THE GEOGRAPHIC CONQUESTS OF THE NINETEENTH CENTURY.

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IN 1800, the year that Jefferson was first elected President of the United States and Napoleon won the history-making battle of Marengo, about one-fifth of the earth's land surface was known. The physical features of the remaining four-fifths were partly supplied by imaginative mapmakers or left a blank on the charts given to the public. In 1900 approximately ten-elevenths of the earth's land surface may be described as known and only one-eleventh as unexplored.

nineteenth century and is the record of one man's work and life. Mungo Park, a Scottish surgeon, then but 24 years of age, but already well known for his discovery of several new fishes in Sumatra, in 1795 undertook to determine for the African Association of London the course of the Niger. Starting from Gambia in December he reached Segu on the Niger in the summer of 1796, and succeeded in ascending it for several hundred miles as far as Bamaku. Ten years later, 1805, he returned to Bamaku, resolved this time to follow the river which he had been the first to reach, till it entered the sea. For nearly 2,000 miles he hugged its bank in a canoe with four com-

encouragement, dependent upon his scanty means and unflinching courage for the fulfillment of his broad plans. His genius laid the foundations upon which Stanley and the explorers who followed him have worked.

Livingstone had come to Africa in 1840 as a medical missionary. For nine years he had been penetrating farther and farther from Cape Colony until in 1849 he was stationed at Bolobeng, 80 miles north of Mafeking and 1,100 from Cape Colony. The chief of the people among whom he was laboring told him of a lake to the north beyond the Kalahari Desert and of a powerful chief who ruled over many tribes. Livingstone, animated with the sole purpose of extending his religion, determined to search for the chief and the lake.

On June 1 he set out, and after two months reached Lake Ngami which he found set in the midst of a luxurious, densely populated country. He was not able, however, to advance farther and thus returned to his station without seeing the chief.

Two years later he renewed his effort, passed Lake Ngami, and finally reached the Upper Zambesi at a place called Sesheke, over 1,000 miles from its outlet. Livingstone was a Scotsman and had never seen a real river before, and we can imagine what an effect this mighty stream, discovered 1,000 miles from the coast, and whose origin or outlet he knew not, must have had upon him.

He was now 750 miles from his mission post, and through the entire march he had been continually discovering lakes, rivers, and largely populated towns whose existence had previously been unsuspected. It came upon him that his true mission was to open up Africa, and he therefore returned to the Cape to prepare himself for the work.

In the summer of 1852 he retraced his route to the Upper Zambesi and followed its basin westward for some distance and then pushed farther west until he finally reached the Atlantic Ocean at St. Paul de Loanda. He then returned to the basin of the Zambesi. In all his travels Livingstone never named any lake, river, or mountain that he discovered, but he had not descended the Zambesi many miles before he came upon a grand fall whose waters were dashed upon the rocks 300 feet below. A loyal subject, he named the falls after his Queen, "Victoria." He finally reached the Indian Ocean at Quilimane, thus being the first white man to cross the continent.

In 1858 he began his second great exploration, which resulted in tracing the course of the Shire River, a tributary of the Zambesi, and the discovery of Lakes Nyassa and Shira, feed lakes of the Zambesi.

The problems of the Niger and Zambesi had thus been solved, but the Nile and Kongo still remained a mystery. In 1859 Captains Burton and Speke started from Zanzibar to discover a lake of which rumors had for a long time been heard, and in a few months succeeded in reaching Lake Tanganyika. Returning to the coast they separated, Burton taking a southerly route and Speke a more northerly one. Speke beheld in the far distance another great lake, the Victoria Nyanza, and in 1861 returned with Grant to explore it. On circling the lake they found a large river leading to the north, which they followed for some distance, when they came upon Baker (afterward Sir Samuel), who had been following it, the White Nile, from Khartum. Baker later continued his search westward and discovered a smaller lake which he called "Albert Nyanza." Thus, by the discovery of Victoria Nyanza and Albert Nyanza the feed lakes of the Nile were definitely determined.

In 1865 Livingstone set out for the region of Lake Tanganyika and discovered Lakes Moero and Bangweolo, and explored the Luapula River, which flows from Lake Moero and is the main head stream of the Kongo, though he did not know it, but probably suspected it.

The world became alarmed at not hearing from him for some time, and Stanley was dispatched to find him by James Gordon Bennett, of the New York Herald.

Stanley cut across from Zanzibar and found him at Ujiji, on Lake Tanganyika. He had been surrounded by Arab slavers, his supplies destroyed, and his communication with the seacoast interrupted. After being

MAP OF AFRICA, SHOWING MAIN ROUTES OF EXPLORATION.

In fact, much less than one-eleventh remains unknown, for the unknown area is so distributed in both hemispheres that nowhere except at the North and South poles are there remaining large unexplored tracts. This will be readily seen by a glance at the maps that accompany this paper.

