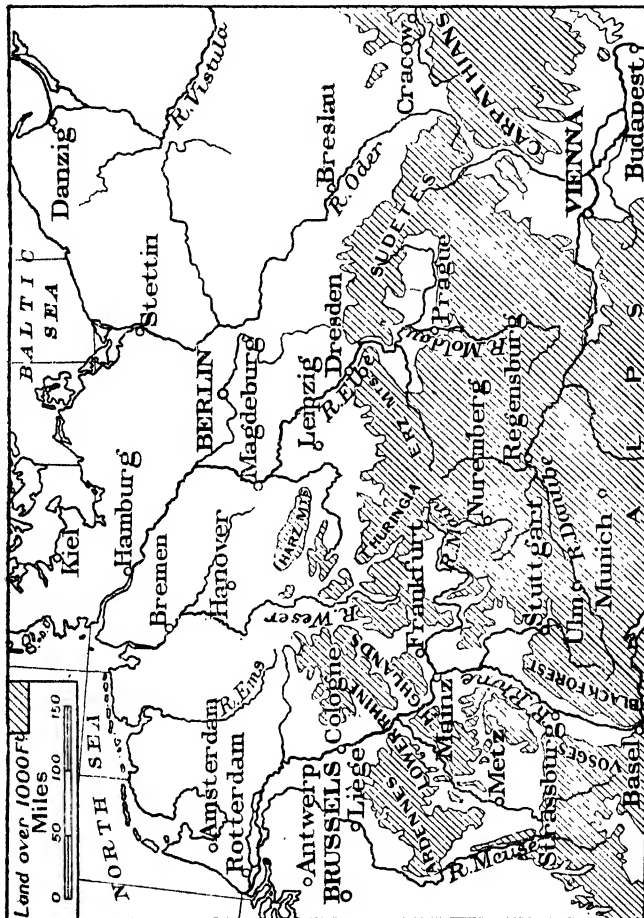


FIG. 62. Central Europe. The highlands are shaded.

a part of Chekho-Slovakia. Through these highlands we follow the Elbe in a picturesque gorge and reach Prag, the capital of Chekho-Slovakia, on its tributary, the Moldau.

The Central German Highlands. The highlands of Central

Germany are all similar in character. Their slopes are densely wooded, the upper parts with dark pines, the lower parts with trees whose leaves fall in autumn, especially beech and oak. Here and there are little mountain valleys with a stream rushing through them and cattle feeding on the hill slopes, reminding us somewhat of the Alps, but without the surrounding snow heights. At the base of the hills the valleys widen and the lower slopes of these valleys are carefully cultivated. The stream is used to turn mills which saw timber or grind flour. Most of the houses are built of wood, the cheapest building material in such a region.

Here and there in the broader valleys a town manufactures woollens or linens from wool grown on the hill pastures, or flax grown in the bordering plains. Parts of the highlands are rich in minerals, both useful and precious, and coal is abundant. Here and there round their base an old manufacturing village has become a great town, engaged in making textiles and working metals.

Belgium and North-eastern France. We have still the region west of the Rhine to describe. If we take a train southwards from Rotterdam we pass through Antwerp, a great port at the mouth of the short river Schelde, and Brussels, the capital of Belgium. We then cross the fertile plains of Flanders, with their hedgeless fields of corn, sugar-beet, and flax, usually grown in long narrow strips. We pass many old picturesque towns. Next we come to a region which before the great war was industrial, and has become so again, with coal mines, engineering works, and cloth factories. Away to the south are the dark forested hills of the Ardennes, whose sheep supplied the wool which early made Flanders an important manufacturing country. Lille, in the north-east of France, is the busiest town on the French part of this coalfield.

Paris. From Lille a line runs south-westwards to Paris, the capital of France, built where the Marne joins the Seine. Like many other cities it is built where the river is easily crossed, growing up first of all on two islands in the middle

of the river, which would be difficult to attack. Now the city has spread for miles on both banks, and to it converge all the railways and roads of Northern France.

Central France. Going southwards from Paris we cross

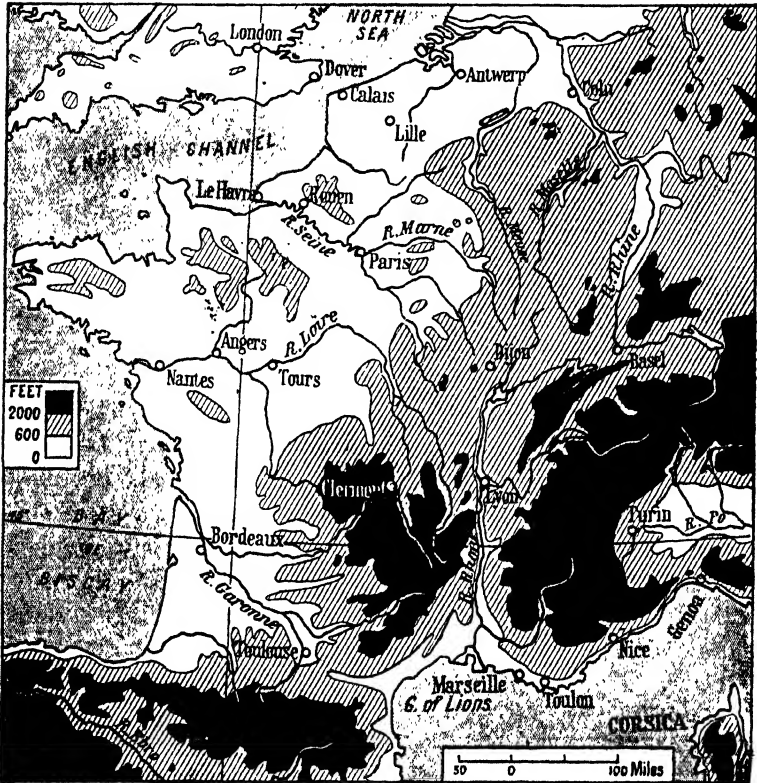


FIG. 63. France, the Rhine, and the Rhone.

the Loire, and pass through hillier land, to a long, narrow, flat plain, with heights on either side. Those on the west form a chain of cones, and if we climb one of them we see that they are indeed extinct volcanoes, from the tops of which we

can look down into the hollow craters. Clermont, at the base of this volcanic chain, is the most important town in this Central Plateau of France.

