GEOGRAPHICAL EVOLUTION[1]

IN the future development of scientific geography one of the main lines of advance will be in the direction of a closer alliance with geology. The descriptions of the various countries of the globe will include an account of how their present outlines came into existence, and how their plants and animals have been introduced and distributed. The principles on which this evolutional geography will be founded have regard to the materials of which the framework of the land consists, to the various ways in which these materials have been built up into the solid crust of the earth, and to the superficial changes to which they have been subsequently exposed. The materials of the land consist mainly of compacted detritus, which, worn from previously existing terrestrial surfaces, has been laid down in the sea. Hence the land, as we now see it, has originated under the sea. But the common belief that over the whole globe land and sea have been continually changing places, and that wide continents may have bloomed even over the site of the most lonely abysses of the ocean, may be shown to be incorrect by a consideration of the character of the sedimentary rocks of the land on the one hand, and of that of the deposits of the sea-floor on the other. The sedimentary rocks, even in the most massive palæozoic formations where they attain depths of several miles, are shallow-water deposits, formed out of the waste of the land and always laid down near land. Nowhere among them, even including the thick organically-derived limestones, such as the chalk, is there any formation which properly deserves to be considered that of a deep sea. Recent researches into the nature of the sea-bottom across the great ocean-basins have likewise shown that the deposits there in progress have no real analogy among the rocks of the land. The conclusion to be drawn from the evidence is that the great ocean-basins have always existed, and that the terrestrial areas have also lain on the whole over those tracts where they still exist.

The way in which the sedimentary rocks have been tilted up and made to lie discordantly on each other shows that the marginal belt of sea-floor near the land has again and again been upraised and worn down. The ocean-basins appear from very early times to have been areas of subsidence, while the continental elevations have been lines of relief from the strain of terrestrial contraction. The land has been subjected to periodic movements of upheaval, sometimes of great violence, whereby not only large areas of sea-bottom were raised into land, but where, as huge earth-waves, lines of mountain-chain were ridged up. During these movements great changes were effected in the structure and arrangement of the rocks in the regions affected, original sedimentary masses being rendered crystalline, and even reduced to such a pasty or fluid condition as to be squeezed into rents of the more solid superincumbent rocks. Volcanic orifices were likewise opened, by which communication was established between the heated interior and the surface. The relative dates of these successive terrestrial disturbances can be satisfactorily determined by stratigraphical and palæontological evidence.

The history of the gradual growth of the European continent furnishes many interesting and instructive illustrations of the principles by which evolutional geography is to be worked out. The earliest European land appears to have existed in the north and north-west, comprising Scandinavia, Finland, and the north-west of the British area, and to have extended thence through boreal and arctic latitudes into North America. Of the height and mass of this primeval land some idea may be formed by considering the enormous bulk of the material derived from its degradation. In the Silurian formations of the British Islands alone there is a mass of rock, worn from that land, which would form a mountain-chain extending from Marseilles to the North Cape (1,800 miles), with a mean breadth of over 33 miles and an average height of 16,000 feet, or higher than Mont Blanc. The Silurian sea which spread across most of Central Europe into Asia suffered great disturbance in some regions towards the close of the Silurian period. It was ridged up into land inclosing vast inland basins, the areas of some of which are still traceable across the British Islands to Scandinavia and the west of Russia. An interesting series of geographical changes can be traced during which the lakes of the Old Red Sandstone were effaced, the sea that gradually overspread most of Europe was finally silted up, and the lagoons and marshes came to be densely crowded with the vegetation to which we owe our coal-seams. Later terrestrial movements led to the formation of a series of bitter lakes across the heart of Europe like those now existing in the south-east of Russia. Successive depressions and elevations brought the open sea again and again across the continent, and gave rise to the accumulation of the rocks of which most of the present surface consists. In these movements the growth of the Alps and other dominant lines of elevation can be more or less distinctly traced. It was at the close of the Eocene period, however, that the great disturbances took place to which the European mountains chiefly owe their present dimensions. In the Alps we see how these movements led to the crumpling up and inversion of vast piles of solid rock, not older in geological position than the soft clay which underlies London. Considerable additional upheaval in Miocene times affected the Alpine ridges, while in still later ages the Italian peninsula was broadened by the uprise of its sub-Apennine ranges. The proofs of successive periods of volcanic activity during this long series of geographical revolutions are many and varied. So too is the evidence for the appearance and disappearance of successive floras and faunas, each no doubt seeming at the time of its existence to possess the same aspect of antiquity and prospect of endurance which we naturally associate with those of our own time. The law of progress has been dominant among plants and animals and not less upon the surface of the planet which they inhabit. It is the province of the biologist to trace the one series of changes; of the geologist to investigate the other. The geographer gathers from both the data which enable him to connect the present aspects of Nature with those out of which they have arisen.

