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Twenty-Five Years' Geographical Progress

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Source: *The Geographical Journal*, Vol. 28, No. 4 (Oct., 1906), pp. 377-384

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1776517>

Accessed: 27-06-2016 02:57 UTC

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Richard Lander was informed that the mountains south of Kano, towards the sea, were all inhabited by the wild Nyamnyams, and again we meet that name in the descriptions of Schweinfurth's travels through the heart of Africa. The occurrence of this name of a like meaning in the different parts of Africa points to a language common to some primitive race, which must have been that of the original inhabitants of the country, or that in these hill pagans we have fairly sure descendants of the old Africans. The Tangalis that I saw were very black and ungainly built, with coarse negro features. They had no tribal marks, and wore absolutely no clothes.

Doho was the last heathen village that I saw before crossing the Gongola into Bornu. To the north of Doho the country is inhabited by the Gombe Fulanis. Passing through Dukul, Tongo, and over the ruins of Burmi, I came to Ashaka, and, bidding farewell to that country where such an interesting chapter of African history has been written, crossed over the Gongola river into the land of the merry Kanuri.

TWENTY-FIVE YEARS' GEOGRAPHICAL PROGRESS.*

By the Right Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G.,
President R.G.S.

It is just a quarter of a century since the British Association held its last meeting in this ancient city of York, and celebrated the jubilee of its foundation, so that from the moment of accepting the invitation to preside over this Section it was clear to my mind that the most appropriate subject for my address would be the progress of geography between that jubilee and what I believe would be called in other spheres our Diamond Jubilee. For although the immediate concern of geographers is with the Earth's surface, yet we cannot avoid sharing with the rest of our race the religious observance of astronomical periods and the tendency to regard certain numbers of such periods as having a peculiar value. Geographers, indeed, might be excused some tendency to this human weakness, as they are entirely dependent on astronomical methods and on an elaborate use of numbers for the primary necessity of ascertaining where they are on that surface which it is their business to examine and describe.

I do not propose in this address to deal only, or even chiefly, with the progress of exploration since our jubilee meeting in York, for although that progress has been remarkable, its effects are probably less far-reaching than the growth during the same period of the scientific treatment of geography; while both of these advances, taken together, are, to my mind, of less importance to our country—and we are, after all, a "British" Association—than the spread of the geographical spirit amongst our people, on the main cause of which I shall say a few words. Let me deal, then, with these matters in turn, bearing in mind, however, that the two latter subjects—the growth of scientific method and what I may term the democratization of geography—are so interwoven as to make it impossible to separate them altogether.

First, then, as to the advance of exploration since 1881. In that section of the

* Address to the Geological Section at the York meeting of the British Association for the Advancement of Science, by the Right Hon. Sir George Taubman Goldie, K.C.M.G., LL.D., F.R.S., President of the Section.

Arctic Regions in which the Nares and the Greely expeditions had done their work considerable progress has been made, mainly by Lieut. Peary, who carried the investigation of the coast of Greenland further north and east than had been the case before, while his contributions to our knowledge of the inland ice are of much value. The explorations of Captain Sverdrup among the lands lying north of America, and the not less important expeditions of Nordenskjöld and Nansen across the centre of Greenland, have added much to our knowledge, not only of the physical geography, but also of the geology, biology, and ice conditions of a land which, though lying to a large extent outside the Arctic circle, is essentially Arctic in character. Another expedition, under Captain Amundsen, is now completing its work, which has extended over about three years, around the north magnetic pole. Both English and Swedish expeditions have greatly improved our knowledge of the islands of Spitsbergen, while Jackson, Nansen, and others have enabled us to lay down with something approaching to accuracy the archipelago of Franz Josef Land. But perhaps the largest addition to our information about the north polar region during these twenty-five years has been through the ever-memorable expedition of Dr. Nansen, during which he reached within four degrees of the pole, obtained soundings down to 2000 fathoms, and collected a vast amount of meteorological, physical, and biological information, which has enabled him to work out, to a large extent, the probable conditions which prevail around the pole itself.