The Loire and Garonne. Travelling south-west from Paris we follow the lower course of the Loire through Touraine, the Garden of France, with many stately castles along the river. 'As the traveller slowly steams from Angers to Nantes, amid flowery banks and low-lying meads, it is difficult to believe that a few months later all may disappear, only the loftiest tree-tops being visible above the engulfing waters. An unforgettable, unimaginable sight is an inundation of the Loire—Nantes, the Liverpool of Western France, suddenly turned into a second Venice; locomotion in its busy streets only possible by boat; far away, looking seaward, the terrified townfolk behold vista upon vista of gradually vanishing islets.'

South of the Loire is a vine-growing region, the capital of which is Bordeaux, at the mouth of the Garonne.

Down the Seine from Paris. Sailing down the Seine from Paris, with steep banks wherever the river bends outwards, and very gently sloping ones on the opposite side, we pass the old Norman city of Rouen, with its beautiful churches, and the many chimneys of its cotton mills, and reach the sea at Havre, the chief French port in the English Channel. The chalk cliffs remind us of the southern cliffs of England. Exactly opposite, but too far off to be visible, is the English port of Southampton, to which there is a regular service from Havre. A number of other French ports are the starting-places of steamers which cross to England regularly.

XVI. THE BRITISH ISLES.

The South of England. Having gone round the World, we must now see a little of our own islands. Entering the English Channel from the Atlantic, we notice the great cliffs of Land's End and the Lizard in the south-west. The coast continues high for many miles, broken here and there by

narrow openings, within which are broad, calm waters suitable for harbours. If we enter that of Plymouth, we find that the town is built round the sides of the estuary, and that immense ocean liners and huge men-of-war lie safe at anchor. The coast continues high as we go eastwards, until we reach the narrow channel of the Solent, between the Isle of Wight and the mainland. Sailing through this, we may either turn north-westwards to the great port of Southampton, or south-eastwards to the English Channel through Spithead. At the mouth of Spithead is Portsmouth with its great naval

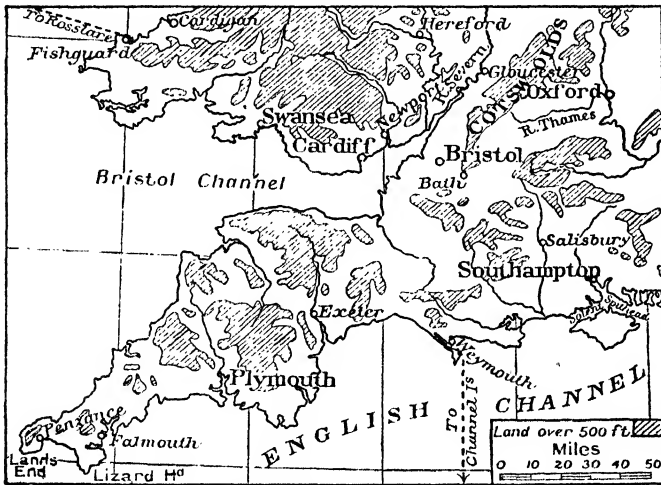


FIG. 64. South-Western England and South Wales.

docks, well protected from gales and from an enemy. Farther east, low flat coasts and steep chalk cliffs alternate, and at last we pass through the Strait of Dover, between England and France. It is so narrow that the one coast can generally be clearly seen from the other.

London and the Thames. We reach the North Sea, turn up the estuary of the Thames, and enter London docks. Whether we go north, south, or west from London, we have to climb the rounded slopes of chalky downs, on which many sheep feed. When we reach the summit we look down

over steep slopes to fertile plains below. If we follow the Thames to its source, we must pass through a deep gorge at the south of the chalky Chilterns and, after leaving Oxford, rise again over rounded grass-covered slopes of the limestone Cotswolds, which feed many sheep.

The Severn. From the summit of these hills we should descend steeply to the flat plains drained by the Severn. If

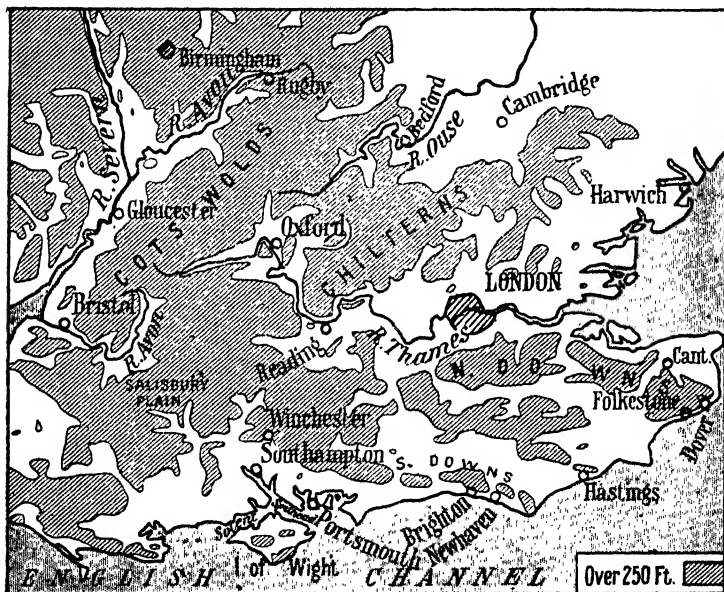


FIG. 65. The Thames Basin.

we follow the Severn to its mouth we reach Bristol, the port of the Bristol Channel.

If we follow the Severn northwards we pass through a gently undulating country crossed by streams coming down from the Welsh Highlands in the west. Above Shrewsbury we see the Severn itself descending from these highlands.