[1] Abstract of an Address given by Prof. Geikie, F.R.S., at the meeting of the Royal Geographical Society on March 24, 1879.

GEOGRAPHICAL NOTES

AT a recent meeting of the Board intrusted by the French Government with the care of granting missions for exploring foreign countries, it was decided that none of the regions proposed offered any special field for exceptional services rendered to science. The funds of the Government will be spent neither in exploring Central Africa nor in seeking the north pole, but in excavating Trojan ruins and examining some of the islands of the Asian Archipelago. It was also complained that no qualified traveller had been sent into civilised parts to study the progress of special arts and sciences. Such excursions as the celebrated "Voyage en Angleterre et en Irlande," accomplished by Baron Dupin in 1820 have rendered immense services to French industry, and the memory of it is not extinguished by the sixty years which elapsed. The sending of regular scientific missions abroad was inaugurated in France by the First Republic, for the purpose, not exclusively for cultivating anthropology, but for introducing into France the progress made by the foreign nations.

M. CHARNAY has recently forwarded to the Minister of Public Instruction at Paris a series of communications on the results of his investigations in Java in the summer of last year. He explored the east and west portions of the island, and he claims to have discovered a close affinity between the remains of the civilisation introduced by Hindu Buddhists and that of the ancient Mexican Empire. He also calls attention to the great density of the population of Java. From this island M. Charnay went on to Melbourne, and when last heard from, was engaged in making natural history collections in Queensland and at Thursday Island in Torres Straits.

THE death of the last chief of the Belgian caravan has not abated the resolution of King Leopold and the members of the International Committee for African Exploration. A third expedition is to be sent out immediately, it is said, under the guidance of Mr. Stanley. It is also stated that a new Belgian expedition led by Capt. Popelin will soon start for Zanzibar, in order to work out the plan of establishing a chain of stations right across Central Africa, viz., from Zanzibar to the Loango coast. The King of the Belgians will grant the means for this important undertaking.

THE last *Bulletin* of the Société de Géographie Commerciale de Bordeaux contains a brief paper by M. Albert Merle, advocating the exploration of Ferlo, Senegambia. This is a tract of country between the Senegal and the Gambia, marked in our latest maps, "desert country, no water;" it extends from 14° to 16° N. lat., and its interior is quite unexplored. Several travellers have passed along the outskirts of the region, and from their accounts and from native reports, it appears to be covered with thick forests containing many kinds of valuable trees; tobacco, indigo, and cotton also grow there in abundance. Those of its products which are at present turned to account, find their way to the Gambia, but M. Merle's desire is to divert the trade to the French settlements on the north.

M. PAUL SOLEILLET, the French traveller who left St. Louis in Senegal with the intention of reaching Algeria through the Sahara, according to the last intelligence received in Paris by telegraph, had reached Segou, the capital of the negro state of the same name, and he was proceeding onwards. This adventurous man received only 6,000 francs from the Governor-General of Senegal. The Paris Society of Geography, as a protest against such indifference, resolved to send him, when possible, all the money disposable from the travelling and exploring funds.

