

ment; and after the invention of Hadley's quadrant, these rough route surveys began to be checked and verified by astronomical observations.

The most remarkable example of the early application of these improvements is to be found in the survey of China by the Jesuit missionaries. They first prepared a map of the country round Peking, which was submitted to the emperor Kang-hi, and, being satisfied with the accuracy of the European method of surveying, he resolved to have a survey made of the whole empire on the same principles. This great work was commenced in July 1708, and the completed maps were presented to the emperor in 1718. The records preserved in each city were examined, topographical information was diligently collected, and the Jesuit fathers checked their triangulation by meridian altitudes of the sun and pole star, and by a system of remeasurements. The result was a more accurate map of China than existed, at that time, of any country in Europe. Kang-hi next ordered a similar map to be made of Tibet, the survey being executed by two lamas who were carefully trained as surveyors by the Jesuits at Peking. From these surveys were constructed the well-known maps which were forwarded to Duhalde, and from which D'Anville constructed his atlas.

Several European missionaries had previously found their way from India to Tibet. Antonio Andrada, in 1624, was the first European to enter Tibet since the visit of Friar Odoric in 1325. The next journey was that of Fathers Grueber and Dorville about 1660, who succeeded in passing from China, through Tibet, into India. In 1715 Fathers Desideri and Freyre made their way from Agra, across the Himalayas, to Lassa, the capital of Tibet; and the Capuchin Friar Orazio della Penna resided at Lassa from 1735 until 1747. But the most remarkable journey in this direction was performed by a Dutch traveller named Samuel Van de Putte. He is the only European who has ever completed the journey from India, through Lassa, to China, and returned to India by the same route. He left Holland in 1718, went by land through Persia to India, and eventually made his way to Lassa, where he resided for a long time. He went thence to China, returned to Lassa, and was in India in time to be an eye-witness of the sack of Delhi by Nadir Shah in 1737. In 1743 he left India, and died at Batavia on the 27th of September 1745. The premature death of this illustrious traveller is the more to be lamented because his vast knowledge died with him. Two English missions sent by Warren Hastings to Tibet, one led by Mr George Bogle in 1774, and the other by Captain Turner in 1783, completes the list of Tibetan explorers in the 18th century. From Persia much new information was supplied by Chardin, Tavernier, Hamilton, Thevenot, and Krusinski, and by English traders on the Caspian. In 1738 John Elton traded between Astrakhan and the Persian port of Enzeli on the Caspian, and undertook to build a fleet for Nadir Shah. Another English merchant, named Jonas Hanway, arrived at Astrabad from Russia, and travelled to the camp of Nadir at Kazvin. One lasting and valuable result of Hanway's wanderings was a most charming book of travels. The extension of the dominions of the Company largely increased the knowledge of India. In 1700 Guillaume Delisle, the principal creator of the modern system of geography, published his map of the continents of the Old World; and his successor D'Anville produced his map of India in 1752. D'Anville's map contained all that was then known, but ten years afterwards Major Rennell commenced his surveying labours, which extended over a period from 1763 to 1782. His survey covered an area 900 miles long by 300 wide, from the eastern confines of Bengal to Agra, and from the Himalayas to Calpi. Rennell was indefatigable in collecting geographical information; his Bengal atlas appeared in 1781, his famous

map of India in 1788, and the memoir in 1792. Surveys were also made along the Indian coasts, and the charts of Huddert, Ritchie, and M'Cluer were the forerunners of the more accurate and elaborate productions of the succeeding century.

Arabia received very careful attention, in the 18th century, from the Danish scientific mission, which included Carsten Niebuhr among its members. Niebuhr landed at Loheia, on the coast of Yemen, in December 1762, and went by land to Sana. All the other members of the mission died, and he proceeded from Mocha to Bombay. He then made a journey through Persia and Syria to Constantinople, returning to Copenhagen in 1767. His invaluable work, the *Description of Arabia*, was published in 1772, and was followed in 1774-78 by two volumes of travels in Asia. The great traveller survived until 1815, when he died at the age of eighty-two. James Bruce of Kinnaird, the contemporary of Niebuhr, was equally devoted to Eastern travel. After studying Arabic and Geez for some years, he went out as consul to Algiers, and resided there from 1762 to 1765, exploring and sketching the Roman ruins in Algiers and Tunis. In 1765 he travelled by land from Tunis to Tripoli, and then took a passage for Candia, but was shipwrecked near Bengazi, and had to swim on shore. He eventually reached Candia, and, sailing thence to Sidon, travelled through Syria. In June 1768 he landed at Alexandria in the dress of an Arab, and soon afterwards we hear of him at Jiddah, the port of Mecca, in the dress of a Turkish sailor. He had resolved to attempt the discovery of the source of the Nile; and in 1769 he landed at Massowah, on the Abyssinian coast. He then penetrated to Axum and Gondar, and in November 1770 he reached the source of the Abai, then supposed to be the main stream of the Nile. He thus attained the great object of his ambition. Returning by the desert into Egypt, Bruce reached England in 1774, and settled once more at his old home at Kinnaird after an absence of ten years. Urged by his old friend, Mr Daines Barrington, the great traveller at length published his *Travels to Discover the Source of the Nile in the Years 1768-73* (5 vols. 4to) in 1790. Bruce, like many other conscientious and deserving explorers, was assailed by calumny and detraction. But every succeeding year has added to the high estimation in which his labours are held, and to the reverence with which his memory is cherished. He died at Kinnaird House, Stirlingshire in 1794.