North of the Severn another river, the Dee, issues from the highlands, but flows northwards. Chester is the chief town in

the Dee valley, commanding a route to the west along the coast.

The Welsh Highlands. The Welsh Highlands are rounded, and often rugged, mountains. On the east, where it is drier, sheep are grazed ; but in the west, where stormy winds from the Atlantic bring abundant rain, the rivers are short and rapid.

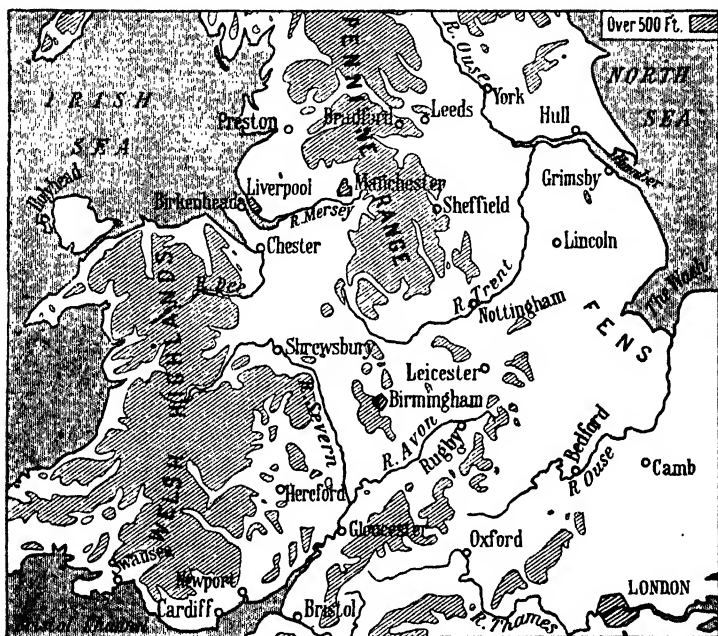


FIG. 66. Towns of Central England.

West of the Severn is the hilly land of South Wales. Deep, narrow valleys opening to the south have railways running along their sides to carry the coal from the valley mines to Newport, Cardiff, or Swansea, the coal ports of South Wales.

The Midlands. East of the Severn we might follow its tributary, the Avon, through broad, grassy meadows into a more undulating country, covered with grass and set with

clumps of trees. No great height of land separates the waters flowing west from those flowing east. The chief of the east-flowing rivers is the Ouse, which we might descend, through gently undulating country, to a flat plain, well drained and cultivated, in which more wheat and barley are grown than anywhere else in Britain. The lower part of this is the Fenland round the Wash, which was once a great marsh, but has been reclaimed by draining and dyking.

The largest towns in this Midland region are near coalfields and manufacture either iron (Birmingham) or pottery (Stoke) or hosiery and boots (Leicester) or lace (Nottingham).

These and other towns are usually built where many roads meet.

The West Riding of Yorkshire. Let us now cross England from east to west, but farther north. We first enter the broad estuary of the Humber, with the ports of Grimsby on the south and Hull on the north. At the head of the estuary two broad valleys open: one to the south drained by the Trent, one to the north drained by the Yorkshire Ouse, with belts of rich meadow land and cultivated fields. The land begins to rise; and following the Aire, a tributary of the Yorkshire Ouse, we reach Leeds. All round are coal-mines, and great factories whose chimneys send forth black smoke. This is the woollen manufacturing district, of which Leeds and Bradford are the chief centres. Up each of the valleys the railway runs to other manufacturing towns, while the hill pastures provide food for many sheep.

South Lancashire. We now cross the Pennine Range, and descend on the western side into a much damper land, where rain falls frequently. Here again each valley has its railway and its factories, and, in the plain beyond, great coal-mines. We have reached the cotton manufacturing district, of which Manchester is the chief commercial centre. Raw cotton cannot be grown in Britain, and must be brought from the Southern United States, Egypt, or some other cotton-growing region. So important is cotton manufacturing that a great ship canal,

36 miles long, has been cut, to make Manchester a port for ocean-going steamers. This canal joins Manchester to the estuary of the Mersey, at the mouth of which are Liverpool on the eastern and Birkenhead on the western bank, the most important ports in the country after London. They trade with all parts of the world.

Northern England. Still farther north the hills become higher, and occupy more of the land between the Irish Sea in the west and the North Sea in the east. The lower slopes of the valleys grow oats and barley, especially in the east; and on the upper slopes are sheep; while in the west cattle are more important. Round the towns are coal-mines, and, round the lower Tees, in the Cleveland Hills, iron-mines.

Engineering and shipbuilding works are important in such towns as Newcastle and Middlesbrough.

Southern Scotland. Farther north still we cross the Border, and enter into Scotland. Here the hills stretch from sea to sea. The valleys contain small manufacturing towns, the most important being the woollen centres of the Tweed basin.

Central Scotland. Some of these we pass on our way to Edinburgh, the capital of Scotland. It is built, like Athens, round a great rock, where there is only one narrow route between the hills and the sea. Its port is Leith on the southern bank of the estuary of the Forth.

This wide estuary leads far into the heart of a plain which crosses Scotland from east to west. On the west coast the estuary of the Clyde runs far inland like that of the Forth in the east. At the head of the Clyde estuary is Glasgow, the second largest city in Britain, with coal- and iron-mines all round it, and great shipbuilding works on the shores of the Clyde below it.

From Glasgow or Edinburgh the route to the north crosses the Forth at the head of tidal waters at Stirling, which has a castle built on a rock guarding the pass between the Campsie Fells and Ochil Hills. North of the Ochils the estuary of the

Tay penetrates far into the land from the east, and Perth is built at the head of tidal waters at the western end of the Sidlaw Hills. Dundee, famous for jute manufactures, lies on the north



FIG. 67. Northern England and Scotland.

side of the Tay estuary, where a bridge two miles long has been built across it. A long fertile plain, Strathmore, or the Great Vale, lies between the Sidlaws and the Highlands to the north. Aberdeen lies near the north-east corner.