THE latest news from Dr. Rohlffs' expedition to Central Africa states that one of its members, Baron Leopold von Csillagh, has left the expedition, and will return to Europe after paying a short visit to Murzuk. News from Tripolis states that the presents sent by the Emperor of Germany, and destined for the Sultan of Wadai, have at last arrived there. The latest papers sent by Dr. Rohlffs contain a valuable zoological report by Dr. Stöcker, the naturalist accompanying Dr. Rohlffs' expedition, besides a number of astronomical observations.

IN the present demand for accurate information respecting the Zulus and their country, it may not be out of place to call attention to a series of papers which appeared in the *Nautical Magazine* for 1853 and 1854, under the title of the "Loss of the Brig *Mary* at Natal, with Early Recollections of that Settlement." These papers were published anonymously, but were written by Mr. C. R. Maclean, now an official in St. Lucia, who more than fifty years ago spent three years with the famous Chaka, then King of the Zulus, and consequently had the best of opportunities for observing the character of the country and the people.

WE regret to announce the death of Dr. Friedrich Wilhelm Vogler of Lüneberg, well known in Germany as the author of several excellent geographical handbooks. Dr. Vogler was in his eighty-seventh year.

THE King of Portugal has presented to Dr. Oskar Lenz, the well-known African traveller, the knightly cross of the Portuguese Order of Christ.

PROF. BASTIAN, whose severe illness was announced not long ago, is in a fair way of recovery. The indefatigable traveller and ethnographer is at Calcutta and intends soon to start for Batavia.

WE learn from the *Colonies and India* that those who took part in the recent expedition from Wellington, New Zealand, to New Guinea, which proved a failure, intend starting another one. They propose to proceed to Astrolabe Bay, and will take with them two whale boats and a long boat, two horses, some goats, &c. The services of a doctor, geologist, and botanist are to be secured, and a carpenter, gunsmith, and one or two other handicraftsmen are to be invited to join.

NOTES

ON Tuesday morning, in the presence of a small number of his sorrowing friends, the remains of the late Prof. W. K. Clifford were placed in their last resting-place in Highgate Cemetery.

THE following grants have lately been made from the Research Fund of the Chemical Society:—10*l.* to Dr. C. A. Burghardt for an investigation into the constitution of topaz; 20*l.* to Mr. Francis Jones for the investigation of boron hydride; 15*l.* to Mr. F. D. Brown for the study of the theory of fractional distillation; 30*l.* to Dr. Dupré for the estimation of organic carbon in air; and 15*l.* to Prof. T. E. Thorpe for the investigation of albietene, the hydrocarbon of nut-pine.

M. BISCHOFFSHEIM, the well-known French Mæcenas of science, has just returned from Mentone, which he visited with M. Lœwy, the Sub-director of the National Observatory, to examine the practicability of establishing an observatory in his mansion. The site was found to be very convenient in all respects, and M. Bischoffsheim resolved to spend a sum of 900,000 francs for instruments, &c. The work is to begin immediately.

M. ANDRÉ, the well-known eclipse and transit of Venus observer, has inaugurated the publication of meteorological readings taken in the Municipal Observatory established at Tête d'Or, in the vicinity of Lyons. The peculiarity of that establishment is that astronomical and meteorological observations are conducted *pari passu* with the same zeal. It is the only place in France where the schemes organised by Leverrier, at Paris, are practised.

THE Select Committee of the House of Commons appointed to inquire into the subject of the lighting of towns by means of electricity, and to which the Liverpool Lighting Bill was referred, has determined to go into the general question, settle the principle, and then leave the thirty-four private Bills which ask for powers to light by electricity to be dealt with by the regular Committees of the House of Commons. The inquiry will commence on the 31st inst. As the evidence will be lengthy and the committee will probably report late in the Session, it is expected that no powers will be granted this Session for lighting by electricity.

THE Werderman light was tried by M. Becquerel in his lectures on electricity, delivered at the Conservatoire des Arts et Métiers on March 19. This apparatus, which will be tried very shortly in Paris, has been introduced into France by Dr. Cornelius Herz. Six Werderman lights were arranged round the chair of the professor and burned with the utmost regularity every time they were lighted. The opinion of M. Becquerel was very favourable indeed; he insisted upon the presence of a micro-