Before the death of Bruce an African Association was formed, in 1788, for collecting information respecting the interior of that continent, with Major Rennell and Sir Joseph Banks as leading members, and Bryan Edwards as secretary. The association first employed a Mr Ledyard to cross Africa from east to west on the parallel of the Niger, and Mr Lucas to cross the Sahara to Fezzan. Ledyard, who had previously made a most extraordinary journey into Siberia, died at Cairo in 1788. Lucas went from Tripoli to Mesurata, obtained some information respecting Fezzan, and returned in 1789. One of the chief problems the Association wished to solve was that of the existence and course of the river Niger, which Maxwell believed to be identical with the Congo. Mungo Park, then an assistant surgeon of an Indiaman, volunteered his services, which were accepted by the Association, and in 1795 he arrived at the English factory of Pisanía, 200 miles up the Gambia. Leaving this station in December he reached Ludamar, where a Moorish chief imprisoned him until the following July. He then crossed a mountainous tract to a Mandingo town called Kamalia. Quite destitute, and suffering from fever, he remained there for several months, but finally found his way back to Pisanía, and returned to England. The interesting narrative of his adventures, with a geo-

graphical memoir by Rennell, was published in 1799. Five years afterwards he accepted an offer from the Government to command an expedition into the interior of Africa, the plan being to cross from the Gambia to the Niger, and descend the latter river to the sea. Park left the factory of Pisanía, on the Gambia, on the 4th of May 1805, accompanied by Lieutenant Martyn and 35 soldiers, besides guides. All died but four during the rainy season, and the rest, including Mungo Park, perished in a rapid on the Niger, having been attacked from the shore by order of a chief who thought he had not received suitable presents. Park was only thirty-five at the time of his death. The details respecting the fate of the ill-fated explorer and his party were obtained from the guide.

While the English were at work in the direction of the Niger, the Portuguese were not unmindful of their old exploring fame. In 1798 Dr Lacerda, an accomplished astronomer, was appointed to command a scientific expedition of discovery to the north of the Zambesi. He started in July, crossed the Muchenja Mountains, and reached the capital of the Cazembe, where he died of fever. Dr Lacerda left a valuable record of his adventurous journey; but with Mungo Park and Lacerda the history of African exploration in the 18th century closes.

In South America scientific exploration was busily at work during this period. The great event of the century, as regards that continent, was the measurement of an arc of the meridian. The undertaking was proposed by the French Academy, and a commission left Paris in 1735, consisting of La Condamine, Bouguer, and Godin. Spain appointed two accomplished naval officers, the brothers Ulloa, as coadjutors. The operations were carried on during eight years on a plain to the south of Quito; and, in addition to his memoir on this memorable and most important measurement, La Condamine collected much valuable geographical information during a voyage down the Amazon. The arc measured was $3^{\circ} 7' 3''$ in length; and the work consisted of two measured bases connected by a series of triangles, one north and the other south of the equator, on the meridian of Quito. Contemporaneously, in 1738, M. Maupertuis of St Malo measured an arc of the meridian in Lapland. Another result of this expedition was the publication of a valuable work by the brothers Ulloa.

The English and French Governments despatched several expeditions of discovery into the Pacific and round the world during the 18th century. They were preceded by those wonderful and romantic voyages of the buccaneers, of such men as Woodes Rogers, Davis, Shelvocke, Clapperton, and Dampier, which can never fail to interest, while they are not without geographical value. The works of Dampier are especially valuable, and the narratives of William Funnell and Lionel Wafer furnished the best accounts then extant of the isthmus of Darien. Dampier's literary ability eventually secured for him a commission in the king's service; and he was sent on a voyage of discovery, during which he explored part of the coasts of Australia and New Guinea, and discovered the strait which bears his name between New Guinea and New Britain, returning in 1701. In 1721 Jacob Roggewein was despatched on a voyage of some importance across the Pacific by the Dutch West India Company, during which he discovered Easter Island on April 6, 1722.

The voyage of Lord Anson to the Pacific in 1740-44 was of a predatory character, and he lost more than half his men from scurvy; while it is not pleasant to reflect that at the very time when the French and Spaniards were measuring an arc of the meridian at Quito, the English under Anson were pillaging along the coast of the Pacific, and burning the town of Payta. But a romantic interest

attaches to the wreck of the "Wager," one of Anson's fleet, on a desert island near Chiloe, for it bore fruit in the charming narrative of Byron, which will endure for all time. In 1764 Captain Byron himself was sent on a voyage of discovery round the world, which led immediately after his return, to the despatch of another to complete his work, under the command of Captain Wallis.