Western Scotland. North of Glasgow, in the west of Scotland, the hills become higher and more rugged. Great fiords run far into the land, with steep sides and waterfalls, like those in Norway, but on a smaller scale. The people live by fishing and cultivating small patches of land at the sides of the fiords. The population is very scanty, and there are few towns. Oban is the centre from which most boats sail.

The Highlands of Scotland. On the eastern side of Scotland, the land is lower near the coast, but rises inland to highlands which are cut by deep valleys, often containing long, narrow lakes. The most important rivers are the Tay, which drains many of these lakes, the Dee, and the Spey. The railway crosses from the Tay to the Spey valley, and joins Perth to Inverness, Elgin, and other towns on or near the Moray Firth. This great bay is bordered by lower land which is very fertile. From it, a long narrow rift valley, Glenmore, with beautiful lakes called Loch Ness and Loch Lochy, leads to Fort William and Oban on the west coast. A ship canal, the Caledonian Canal, follows Glenmore.

In the north-east, the long narrow valley lakes persist, but the land near the east coast is flatter. Beyond the fishing town of Wick is the stormy Pentland Firth, where the tides are very strong and the currents dangerous. Across it are the Orkney and the Shetland Islands, which are also fishing centres.

North-east Ireland. From south-western Scotland many boats sail to Ireland, from Greenock or Ardrossan to Belfast or Londonderry, or from Stranraer to Larne by the shortest sea passage between Great Britain and Ireland. The north-east or Antrim region is a great plateau of igneous rocks, which in some places are shaped in columns. These form the Giant's Causeway in Ireland and similar columnar rocks are found at Fingal's Cave in Staffa, off the island of Mull in Scotland. Farther south the Mourne Mountains rise to considerable heights.

Belfast. Belfast Lough or Bay lies between the Antrim and Mourne Mountains, and gives an opening to the interior.

At its head is built Belfast, capital of the State of Ulster, the north-east part of Ireland. It manufactures local and imported flax into linen, and has great shipbuilding works. It obtains its supplies of coal and iron from the western coal and iron fields of Scotland and northern England.

North and West Ireland. Sailing round the north coast we

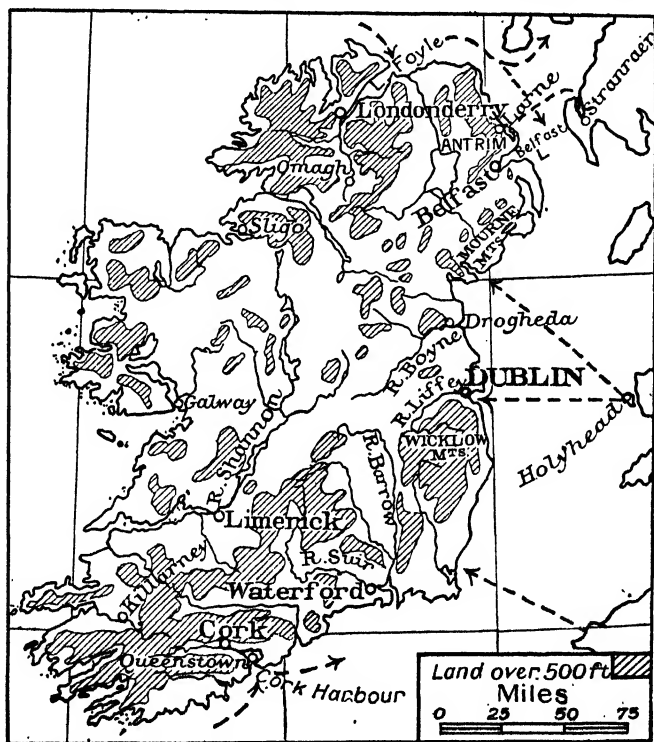


FIG. 68. Ireland.

pass many mountains, broken here and there by low valleys through which rivers come from the interior. The most important opening is Lough Foyle, with Londonderry, famous for shirt making. The west coast is very similar.

Central Ireland. Near the south-west corner we enter the estuary of the Shannon, with Limerick at the head. Passing

up the Shannon we cross a flat region where the river widens out into long lakes. Much of the ground is boggy or covered with rich green grass on which many cattle are grazed. The centre of Ireland is a low-lying plain.

Southern Ireland. Leaving the Shannon and continuing south along the coast we pass numerous long, narrow bays, running east and west. Half-way along the south coast is Cork harbour, where we find great Atlantic liners calling at Queenstown, a town built on an island in the middle of the harbour, at the head of which is the city of Cork. In the south-east another harbour leads to the city of Waterford.

Eastern Ireland. We turn northwards, and the hills on our left gradually rise to the beautiful Wicklow Mountains, the northern end of which slopes steeply down to a flat plain. Here the river Liffey enters the sea, and at its mouth stands Dublin, the capital of the Irish Free State (that is, Ireland excepting Ulster). This commands the routes to the interior by the flat plains between the Wicklow and Mourne Mountains; and to England via Holyhead and North Wales. Drogheda is built farther north at the mouth of the Boyne.

XVII. THE NATURAL REGIONS OF THE OLD WORLD, WITH COMPARISONS WITH THOSE OF THE NEW WORLD.

Configuration. Turn back to p. 49 and read the comparison between North and South America, and examine Figs. 26 and 30. The configuration of the Old World is not so simple (see Figs. 39, 43, 55, and 61). Vast lowlands extend far southwards from the Arctic Ocean as in North America. They are bordered by highlands on the Atlantic and Pacific sides. Here their likeness to those of North America ends. In North America the lowlands are continuous from the extreme north to the extreme south (see Fig. 30). In the Old World they end in a belt of lofty land which is almost continuous from the Atlantic to the Pacific.

Africa, Arabia, India, and South-east Asia all project to the south from this belt of mountains, and all are high with few lowlands. Australia reminds us of America, but reversed, for its mountains are in the east, and beyond the lowlands to the west rises a wide tableland.