The eighteenth century had been noted for the explorers of the seas, the nineteenth was pre-eminent in men who split open great continents and laid bare to the eyes of mankind their mountains, rivers, and lakes.

AFRICA.

One hundred years ago Africa was a gigantic black plate with a white rim which had been tolerably well traced by Vasco de Gama and other bold Portuguese adventurers of the sea. Though nearer to Europe than any of the continents, stretching as it does parallel to the south coast of Europe for 1,000 miles, the deadliness of its climate had averted the greedy eyes and hands of Spain, France, England, and Portugal, who were battling for dominions in the Americas and India thousands of miles farther away. They came to Africa for slaves to develop the new world, and that was all they sought in the Dark Continent.

To-day hundreds of sharply defined lines of light, the routes of the patient Livingstone, of grim Stanley, of Baker, Speke, and Mungo Park, like the piercing beams of a searchlight have penetrated the continent from north and south, from east and west, until there remain black patches only here and there, and these are partly lighted by the rays radiating from the main lines of exploration. Every square mile of this great continent, excepting Morocco and Abyssinia, has, moreover, been peacefully parceled out within the nineteenth century to the powers of Europe, while the possession of India and the Americas cost thousands and tens of thousands of lives lost in battle.

The history of the exploration of Africa centers in the discovery of the sources of the four great rivers of the continent, the Niger, the Zambesi, the Nile, and the Kongo.

In a mighty torrent they swept into the Atlantic and Indian Oceans on the west and east and into the Mediterranean on the north, but of the four, the Nile only was known for any considerable distance. Bruce, in the last half of the eighteenth century, had penetrated from the Red Sea to the head-waters of the Blue Nile in Abyssinia and had followed the latter to its junction with the Nile near Berber, and then down the Nile to Cairo; but he had not solved the secret of that everflowing stream whose waters had for thousands and thousands of years made the valley of Egypt the granary and garden of the world.

To-day the Nile has been scientifically explored for its entire length of 3,400 miles; the Niger, with the exception of a small portion of its middle course, for 2,600 miles; the Zambesi, for 1,500 miles; and the Kongo, which in volume is exceeded only by the Amazon, for nearly 3,000 miles.

The course of the Niger was determined early in the

panions and had all but reached its outlet, when his canoe was upset in an attack by the natives at Bussa and he was drowned.

During nearly fifty years after the death of Mungo Park, exploration in Africa was confined to the Great Sahara Desert. Denham and Clapperton in 1822-24 pushed southward from Fezzan through the burning sands and discovered Lake Tchad, then to Bornu, and thence to Sokoto on the Niger. Several years later Clapperton ascended the Niger from its mouth to Sokoto, where he died.

Another crossing of the desert was made by a brilliant young Frenchman, Caillié, who succeeded in reaching Timbuktu, the mysterious African capital, in 1828. Nearly thirty years later Barth connected the routes of Caillié and Denham, and in 1867-74 Nachtigal proceeded from the Niger to Lake Tchad, then eastward through Wadai and Darfur to Egyptian Sudan. Ringer, Foureaux and Lamy, and numerous

FIG. 1.—AFRICA AS KNOWN IN 1800.

The darkened portions in this and succeeding maps show the unexplored areas.

explorers of later years, have done important work in erasing the blanks between the routes of these great pioneers, while Rohlf, farther north, explored southern Algeria, Fezzan, and the edge of the Libyan Desert.

The patient, persevering work of Livingstone made possible the opening up of the southern half of the continent. For thirty-three years he toiled in the fearful heat of the tropics, pausing only for two brief visits to England. Often he was without money and

FIG. 2.—AFRICA AS KNOWN IN 1900.

relieved by Stanley, Livingstone returned to Lake Bangweolo, where he died in 1873. His faithful followers bore his body to the seacoast and later it was carried to England and buried in Westminster Abbey.

Stanley took up the work of Livingstone. After circling Victoria Nyanza, he explored Albert Nyanza and Tanganyika and discovered Albert Edward Nyanza. He then descended the Lualaba Basin, which brought him to the Kongo, which he followed to the ocean.

Stanley was thus able to solve the last great African problem, namely, that Tanganyika and the waters

* From the Annual Report of the Smithsonian Institution for 1900.

the Appalachian or Alleghany Mountains." Immediately after the Louisiana Purchase Lewis and Clarke were dispatched to the new land to explore it, and they made their historic march up the valley of the Missouri River, across the Rocky Mountains, and down the Columbia to the sea. Pike, the year following, commenced his explorations of the country between the Mississippi and the Red River and discovered Pike's Peak in 1806. Bonneville, in 1831-38, explored sections of the Rocky Mountains and California. Fremont, the most noted of American pioneers in the West, in 1842 explored the South Pass of the Rocky Mountains and in the following years the

FIG. 8.—NORTH AMERICA AS KNOWN IN 1800.