The expedition, consisting of the "Dolphin" commanded by Captain Wallis, and the "Swallow" under Captain Carteret, sailed in September 1766, but the ships were separated on entering the Pacific from the Straits of Magellan. Wallis discovered Tahiti on June 19, 1767, of which island he gave a detailed account, and Sir Charles Saunders's Island; he returned to England on May 17, 1768. Carteret discovered the Charlotte and Gloucester Islands, and Pitcairn Island on July 2, 1767; revisited the Santa Cruz group, which was discovered by Mendaña and Quiros; and discovered the strait separating New Britain from New Ireland. He reached Spithead again on February 20, 1769. Wallis and Carteret were followed very closely by the French expedition of Bougainville, which sailed from Nantes in November 1766. Bougainville had first to perform to him the unpleasant task of delivering up the Falkland Islands (Malouines), where he had encouraged the formation of a French settlement, to the Spaniards. He then entered the Pacific, and reached Tahiti on April 2, 1768. Passing through the New Hebrides group he touched at Batavia, and arrived at St Malo after an absence of two years and four months.

The three voyages of Cook form an era in the history of geographical discovery. All his work was thoroughly and completely done. He systematically surveyed every land he discovered, collecting information touching every branch of inquiry, so that his labours form a very large addition to geographical knowledge. James Cook was born near Whitby, Yorkshire, in 1728, and had been marine surveyor of Newfoundland and Labrador from 1763 to 1767. In the latter year he commissioned the "Endeavour" and sailed for Tahiti, with the object of observing the transit of Venus, accompanied by Sir Joseph Banks and Dr Solander, a pupil of Linnæus. The transit was observed at Tahiti on June 3, 1769. After exploring Tahiti and the Society group, Cook was six months surveying the two islands of New Zealand, and the coast of New South Wales from latitude 38° S. to the northern extremity. Passing through Torres Strait, he touched at Batavia, and arrived in England on June 12, 1771.

Cook's second voyage was mainly intended to explore the region round the Antarctic Circle; and it may be mentioned that meanwhile a French ship, commanded by M. Kerguelen, had sailed southwards in 1771, and discovered the island which bears his name. Captain Cook was provided with two vessels built at Whitby, the "Resolution," which he himself commanded, and the "Adventure" under Captain Furneaux, who had been with Wallis. After rounding the Cape the two vessels reached a south latitude of $57^{\circ} 15'$. On March 26, 1773, Captain Cook arrived at New Zealand and proceeded to the Society Islands, whence he made another voyage southwards between the meridians of 170° E. and $106^{\circ} 54'$ W. On this occasion he was stopped by ice in $71^{\circ} 10'$ S. During the second voyage Cook visited Easter Island, discovered several islands of the New Hebrides and New Caledonia; and on his way home by Cape Horn, in March 1774, he discovered the Sandwich Island group. Arrived at Spithead on July 30, 1774. The account of the second voyage was written by the young naturalist George Forster, whose subsequent work was so justly eulogized by Humboldt. The third voyage was intended to attempt the passage from the Pacific to the Atlantic by the north-east. The "Resolution" and "Discovery" sailed

in 1776, and Cook again took the route by the Cape of Good Hope. In 1777 he was at the Friendly group, and on January 18, 1778, he discovered the Sandwich Islands. He then proceeded to the North American coast, and, after a stay of a month in Nootka Sound, he proceeded northwards, fixed the position of the western extremity of America, and surveyed Behring Strait. On August 17, 1778, he was stopped by the ice in $70^{\circ} 41' N.$, and named the farthest visible point on the American shore Icy Cape. He then visited the Asiatic shore and discovered Cape North, bearing up on August 29 when he was in the 180th degree of longitude. Returning to the Sandwich Islands, Captain Cook was murdered by the natives of Hawaii. On February 14, 1779, his second, Captain Clerke, took the command, and proceeding to Petropaulowski in the following summer, he again examined the edge of the ice, but only got to $70^{\circ} 33' N.$ The ships returned to England in October 1780.

In 1785 the French Government fitted out a very carefully-prepared expedition of discovery at Brest, which was placed under the command of La Perouse, an accomplished and experienced officer. After touching at Concepcion in Chili, and at Easter Island, La Perouse proceeded to the Sandwich Islands, and thence to the coast of California, of which he has given a very interesting account. He then went across the Pacific to Macao, and in July 1787 he proceeded to explore the Gulf of Tartary and the shores of Saghalien, remaining some time at Castries Bay, so named after the French minister of marine. Thence he went to the Kurile Islands and Kamchatka, and sailed from the far north down a meridian to the Navigator and Friendly Islands. He was in Botany Bay in January 1788; and sailing thence, the explorer, his ship, and crew were never seen again. Their fate was long uncertain. In September 1791 Captain D'Entrecasteaux sailed from Brest with two vessels, to seek for tidings. He visited the New Hebrides, Santa Cruz, New Caledonia, and Salomon Islands, and made careful though rough surveys of the Louisiade Archipelago, islands north of New Britain, and part of New Guinea. D'Entrecasteaux died on board his ship on July 20, 1793, without ascertaining the fate of La Perouse. It was Captain Peter Dillon who at length ascertained, in 1828, that the ships of La Perouse were wrecked on the island of Vanikoro during a hurricane.