Temperature. Compare the temperature maps of Figs. 32

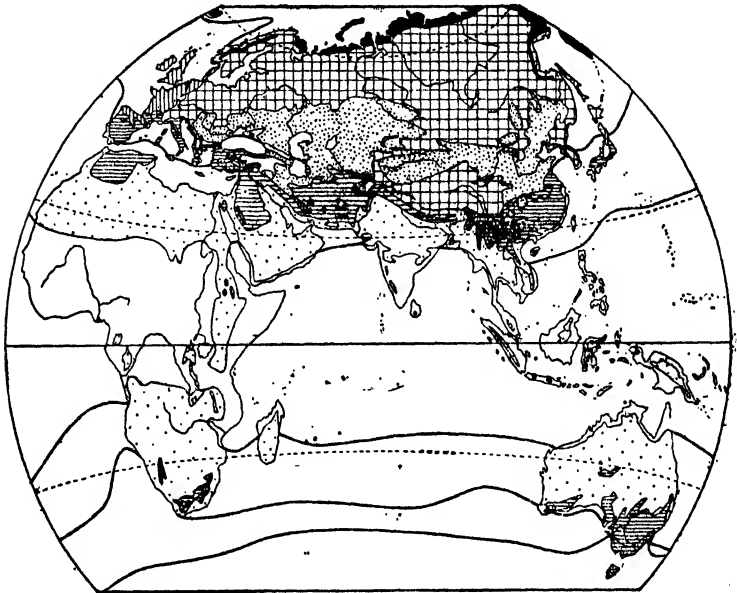


FIG. 69. Temperature Regions of the Old World, neglecting mountainous areas. In the areas left white it is always hot; in those where the dots are far apart, the winters are warm, the summers hot; in those where the dots are closer, the winters are very cold and the summers hot. In areas with horizontal lines the winters are cool and the summers hot, but where there are dots between the lines the summers are warm, not hot. In areas with vertical lines the winters are cool and the summers warm. In areas with cross rulings the winters are bitterly cold and the summers warm. In the black areas it is never warm.

and 69. Notice the corresponding areas. They are larger in Eurasia than in North America.

Winds and Rainfall. Read again the account of climate on pp. 51 to 57. Compare Figs. 34 and 70; compare also Figs. 35 and 71. Notice that in the Old World as in the New

World in summer the winds blow on the whole from sea to land, and in winter from land to sea. The rainfall is greatest in summer and least in winter, except in (a) the western sides of the continents in the stormy westerly wind belt, and (b) in some east coastal regions which are in the normal trade-wind area in winter, but are in the lee of the rain-bearing monsoon in summer; for instance, Annam in

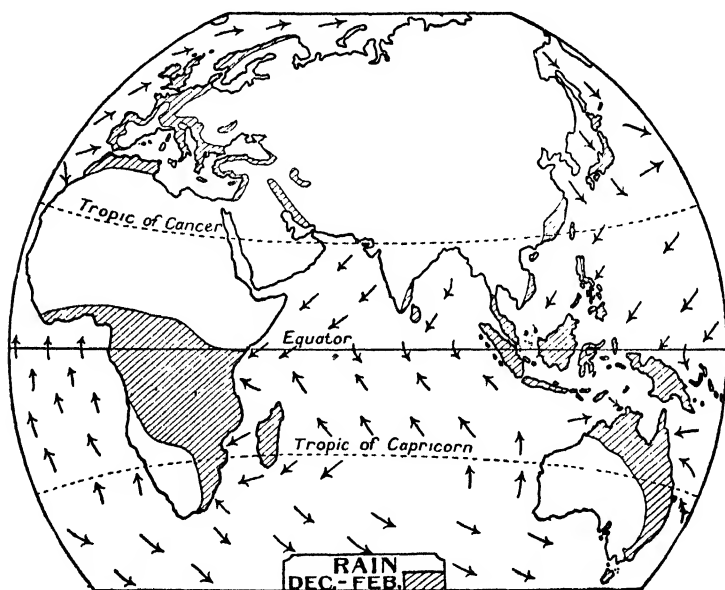


FIG. 70. Rainfall and Winds in December, January, and February. Contrast the conditions north of the equator, where it is winter, with those south of the equator. Compare with the similar map of America (Fig. 34).

South-east Asia. Notice the type of rainfall of the Mediterranean region, where it is dry in summer but wet in winter.

Now compare the maps of mean annual rainfall, Figs. 33 and 72. The areas of little, moderate, and heavy rains are very similarly placed in the two maps. In both it is heavy at the equator, and passes gradually in the west and centre through belts of moderate rainfall to desert. On the east

coasts the rainy belt is practically continuous, and unbroken by great dry areas such as are found in the west. Notice the effect of the American midland sea and compare it with that of the seas of South-east Asia. In similar latitudes compare North Africa and Australia, with these, and with each other.

Beyond the desert in the west is a belt of moderate rainfall.

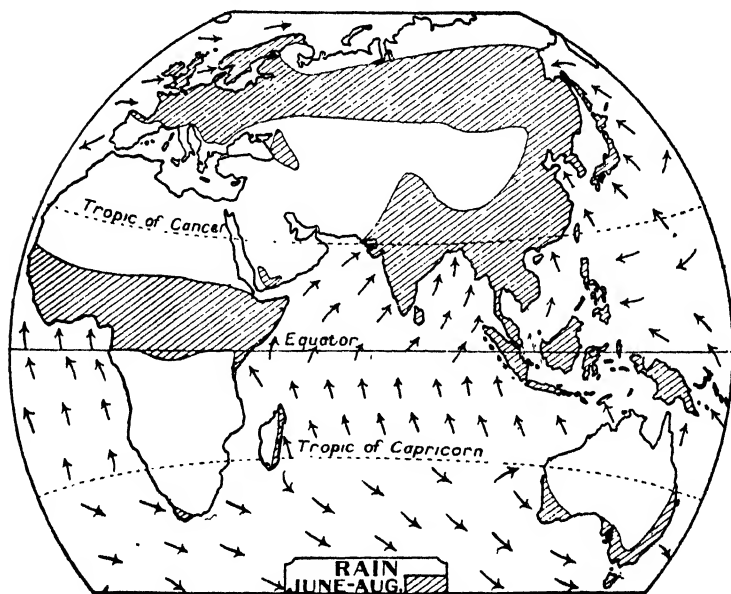


FIG. 71. Rainfall and Winds in June, July, and August. Contrast the conditions north of the equator with those south of the equator, where it is winter. Compare with the similar map of South America (Fig. 35). Compare the four maps of Figs. 34, 35, 70, and 71.