FIG. 9.—NORTH AMERICA AS KNOWN IN 1900.

Pacific slope. Powell, in 1869, traversed the noble and menacing gorges of the Grand Cañon of the Colorado. Meanwhile Whitney, Wheeler, and Hayden were investigating the mountain systems of the West.

In Alaska, Dall was the pioneer and his work revealed the extent of the Yukon. Kotzebue, the Russian navigator, fifty years before, in 1816, had coasted along the northwest coast of Alaska and discovered the magnificent sound which now bears his name. Schwatka, Allen, Abercrombie, Brooks, and Schrader, and others, including gold prospectors, have explored the territory very rapidly until only a few tracts remain unknown. In Canada, Dawson and Ogilvie have worked in the Yukon watershed; Bell and the Tyrrell brothers around Hudson Bay, and Low in Labrador.

SOUTH AMERICA.

Of the six continents South America is now the least known, though one hundred years ago it was better

FIG. 10.—SOUTH AMERICA AS KNOWN IN 1900.

explored than any continent except Europe. The Jesuits had penetrated to the heart of the continent on the rivers which radiate in all directions and had

been able to publish tolerably good maps. But the continual state of unrest and the depleted treasuries of the South American governments, with the lack of the incentive of trade and colonization, have kept them from keeping pace with the geographic advance in other sections of the world.

Humboldt, in 1799-1804, traveled in the basins of the Orinoco and Magdalena and in various sections of the Andes. He was the first to interpret the word "geography" in its original, truest, and broadest sense, i. e., "description of the earth," which includes meteorology, climatology, the distribution of animals and plants, and the nature of soils, as well as the mere mapping of rivers and mountains. Later his interpretation of the work of the geographer and explorer was accepted by all the scientific explorers of the nineteenth century. Later, Spix and Martius botanized in Brazil, Schomburgk explored British Guiana, Crevaux and Chaudless investigated the mighty tributaries of the Amazon, Castelnau explored the Paraguay, and Hatcher, in 1898, made important discoveries in Patagonia.

ASIA.

Marco Polo was the only European who before 1800 had traversed any considerable part of Asia. But during the nineteenth century the continent was overrun by explorers of every nationality, who have made the map of the continent in the larger details quite accurate. Russia from the northeast sent numberless explorers, and England vied with her from the south. In one respect, perhaps, the geographic conquest of Asia has been more remarkable than that of Africa, Australia, or North America, for to penetrate this giant continent the explorer has had to contend against

FIG. 11.—ASIA AS KNOWN IN 1800.

FIG. 12.—ASIA AS KNOWN IN 1900.

hundreds of millions of people—all prejudiced against his advance and of quite a different character from the naked savages of the "Dark Continent."

Humboldt, in 1829, invaded Central Asia and the country of the Caspian Sea. The French missionary, Huc, succeeded in traversing Tibet in 1844-45, and lived several months at Lhasa. Palgrave, in the early '60's, journeyed across Arabia. The adventurer Garnier, in 1866-68, surveyed the course of the great Mekong and traversed over 5,000 miles in Cambodia and China, almost all of which was previously unknown to European geographers. Ney Elias at the same time was ascending the mighty Yangtze and penetrating western Mongolia. Fedchenko, in Pamir, and the untiring Prejewalski, in Mongolia and western China, were rapidly mapping these regions. Prejewalski made four separate journeys to western China, and in the importance and extent of his explorations in the heart of the vast continent has been equaled by none except Sven Hedin. Richthofen and Pumpelly in China, Rockhill in Tibet, Forsyth in East Turkestan, and the faithful, plodding pundits of the trigonometrical survey of India north of the Himalayas, are a few of the many men who have contributed much to the progress of geographic knowledge of Asia.

CONCLUSION.

The progress of geography during the nineteenth century has thus opened to the white man almost every corner in the immense, diverse world of which he is a part. But the even more startling advance in geographic sciences, or, more truly, the creation of these sciences during the century, has nearly explained the manner of origin and the formation of the world itself. Geology, which describes the nature and forming of the earth's crust, tells of glacial action, and by means of fossils proves that the earth millions and millions of years ago was covered with life; meteorology, which studies the conditions governing the heavy and yet light mantle of the earth; oceanography, which is beginning to explore the lands beneath the oceans, are all geographic conquests of the nineteenth

century. The "Dark Continent" at the beginning of the twentieth century is that immense land surface buried beneath the oceans, an area thrice the area of the exposed land surface. Maury and Murray and the soundings for submarine cables have but scratched the surface as with a pin. To solve the many mysteries which the oceans hide is the problem of the explorer of the twentieth century.