The work of Captain Cook bore fruit in many ways. His master, Captain Bligh, was sent in the "Bounty" to convey breadfruit plants from Tahiti to the West Indies. He reached Tahiti in October 1788, and in April 1789 a mutiny broke out, and he, with several officers and men, was thrust into an open boat in mid-ocean. During the remarkable voyage he then made to Timor, Captain Bligh passed amongst the northern islands of the New Hebrides, which he named the Banks Group, and made several running surveys. He reached England in March 1790. The "Pandora," under Captain Edwards, was sent out in search of the "Bounty," and discovered the islands of Cherry and Mitre, east of the Santa Cruz group, but she was eventually lost on a reef in Torres Strait. In 1796-97 Captain Wilson, in the missionary ship "Duff," discovered the Gambier and other islands, and rediscovered the islands known to and seen by Quiros, but since called the Duff Group. Another result of Captain Cook's work was the colonization of Australia. On January 18, 1788, Admiral Phillip and Captain Hunter arrived in Botany Bay in the "Supply" and "Sirius," followed by six transports, and established a colony at Port Jackson. Surveys were then undertaken in several directions. In 1795 and 1796 M. Flinders and G. Bass were engaged on exploring work in a small boat called the "Tom Thumb." In 1797 Bass, who had been a surgeon, made an expedition southwards,

continued the work of Cook from Ram Head, and explored the strait which bears his name, and in 1798 he and Flinders were surveying the east coast of Van Diemen's Land. The planting of a colony at Port Jackson led to the despatch of an expedition to complete the exploration of the Australian coasts. The command was given to Captain Matthew Flinders. He was furnished with a vessel called the "Investigator," and sailed from England on July 18, 1801. Commencing from King George's Sound, Captain Flinders discovered and made a preliminary survey of all the south coast of Australia to Bass Strait, and the east coast from the barrier reef to Torres Strait, as well as the east coast of the Gulf of Carpentaria. Flinders met the French expedition under Baudin and Freycinet with the two ships "Géographe" and "Naturaliste," which was engaged upon the same work. He was taken prisoner by the French in 1804 and detained until 1810, so that his work did not appear before 1814.

Yet another out-come of Captain Cook's work was the voyage of George Vancouver, who had served as a midshipman in Cook's second and third voyages. The Spaniards under Quadra had commenced a survey of north-western America and occupied Nootka Sound, which their Government eventually agreed to surrender. Captain Vancouver was sent out to receive the cession, and to survey the coast from Cape Mendocino northwards. He commanded the old "Discovery," and was at work during the seasons of 1792, 1793, and 1794, wintering at the Sandwich Islands. Returning home in 1795, he completed his narrative and very valuable series of charts, and died in 1798.

The 18th century saw the Arctic coast of North America reached at two points, as well as the first scientific attempt to reach the North Pole. The Hudson's Bay Company had been incorporated in 1670, and its servants soon extended their operations over a wide area to the north and west of Canada. In 1741 Captain Christopher Middleton was ordered to solve the question of a passage from Hudson's Bay to the westward. Leaving Fort Churchill in July 1742 he stood northwards and discovered the Wager River and Repulse Bay, bearing up again on August 9. He was followed by Captain W. Moor in 1746, and Captain Coats in 1751, who examined the Wager Inlet up to the end. On November 6, 1769, Samuel Hearne was sent by the Hudson's Bay Company to discover the sea on the north side of America, but was obliged to return. On February 23, 1770, he set out again from Fort Prince of Wales; but, after great hardships, he was again forced to return to the fort. He started once more on December 7, 1771, and at length reached the Coppermine River, which he surveyed to its mouth, but his observations are very unreliable. With the same object of reaching the sea, Alexander Mackenzie, with a party of Canadians, set out from Fort Chipewyan on June 3, 1789, and descended a river which bears the explorer's name. His account of the journey is even more unsatisfactory than that of Hearne.