Along the coast this passes into an area of heavy rains. On the east coast a similar but smaller rainy area is found, with a strip of moderate rains farther inland. In the centre moderate or slight rains are found, owing to the distance from the sea.

In the polar regions there is very little rain owing to the cold.

Vegetation. The surface features of the Old and New World should now be compared. Study Fig. 31 and p. 51, and then look at Fig. 47 and compare it with Fig. 31. Compare

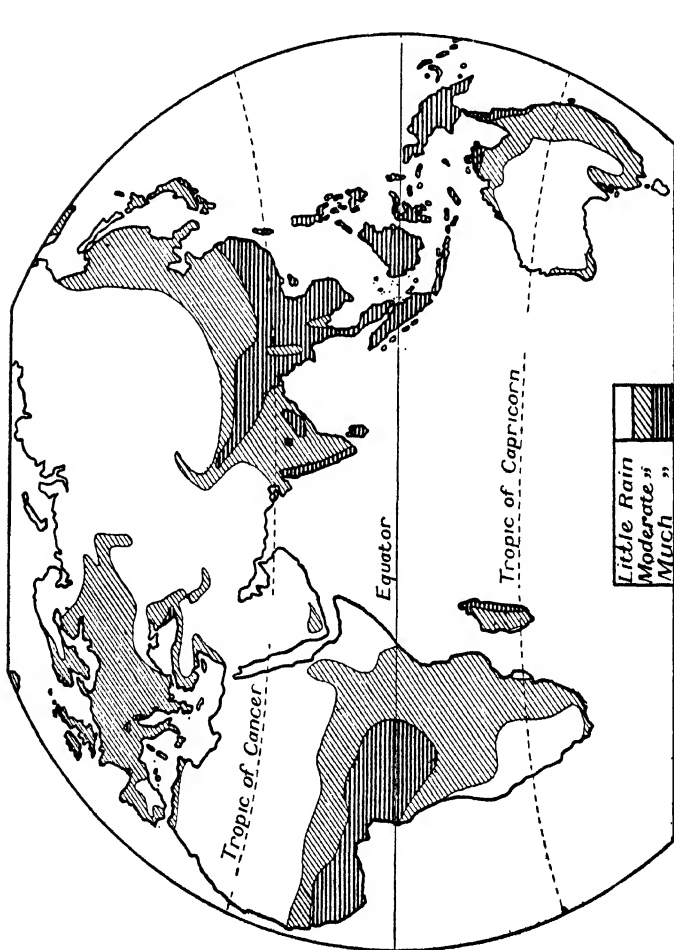


FIG. 72. Rainfall of the Old World. Compare the west and east coasts in similar latitudes. Compare parts similarly situated, but one north, the other south of the equator. Compare with the rainfall map of America (Fig. 32).

Figs. 50 and 31 in similar latitudes. Now read pp. 58 and 59 again. Try to make out the natural regions of the Old World for yourself before reading the next paragraph.

The Natural Regions of the Old World. Round the equator we find a region where it is always warm, always wet, and where the surface is covered with dense forests. In the East Indies this is an island region, in Africa it is continental. Part of Central Africa is so high that both temperature and rainfall are insufficient for these dense forests. Then a savana region is found. (See also Figs. 47, 50.)

To the north and south of the wet forests are regions where it is always warm, where the summers are wet and the winters are dry. These are open woodlands and savanas, and are found in Africa, South Asia, and North Australia.

North and south of this again we find in the centre regions which are very warm in summer but cold in winter, with rain falling in the summer. These are the steppes of Eurasia.

To the east of this the summers are warm, the winters cold, and rain falls all the year round. This forms the forest areas of eastern Asia and Australia, and South-east Africa.

Farther north still in Asia comes a region where the winters are excessively cold and the summers cool or cold, where little rain falls and the ground is frozen nearly all the year round. This is the region of the barren grounds or tundra.

Still farther north the snow and ice never melt.

In the west of Africa and Australia we find beyond the tropical forest and savanas a region of desert extending far into the interior. In Western Asia there is a similar desert region which extends much farther inland to the north-east, owing to the mountain barrier, which keeps the rain from reaching the interior.

Then comes a region of warm summers and cool winters with rain in winter. Here evergreen forests are found on the windward sides of the mountains, but deserts extend along the leeward side. This region resembles the Mediterranean, and is found also in South-west Africa and the south of Australia. Beyond is a region of cool summers and mild winters with rain at all seasons. These regions are heavily forested. They are found in North-west Europe, Tasmania, and New Zealand.

We have considered the natural regions of the lowlands. In each region, however, the highlands may rise high enough to make both summer and winter much colder than in the lowlands. Then we find a colder type of region rising like an island out of a warmer region. The savana lands of Borneo rise above the wet hot forests. The perpetual snow and ice of the Himalayas rise above areas where similar forests skirt the base of the mountains. The mountain slopes have belts of temperate grass and wood land between the ice desert and the wet jungle. The lofty plateau of Tibet may be compared with that of Bolivia.

The Occupations of the Peoples of the Natural Regions of the World. In the hot wet forests the natives live mainly by hunting, fishing, and collecting natural products. It is difficult to move from place to place in the forest. The climate is not healthy. The people are not numerous. They scarcely practise agriculture. They make clearings for manioc in South America, for bananas in Africa, for sago palm in the East Indies. Rubber, palm-oil, copra, and timber are among the chief products of this region. The few white men in these regions are mainly traders, missionaries, administrators, or managers of plantations or mines. Many rubber, cacao, coconut, and other plantations, and mineral workings such as those of Malayan tin, have been started, mainly by white men.