DR. SVEN HEDIN IN CENTRAL ASIA.

THE following is the first of two letters recently received, addressed by Dr. Sven Hedin to his Majesty the King of Sweden and Norway, and is from The Evening Post:

Temirlik, in Chimen Tag. South of Lob Nor, October 30, 1900.—The journey of last summer has been brought to a successful termination, and I think I may truly say that it is extraordinarily rich in discoveries and scientific observations, as well as in adventure, and that it will be the crowning effort of the expedition.

In the mountainous tracts of Chimen I made a depot, and there left the greater part of the caravan, under the command of the Cossack Schagdur, and of Islam Bai; myself striking camp with a lighter caravan on July 30, for the purpose of exploring the unknown regions in the table-lands of northern Tibet. After a "circular tour" of ninety-three days, we arrived back at the camp, having covered 965 miles, or a distance, as the crow flies, as great as from Paris to Stockholm. This long excursion was through entirely unknown country, and I mapped it to the very smallest detail in 173 maps.

My caravan reckoned at the start six servants (among them the Cossack Tjerdén), seven fine camels, twelve horses, one mule, and, in the capacity of living provisions, sixteen sheep. Of this party there returned only five men, four camels, three horses, and the one mule; the greater number of the animals having died from privation and fatigue, while most of the sheep were eaten by wolves. After that, in order to get fresh meat, we were reduced to hunting, and were very successful in our efforts, as we shot as many yaks, khulans (wild asses), and orongo-antelopes as we required for consumption.

A great sorrow was the loss of my Afghan yak-hunter. He was ill for a fortnight, and it was no easy matter to convey a dying man with us in such country as we were then traveling through. The caravan animals gave in one by one, partly on account of the poor and insufficient pasture, and partly from the rarification of the air, for we were the whole time more than fifteen thousand feet above the sea level, and as a rule had half the atmosphere below us.

Our route first led to the south, across the mountain-chains of Chimen Tag, Ara Tag, and Kalta-alagan to Lake Kum-Kul, where for the first time we shot some khulans, capturing their foals alive. We proceeded thence across the Akka Tag, the largest mountain-system in the world, and proved it to consist here of four parallel chains. To the southward of them we found ourselves in the Tibetan plateau proper, an immense protuberance from the earth's surface with parallel chains of mountains running from it in directions east and west. Between these extend valleys abounding in large lakes which are generally salt. We passed King Oscar Mountain, at a distance of only a few miles, and continued our way southward to latitude 34 deg. 21 min. north, not far from the sources of the Yang-tse Kiang, but as the caravan was beginning to give in I deemed it wiser to turn back from here. On the return journey we traveled westward, northward, and eastward, until in due course we reached Tenirlik.

This journey, so successfully ended, has been the means of enabling me to fill in a white patch of considerable magnitude on the map of Tibet. True it is that one does not meet here dangers such as one might expect in a hostile country, but all the same there is many an enemy following the caravan like a dark shadow and lying in wait to destroy it. And in a measure, too—to the extent of half the caravan—they were successful. Out of twenty only eight animals returned, and those were totally worn out and will require a long time in which to recover.

WIND AND HAIL.

One of the worst enemies that we had to contend against was the west wind; daily we suffered from its continuance and sorely it tried our patience, for it was generally laden with hail and snow. In these regions, which are as high as seventeen Elmel towers, placed one on the top of the other, you are nearly frozen every day's march, and it is difficult to warm yourself by walking, for you are generally at the point of falling from want of breath. The minimum temperature was as low as 4 deg. below zero Fahr.

I took with me a small English canvas boat, but it proved to be a dangerous craft on Tibetan lakes. You start forth on a fine morning and are probably overtaken, as I was on three of the lakes, by a hail-storm. A situation of the kind is a difficult one to meet, and as the squalls come on without any warning whatever, the only thing to do is to let the boat drift at its pleasure, balancing it as best you may with the oars and movements of the body. The most disagreeable part of these squalls was that it became quite dark, so that we could not see more than a couple of yards in front of us for the hail; the big stones filled the bottom of the boat, and the waves increased to the size of small tents. I always had with me on these voyages a first-rate rower from Lob.

It was a grand sight to see all the different kinds of wild animals: the yaks grazing quietly in the valleys or licking with their jagged tongues the moss and lichen from stones and crannies where our animals would not find a blade of anything that they could eat. The khulans circled in almost military order round our caravan, and the antelope fled from us in herds, often of several hundred head. Then there were wild sheep (Ovis Poli), wild goats, hares, and other rodents, bears (we shot one fine bear), wolves, and foxes. On the other hand, we did not see a single trace of man for eighty-four days, though an old drawing sketched roughly on a wall of rock proved that Mongolians once inhabited these tracts; or possi-