In February 1773 the Royal Society submitted a proposal to the king for an expedition to try how far navigation was possible towards the Pole. The "Racehorse" and "Carcass" bombs were selected as best adapted for the service, and Captains Phipps and Lutwidge were appointed to command them. The expedition sailed on June 2, 1773, and sighted the coast of Spitzbergen on the 28th. Captain Phipps stood into every opening he could find in the ice, but was invariably stopped by a solid barrier. He examined a line extending over twenty degrees of longitude, and found no opening in the heavy polar pack in any direction. After a very careful and persevering examination of the ice, the expedition returned to England in September. The highest latitude reached was $80^{\circ} 48' N.$ But the most important Arctic work in the 18th century was performed

by the Russians, for they succeeded in delineating the whole of the northern coast of Siberia. Some of this work, indeed, was done at a still earlier date. The Cossack Deschneff made an extraordinary voyage, in the summer of 1648, from the river Kolyma, through Behring Strait to Anadyr, a performance which has never since been equalled. Between 1738 and 1750 the mates Manin and Sterlegoff made their way in small sloops from the mouth of the Yenisei as far north as $75^{\circ} 15' N.$ The land from Taimyr to Cape Chelyuskin, the most northern extremity of Siberia, was mapped by the mate Chelyuskin, who discovered the extreme point in May 1742. To the east of Cape Chelyuskin the Russians encountered greater difficulties. They built small vessels at Yakutsk on the Lena, 900 miles from its mouth, whence the first expedition was despatched under Lieutenant Prontschicheff in 1735. He sailed from the mouth of the Lena to the mouth of the Olonek, where he wintered, and on September 1, 1736, he got as far as $77^{\circ} 29' N.$, within five miles of Cape Chelyuskin, which is in $77^{\circ} 34' N.$ Both he and his young wife died of scurvy, and the vessel returned. A second expedition, under Lieutenant Laptieff, started from the Lena in 1739, but encountered masses of drift ice in Chatanga bay, and with this ended the voyages to the westward of the Lena. Several attempts were also made to navigate the sea from the Lena to the Kolyma. In 1736 Lieutenant Laptieff sailed, but was stopped by the drift ice in August, and in 1739, during another trial, he reached the mouth of the Indigirka, where he wintered. In the season of 1740 he continued his voyage to beyond the Kolyma, wintering at Nijni Kolymsk. In 1725 Vitus Behring, a Dane in the Russian service, received his instructions from Peter the Great a few days before the czar's death. Two vessels were built for Behring at Okhotsk, and sailing in July 1728, he ascertained the existence of the strait between Asia and America which bears his name. In September 1740 Behring again sailed from Okhotsk, with Steller on board as naturalist. In June 1741 Commodore Behring named the magnificent peak on the coast of North America Mount St Elias, and explored the Aleutian Islands. In November the ship was wrecked on Behring Island; and the gallant Dane, worn out with scurvy, died there on the 8th of December 1741. In March 1770 a merchant named Liakhoff saw a large herd of reindeer coming from the north to the Siberian coast, which induced him to start in a sledge in the direction whence they came. Thus the New Siberian Islands were discovered, and for years afterwards the seekers for fossil ivory resorted to them. The Russian Captain Vassili Tchitschakoff in 1765 and 1766 made two persevering attempts to penetrate the ice north of Spitzbergen, and reached to $80^{\circ} 30' N.$, and Russian parties twice wintered at Bell Sound. But the result was the same as all others have obtained before and since; the Spitzbergen route is evidently not the way to the Pole.

The 18th century saw great progress in the collection and arrangement of geographical material, and in the work of surveying and map-making. Collections of voyages and travels were brought together in the four quarto volumes of Astley (1745) and the two folios of Harris (1764); while Dr Hawkesworth edited the Government voyages to the Pacific in 1773. Sir Joseph Banks was the great patron of geography in England, aided by the indefatigable labours of such critical geographers as Rennell, Dalrymple, and Barrington; while in France the great cartographer D'Anville introduced a habit of critical accuracy, and caused a complete revolution in the art of map-making.

Towards the close of the century it was recognized that geography served more extensive and important uses than had ever before been supposed. The route survey was

sufficient for the traveller or soldier, while accurate charts guided the mariner across the ocean. But surveys are also the basis of statistics and of administration, and rigorous accuracy became necessary. Surveys on a trigonometrical basis, which have been proceeding in all the countries in Europe (except Turkey) and in India during the present, were commenced in the last century. In Great Britain the Ordnance Survey was begun in April 1784, when General Roy measured a base line on Hounslow Heath. The triangulation of the British Isles was commenced in 1784 and completed in 1852. Maps based on trigonometrical surveys may eventually explain and illustrate the physical aspect of the whole globe, but at present they are necessarily confined to those nations which are in the front rank of civilization. Countries which are not so advanced are still obliged to be content with such maps as sufficed for all the world in the last century, before the results of trigonometrical surveys were available. These secondary maps are adapted for the requirements of the countries which use them, being based on positions fixed by astronomical observations, on cross bearings, and often on chained distances. The third class of maps includes the work of explorers of unknown or little known regions, and of geographers who delineate the features of such regions by compilation and by intelligent collation of the work of travellers. There are thus three grand divisions in the character and uses of maps. There are first those which aim at minute accuracy, and which are intended as documents for administrative purposes, and in pursuing exact statistical investigations. Secondly, there are maps which are based on less accurate surveys of countries less populous or less advanced in civilization; these are useful for political, geographical, and military purposes, but are not to be relied on to the same extent or in the same way as is the case with those based on trigonometrical surveys. Thirdly, there are the roughly compiled maps of little known regions, which are constantly in course of improvement, and which do the work of pioneers.