On the open wood and savana lands the climate is much healthier. Both plant and animal life are more varied. The land supports a denser population. Cattle rearing is common. Agriculture is practised, although in a somewhat primitive manner. Cereals are grown. They can be preserved for a much longer time than the foods of the hot wet forests. Wood is available for fuel. Fuel is not required for warmth, but for cooking and for working metals, more particularly iron. Villages are larger and fair-sized towns are not uncommon. People can move about more easily from place to place. Trade is much more developed than in the wet forests. The conditions described in the Sudan on p. 106

show what the peoples in such regions can do. In some parts, especially of Brazil and the islands of the West Indies and other tropical lands where very varied climates are found at different heights, white men have plantations of cacao, coffee, cotton, and tropical fruits, which are usually cultivated by natives.

The grassy steppes have a more extreme climate and less rainfall, more grass and fewer trees. They are healthy. Here man is usually a rearer of such animals as live on grass, especially cattle, sheep, and goats. The horse is trained for riding, and in drier parts is replaced by the camel. The population is not so dense as on the savanas. There are few settlements and hardly a town. The people are nomadic.

The European has begun to settle on these steppe lands, which he finds healthy. He raises stock, not so much to supply himself with milk, meat, clothing, and shelter, as to send to market. For this he has built long railways, which are easily made on the undulating grass lands except where these are crossed by wide valleys liable to flood when melting snow or summer rains fill the usually almost empty river-beds with raging torrents. West-central Canada and the United States, western Argentina, and the grass lands of South Africa and of Australia are at this stage.

The European has also found that the richer parts of the steppe lands, which have a fair rainfall, can be cultivated. Here he grows wheat, barley, oats, rye, and other grains. Population is denser, railways more numerous, and great cities are developing—e.g. in the more fertile grass lands of central Canada and United States, Argentina, and Australia.

Those who have carried out these wonderful changes have mainly sprung from peoples living in southern, central, and western Europe—part of the temperate forest lands. These temperate forests, though not so impenetrable as the hot wet equatorial ones, are not easily crossed. Their inhabitants were originally all hunters and fishers. The temperate forests

are more easily cleared than the equatorial ones. At one time clearings were made by burning, but now where railways and rivers are available the timber is carried to distant markets.

Europe—with its forests yielding timber for building, for fuel for heating, cooking, smelting ores; with its navigable rivers and many inland lakes and seas rich in fish; with agriculture in the forest clearings—has slowly developed, until it is one of the densest peopled and most productive parts of the world. People of European stock have wandered to all the temperate lands of the world. They now control most of the best parts of the habitable globe except Eastern Asia.

Here, under exceptionally favourable conditions, Chinese and Japanese civilizations developed, and are likely to develop still more. This is another region from which a vigorous population has spread to far distant lands. It too is a forested land in the clearings of which agriculture has developed. We may compare Eastern Asia, North and South America, and Australia in similar latitudes.

Two types of region have hardly any inhabitants—the dry deserts and the icy wastes. The dry deserts are dotted with fertile oases in which agriculture is carried on. Round the desert margins are poor scrub lands where goats and some sheep can be reared. This forms a link between the desert and the richer agricultural grass lands. From this intermediate pastoral region the mounted nomads have raided and often conquered not merely the handful of people in the oases, who pay tribute to them, but also the agricultural peoples of the fertile lands beyond. Europe and China have more than once been overrun by these nomadic horsemen.

The icy wastes are found round the regions of perpetual snow near the poles and on high mountains. Few people live in them. The dwellers on the margin of the Arctic live entirely on the produce of the sea. Elsewhere the dwellers in the upper mountain valleys have scanty flocks of goats or sheep. In these cold regions the people use special animals to carry them or the articles of their scanty trade. Thus the camel is

used in the desert, the yak in the mountains of Tibet, the llama in the Andes, the reindeer and the dog in the tundra of the Old World.

Every geographical region has its own type of life. Each region has its own customs and traditions. Geography should help us to understand these people and their point of view. We must not assume that what is best for us is best for people of other parts of the world. We must not judge and we must not despise the people of other regions and with other habits of life. As it becomes easier to move from place to place, every region becomes less and less self-dependent. We have only to look into the shop windows of the High Street of the nearest town and ask where the various things shown in them came from to realize this. We depend on these people as much as they depend on us. Let us try to understand them better.

The British people have more interest in this than most other people, especially those who dwell in the British Isles. No other people are so dependent on others for food and raw material or for customers for their manufactures. The English language is now spoken by over 125,000,000 people. This links the peoples of the greater part of North America, South Africa, and Australasia with those in the British Isles. The British lands, as we have seen, are found in every continent, in every clime ; and among the British citizens are people of every colour, of almost every race, at every stage of civilization. The British Empire is thus much more complex than the English-speaking peoples, and embraces about one-fifth of the human race. It is this complexity that makes it specially necessary for us to study geography in order to understand the various conditions, modes of life, and customs of the very different races which compose it.

EXAMINATION QUESTIONS

CHAPS. I AND II.—What materials do the Eskimo use for canoes, hunting spears (shaft and point), needles, thread, and lamp-oil? How do the people live in the Barren Lands? Will they always live in one place? Does the season make any difference? What kind of houses will be used? Describe the life of the forest Indians. How do they get materials for canoes, tents, and firewood? Why is Winnipeg a great wheat market? How do rivers make new land? Do they do any harm in the process? Illustrate your answer from the Mississippi. Why are (a) Minneapolis, (b) St. Louis well situated? What are the chief occupations? Why? What is meant by the maize belt? How is the maize chiefly used? What advantage is there in this? Explain the terms—tributary, distributary, delta, alluvial land.