In treating here of the progress of geographical discovery in the present century, it is to those who prepare the last class of maps, to the pioneers—the discoverers—that we must mainly, though not exclusively, confine our attention. We propose to review the work of discoverers and explorers of the 19th century in two sections as regards time,—first during the first thirty, and secondly during the last forty-eight years. The Royal Geographical Society was founded in 1830, and forms a landmark. In each period we shall take first the work done in Asia, then Africa, then America, then Australia, then Polynesia, and finally the Arctic and Antarctic regions.

At the beginning of the century British rule in India was extended over the plains of the Ganges almost to the Sutlej, and the attention of explorers was drawn to the mighty mass of the Himalayas. Captain Herbert, in 1818, attempted to give a general view of the physical character of this great range, and Moorcroft reached the Mansarowara lake, and the upper courses of the Indus and Sutlej; while Mr Manning, in 1811, was the only Englishman who ever visited Lassa, the capital of Tibet. The mission of Sir John Malcolm to Persia in 1808 led to much geographical work being achieved. On his staff was Macdonald Kinneir, who wrote a valuable memoir on the geography of Persia; while at the same time Lieutenant J. Macartney, under Mountstuart Elphinstone, was collecting materials for a map of Afghanistan. In 1810 Pottinger and Christie made an important journey through Baluchistan by different routes, Christie afterwards visiting Herat and Yezd; and in 1827 Mr Stirling of the Bengal Civil Service crossed the Hazárah mountains.

The close of the war in 1815 led to numerous efforts for

the furtherance of geographical discovery, especially in Africa and the far north. In 1818 to 1820 Captain Lyon, R.N., and Mr Ritchie landed at Tripoli, and penetrated as far as Mourzouk; and this led to the more important expedition of Major Denham and Captain Clapperton, R.N., which was despatched by the Government. They landed at Tripoli in 1823, and advanced into the interior as far as the east coast of Lake Tchad, of which they gave a most interesting account, obtaining latitudes by meridian altitudes and longitudes by lunar observations. Clapperton's furthest point was at Saccatoo, westward of the lake, and here he was forced to turn back. But in 1825 he was again employed to explore the interior of Africa, and this time he started from the Atlantic side with his faithful servant Richard Lander. Landing in the Bight of Benin, he succeeded in reaching Saccatoo from the west side, thus completing a route from Tripoli on the Mediterranean to the coast of Guinea. But at Saccatoo the gallant sailor succumbed at last, dying on the 13th of April 1827. His faithful servant Lander returned to the coast; and in 1830 he and his brother were employed to explore the course of the Niger or Quorra. They embarked on the river near Boossa, passed through the Yorriba country, and came out at the mouth of the Nun.

The Admiralty also considered that a river of such magnitude as the Zaire or Congo ought to be explored. Captain Tuckey, R.N., was selected to conduct the Congo expedition, and received command of a steamer called the "Congo," with a crew of 49 officers and men. The expedition reached the mouth of the great river on July 5, 1816, and proceeded up to the foot of the falls of Yellala, the farthest point hitherto reached. Captain Tuckey, with 15 of his party, landed on the north shore on the 14th of August; and, after travelling for about 40 miles over a hilly country, he reached the head of the falls and the banks of the upper river. He had explored the river for a distance of 280 miles from the sea. But death overtook the commander of the expedition and several officers, and the "Congo" returned in command of the master, Mr Fitzmaurice, after executing the survey from the foot of the falls to Embomma.

South America had produced two eminent physical geographers, namely, Caldas of Bogota and Unanue of Lima, before the scenery of the Orinoco and the Andes became familiar to Europe through the charming narratives of Humboldt. It was in 1799 that the great Prussian naturalist embarked at Coruña, and landed at Cumana on the coast of Venezuela. His observant eye and bright imagination, combined with habits of scientific thought, produced pictures of the physical aspects of the regions he explored which are quite unequalled. What he said of George Forster is even more true of himself: "He depicted in pleasing colours the changing stages of vegetation, the relations of climate and articles of food in their influence on the civilization of mankind. All that can give truth, individuality, and distinctiveness to the delineation of exotic nature is united in his work." The Orinoco and Cassiquari, the falls of Tequendama, the mountains of Quindiu, Chimborazo, and Quito, Cajamarca, and the upper Amazon, and the varied scenery of Mexico, are imprinted on the imagination with life-like form and colouring by this great master of description. His service to geography was far greater than that of any mere discoverer. Humboldt left the New World in 1804.

The greatest and most important enterprise, after the peace of 1815, was the renewal of Arctic exploration under the auspices of Sir John Barrow. To the great work of Scoresby, and to the careful observations of himself and his father, we are indebted for the most exhaustive account of the Spitzbergen seas, and of the ice which encumbers them.

When the Government expeditions were undertaken, the volumes of Scoresby formed a storehouse of useful and well-digested information. The true object of modern Arctic enterprise has been the advancement of science, a noble and sufficient reason for incurring expenditure and facing dangers and hardships. In consequence of Sir John Barrow's representations, orders were given in 1818 for the preparation of four vessels for Arctic service,—two to attempt the passage from the Atlantic to the Pacific, and two to attempt an approach to the North Pole. But, as Sir John Barrow himself explained, the main objects were not the accomplishment of voyages by these routes, but the acquisition of useful knowledge. Sir John Ross, who commanded one of the two expeditions, circumnavigated Baffin's Bay on the track of that great navigator, and re-established his fame. Captain Buchan, who led the other, battled with the impenetrable pack to the north of Spitzbergen, like Phipps before him, and then returned. There can be no great success without continuity of effort and perseverance, and the early voyages of this century achieved lasting results, because those who sent them out were endowed with tenacity of purpose. No sooner had Ross returned than Parry was appointed to command two strongly built vessels, the "Hecla" and "Griper," and to proceed on the same service. On the 11th of May 1819 Parry sailed, and on the 1st of August he entered the portals of Lancaster Sound, and commenced the discovery of a new region. He succeeded in sailing for 300 miles along the southern shores of the islands which now bear his name, among ice floes of moderate thickness, until he reached the edge of the impenetrable polar pack at the western extreme of Melville Island. He went as far as it will ever be possible for any vessel to go in this direction, and then wintered in a harbour of Melville Island. In 1820 he returned with a rich harvest of scientific observations, and of valuable information in all branches of inquiry. This first expedition was most successful. Parry's second voyage was into Hudson's Bay in search of a passage westward in that direction. He discovered a strait (that of "Fury and Hecla"), and passed two winters 1821-23 on the coast of Melville Peninsula. The third voyage (1824-25) was again up Baffin's Bay; but it was unsuccessful, and one of his vessels, the "Fury," was lost. Still every voyage, whether successful or not in its main object, brought back valuable results. Meanwhile the "Griper," commanded by Captain Clavering, had, in 1823, penetrated through the ice to the east coast of Greenland in 76° N., to enable Captain Sabine to take pendulum observations in that position. The Russian Captain Lutke had also surveyed the west coast of Novaya Zemlya from 1821 to 1824. Parry, after his return from the third voyage, proposed an attempt to reach the Pole by travelling over the ice during the summer, on the Spitzbergen meridians. He sailed on this service in the "Hecla" on the 3d of April 1827, and, after placing her in a secure harbour in Spitzbergen, he began his bold and interesting attempt with two boats, fitted with runners for being dragged over the ice. But the whole mass of ice was drifting south faster than Parry's men, with all their efforts, could advance north. However, on July 23, 1827, he attained the latitude of 82° 45' N., which continued to be the highest parallel ever reached by man until Captain Markham went beyond it in 1875. Parry returned to England in October. Another expedition of a private character left England in June 1829 under the command of Sir John Ross, who was accompanied by his distinguished nephew James C. Ross. In August they reached Lancaster Sound, and then proceeded southwards down Regent's Inlet, wintering on the most northern peninsula of America, to which Ross gave the name of Boothia. Here they passed three winters, while, during the intervening

summers, some exploring work was accomplished, and James Ross planted the Union Jack on the North Magnetic Pole on the 1st of June 1831. At last they were forced to abandon their little vessel the "Victory," and make their way to the whalers in Baffin's Bay in open boats. They were picked up and arrived in England after an absence of four years.

While these bold and perilous voyages were being conducted in the Arctic seas, a series of land journeys completed the delineation of the northern coast of America, which had just been touched at two points in the last century, by Hearne and Mackenzie. From 1819 to 1823 the gallant Sir John Franklin, with Dr Richardson and George Back, were struggling to explore the Arctic coast eastward from the mouth of the Coppermine River. After great sufferings they embarked on the river on June 30, 1820, reaching the mouth on July 18, and exploring 550 miles of coast line to the eastward, as far as Point Turnagain. On the return journey across the barren lands, the party escaped death from starvation almost by a miracle. Undaunted by this terrible experience, Franklin, Richardson, and Back started on another expedition in 1825, this time by descending the Mackenzie River. Reaching its mouth on July 7, Franklin and Back discovered 374 miles of coast to the westward, as far as Return Reef; while Richardson explored the space between the mouths of the Mackenzie and Coppermine. In 1833 Back undertook a third journey with the object of succouring the Rosses, who had long been missing. He discovered and explored the Back or Great Fish River for 530 miles, and in July 1834 reached its mouth in the Arctic Ocean. The gaps on the north coast, which were left by Franklin and Back, were subsequently filled in by servants of the Hudson's Bay Company. In 1837 Messrs Simpson and Dease, in a boat, connected Return Reef with Cape Barrow. In 1839 the same explorers went from Cape Turnagain to the mouth of Back's River, and still further eastward to Castor and Pollux River. On August 26, 1839, Simpson built a cairn at Cape Herschel, on King William Island, separated by a strait ten miles wide from the mainland. Dr Rae was sent in 1846 to winter in Repulse Bay, and in 1847 he travelled round the Gulf of Akkoolee and connected the work of Ross in Boothia with that of Parry during his second voyage. In 1854 he united the work of Ross with that of Simpson, and ascertained that Boothia was connected with the mainland of America by an isthmus. Thus the whole northern coast of America was explored and delineated without a break.