CHAP. III.—What is lumbering? Which is the lumbering season? Why? Why is milk made into cheese in summer in E. Canada and into butter in winter? Why is Ottawa well situated? With what other town can you compare it in this respect? What industry is important? What is meant by saying that Niagara Falls are moving up stream? Why is Chicago well situated? What industries are important? Why? Why is less wheat grown in the western plains of North America than in the eastern? What occupations are important in the west? Why? Explain what is meant by the snow line. How is a glacier formed? What course does it take? What is a moraine? What is a morainic lake? What is a fiord? Where are fiords found? How do the Pacific Coast winters differ from the Atlantic Coast winters? Which are most like ours? Describe the natural resources and the occupations of British Columbia.

CHAP. IV.—Why is Victoria, B.C., important to the Empire? Why is San Francisco well situated? What does it export? When does California receive most rain? Least? What is a desert? Describe the life lived in the Californian desert. Describe some changes you would see in ascending from the sea coast of Central America to a height of about 6,000 feet. Does any comparison occur to you? Agriculture is carried on in very dry coastal regions of Western South America. How is water obtained? What are llamas? How are they useful to man? Compare California and Chile. What town corresponds with San Francisco? Describe life on the high plateau of Bolivia. Which part of South America resembles British Columbia, and how?

CHAP. V.—What are the pampas of South America? Do they correspond with any region of North America? Is there any resemblance in the occupations of the people? In what latitudes is the Amazon basin? Describe it briefly. Does it correspond with any region of North America? Give your reason. Describe the constructive work done by volcanoes. Why is New York well situated?

CHAP. VI.—Make a table of the succession of vegetation zones between the Arctic Ocean and Cape Horn. Can you suggest any resemblances north and south of the equator? How is the climate of a region affected by being near the sea? What differences may be noticed between the windward and leeward slopes of mountains? Can they be explained? What are trade winds? Are they wet or dry winds? Explain why.

CHAP. VII.—Briefly compare Norway, Sweden, and Russia with the corresponding parts of North America. Is there any resemblance in the occupations? What is a steppe? What kind of climate has it? Why? Are there any steppes in North and South America? How does the dweller in the European steppes live? Explain why if you can. Compare Canada and Siberia.

CHAP. VIII.—Describe the yellow lands of North China. Explain clearly why the lower Hwang-ho flows above the level of the plain. Describe the agriculture of the Yangtse basin. What is meant by a monsoon climate? What part of Asia lies in the equatorial forest belt? Why is the population scanty? How do the people get most easily from place to place? Describe some of the uses of the bamboo.

CHAP. IX.—How are coral islands formed? What kind of water is necessary for their existence? Compare New Zealand with any part of the world which you think it resembles. What peculiarity of the climate of Victoria reminds you of California? Are there any other resemblances? Why is the interior of Australia dry? What kind of region is that on the margin of the desert? Describe the sheep-grazing regions of Australia. How can their area be extended? Can you compare them with any other parts of the world? What observations would lead you to believe that Rockhampton was on or near the Southern tropic? When would most rain fall? Why?

CHAP. X.—Describe fully the plain of the Ganges. Which part of India is a desert? Why? Where is cotton grown in India? Where is wheat? Why is wheat a winter crop? Compare Mesopotamia with the plain of the Ganges. Why is the Suez Canal important?

CHAP. XI.—Explain fully why Egypt is fertile. With what other parts of the world would you compare it? Why is Khartoum well situated? What kind of region is Uganda? With what other parts of the world would you compare it? Why is it difficult to reach the interior of Africa from the sea by sailing up the rivers?

CHAP. XII.—With what parts of South America would you compare (a) the veld, (b) the Kalahari desert, (c) Natal, (d) the extreme south-west of Cape Province? Show the resemblance as fully as you can. Describe the vegetation zones of Africa.

CHAP. XIII.—Compare the Congo basin with the corresponding region of South America. Can you suggest any reason why a very great river occurs in almost the same latitudes in both? What type of region does the Sudan belong to? How does it differ from the Sahara? What effect has this difference on the kind of dwellings? Why is the desert extremely hot by day and cold by night? Describe an oasis. What is the largest oasis in the world?

CHAP. XIV.—Why, do you think, is Northern Africa described in the same section as Spain? Compare Central Chile and the south-eastern coast of Spain. How does the vegetation round Bilbao in Northern Spain differ from that round Gibraltar in Southern Spain? With what North American route would you compare the Rhone-Saône route? To what North American town does Lyon correspond? Why are the following towns well situated:—Marseille, Bologna, Milan, Constantinople, Damascus? What is the most important characteristic of the Mediterranean climate? In what other parts of the world does it occur?

CHAP. XV.—Why is Vienna well situated? With what parts of the world would you compare Hungary? Of which of the natural zones of vegetation does it form part? How do you account for the chains of lakes north and south of the Alps? The Swiss have fortified the St. Gotthard pass very strongly. Explain why. Why is the Rhone muddy when it enters Lake Geneva and clear when it leaves it? What effect has this on the lake itself? How has the plain of the Po been formed? Describe its occupations. Describe fully the course of the Rhine. How does North Germany differ from South Germany in surface features? Describe a valley in the Black Forest and explain why the different occupations are carried on. Why is Belgium more densely populated than Switzerland? Compare the situation of the following groups of towns—Basle and Cologne (Cöln); Vienna and Dresden; Marseille and Rotterdam; Bordeaux and Havre.

CHAP. XVI.—Why is the English Channel one of the great waterways of the world? Why is Southampton well situated? Compare it in this respect with London. Why is the woollen manufacture important in highland valleys? Give examples. Which of these is the most important seat of the industry? Why? Why is the cotton manufacture chiefly carried on in Lancashire? Why do most Scottish people live in the region between Glasgow and Edinburgh? Why is the east of Ireland more prosperous than the west? Why are Belfast and Dublin well situated?

CHAP. XVII.—What is a natural region? Divide Great Britain into natural regions. How do temperate forests differ from tropical forests? Compare the life of savana and steppe peoples. Why are pastoral regions less thickly populated than agricultural regions? How does European colonisation affect (a) a forest region, (b) a steppe region, (c) a semi-desert region?

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