The Russians were engaged on daring Arctic exploration at the same time. In 1809 to 1812 a Russian officer named Hedenstrom surveyed the New Siberia Islands; and in 1821 Lieutenant Anjou made further investigations respecting the state of the ice to the northward. Baron Wrangell prosecuted similar researches from his headquarters at Nijni Kolymsk, near the mouth of the Kolyma. He made four sledge journeys over the Polar Sea from 1820 to 1823, exploring the coast from the Kolyma to Cape Chelagskoi, and making several attempts to advance northwards, but always encountering weak ice. Wrangell's interesting narrative is an important addition to Arctic literature.

The Russians, as well as the French, sent several voyages into the Pacific during the first half of the 19th century. In 1804 Admiral Krusenstern made a voyage round the world, and his pupil, Otto von Kotzebue, son of the dramatist, commanded the "Rurick" from 1815 to 1818 on a voyage of discovery. He discovered the great bay known as Kotzebue Sound, sounded in Behring Strait, and made careful observations of the currents. Wintering in California he returned to the Aleutian Islands in the following spring; and during the voyage homewards he discovered several new islands in the Pacific, especially

Romanzoff and Krusenstern in the Dangerous Archipelago. During another Russian voyage, commanded by Billingshausen, Lazareff and other coral islands in the Dangerous Archipelago were discovered, and in 1828 Captain Lutke, in the "Seniavine," surveyed the Caroline group. Captain Freycinet, the officer who served with Baudin and edited his work, also examined the Caroline Islands in the "Uranie" in 1819, but his voyage was mainly in the interests of natural history. Duperry in 1822-23 did some surveying work on the coast of New Ireland. But the most important French voyage was that of Dumont D'Urville, who was sent out to seek for traces of La Perouse in 1828. He visited Tecopia and other islands in the "Astrolabe," and was nearly a month at Vanikoro collecting relics of the ill-fated expedition. The voyage of D'Urville contributed largely to the advancement of science, and resulted in the publication of a magnificent work in 1830.

The only English scientific voyage to the Pacific in this period was sent out mainly to co-operate with Parry in his third voyage, and Franklin in his second journey. It was commanded by Captain Beechey, who had been first lieutenant with Parry during his first Arctic voyage, and on May 19, 1825, he sailed from Spithead in H.M.S. "Blossom." After visiting Easter, Gambier, Pitcairn, and other islands, the "Blossom" arrived at Honolulu on May 20, 1826, and in July she was in Behring Strait, entering Kotzebue Sound on the 22d. Proceeding along the north coast of America, the ship's barge got as far as 156° 21' W. to a low cape called Point Barrow, at the very time when Franklin and Back were at Return Reef. The accurate examination of the coast was made under circumstances which demanded great fortitude and perseverance, and reflects credit on the officers and crew. The "Blossom" returned to Honolulu in January 1827, and arrived at Macao on the 12th of April. Captain Beechey next proceeded to survey the Log Choo and Bonin Islands, and, after another visit to the far north, and the coasts of California and Mexico, he returned home by Cape Horn and arrived at Woolwich on October 12, 1828. His valuable and interesting narrative, in two volumes, was published in 1831. Mr James Weddell, a master in the navy, made a voyage to the Antarctic Ocean in 1822-24, and went as far south as 74°.

The Royal Geographical Society was founded in 1830, and forms a landmark in the history of discovery. The men who initiated the idea and gave it shape were Sir John Barrow, Sir John Cam Hobhouse, Sir Roderick Murchison, Mr Robert Brown (*Princeps Botanicorum*), and Mr Bartle Frere. They formed the Foundation Committee. The first president was Lord Goderich, and the vice-presidents Sir John Barrow, Colonel Leake, Sir John Franklin, and Mr Greenough. Through this organization explorers and students were encouraged and assisted, information was systematically collected and arranged, and the work of discovery was advanced. A similar society in Paris preceded that of London in point of time, and now every civilized country has established a Geographical Society.

Our rapid review of the progress of discovery since the foundation of the Geographical Society will commence with the continent of Asia, where there were and still are vast and most interesting unexplored regions. In British India the Trigonometrical Survey has been proceeded with, and is now approaching completion. During its progress the Himalayan peaks were measured, and in 1848 Sir Andrew Waugh fixed the height of the loftiest, which he named Mount Everest, at 29,002 feet above the sea. In 1831 Humboldt published his *Asie Centrale*, which, with the *Erdkunde von Asien* of Carl Ritter, gave new and clearer ideas of the orography of Central Asia. Many travellers explored the remoter parts of the Himalayan chain; while, in 1848, Dr Hooker in Sikkim, and Dr Thomson in Ladak.