Let us pass now to the other end of the Earth—to the great continent which, as now appears beyond doubt, surrounds the southern pole. Here also very considerable progress has been made during the last twenty-five years. For a long period after the time of Ross, over sixty years ago, only spasmodic efforts had been made to continue the work of south polar exploration. But in recent years numerous national expeditions—Belgian, German, Swedish, and British—have pursued this work, producing a mass of data in geology, physics, meteorology, and biology which should throw a flood of light both on the present conditions and on the history of this dead continent. Perhaps, as the successor in the presidential chair of the Royal Geographical Society to that great geographer, Sir Clements Markham, a Yorkshireman, I may be allowed to dwell especially on the splendid and varied work of the National Antarctic Expedition under Captain Scott, which not only carried our knowledge of the Antarctic continent about 5° further south than the limits of exploration previously reached, but also collected a vast amount of scientific information.

And now, leaving the polar regions, let me try to recall the position of exploration of the African continent in 1881. Stanley had only recently completed that history-making journey across Africa, by which he traced on the map the last great line in the framework of the continent, the river Congo; and so accurate were his observations that, notwithstanding the vast number of later explorers, the course of the river laid down by him has practically remained unaltered. But a glance at a map of Africa of 1881 reminds us that enormous blanks existed, almost from the tropic of Capricorn to the upper bend of the Niger, in the centre and west of the continent; that the region between the equator and the Gulf of Aden was almost unknown; that our knowledge of the great lake region of Central Africa, as also of the eastern and western tributaries of the upper Nile, was most imperfect. Little had been done for the Central Sudan states since the days of Barth, and only very vague notions existed as to the real character of the Sahara. Since 1881, through the efforts of Stanley himself and of a host of Belgian, French, and British explorers, the map of the whole Congo basin has been crowded with rivers, defined with a fair approach to accuracy, while the hypothetical lakes of the past have evaporated. In the southern quarter of the continent, all the region from the northern limit of Cape Colony up to the Congo watershed and Lake Tanganyika has been to a large extent

mapped in a provisional way and all the main features laid down. The work of exploration in the eastern regions of Africa has been no less complete. Stanley, on his expedition for the relief of Emin Pasha, discovered the important range of Ruwenzori, and laid down with some precision the outlines of Lake Albert Edward; while British and German explorers have made very fully known those remote feeders of the Nile which supply the Victoria Nyanza, and have contributed largely to our knowledge of the great Rift valleys and the lakes which occupy them. Joseph Thomson, the original pioneer from the east coast through Masailand towards Uganda, has been followed by many others, so that the map of all this region is thickly studded with new features; while the Anglo-German Boundary Surveys have been able to lay down a trigonometrical basis for a complete and trustworthy map of the whole region. Somaliland, the outlying parts of Abyssinia, Lake Rudolf, the rivers that run into it, and the rivers that run from the south-east into the Sobat and the Nile—all these have been explored and laid down with wonderful fulness since the Association last met in York; while, after the breaking down of the barrier of Mahdism, the advance in our knowledge of the Egyptian Sudan became almost too rapid to record. Nor has the progress of exploration in Western Africa been less remarkable. Through the energy of the officials of the Chartered Royal Niger Company, of Sir Frederick Lugard and his staff, of Binger, Monteil, and a host of other French as well as German explorers, great blanks have been filled in, and mapping of the most detailed character in many districts has been rendered possible. Our knowledge of Lake Chad and of its present and its probable past has been greatly extended, and many problems have been suggested which will provide ample work for the geographer and the geologist. The Sahara has been crossed and recrossed in many directions during recent years, especially by French explorers, with the result that we have been compelled to revise the prevailing impression of the great desert, which is by no means the featureless waste which it used to be considered. Taking the continent of Africa as a whole, its map has been thickly covered with a network of features, and, so far as cartography is concerned, all that remains to be done is to fill in the meshes of that network with local details and to give precision to our maps by careful triangulation.

I have dealt at some length with exploratory work in Africa, because it is the continent of which we knew least in 1881, and our knowledge of which has made the greatest strides since then; but the contemporaneous advance of our acquaintance with the topographical and physical conditions of other portions of the lithosphere has been very remarkable. A host of explorers, of whom I will only mention Younghusband, Littledale, Bower, Sven Hedin, and Huntington, have crossed the centre of Asia in various directions. During the same period the topographical survey of India has been brought to completion, while Indian officers and others have carried geographical investigations far beyond the limits of our great dependency, and have made much progress in the mapping of Baluchistan and Persia. The recent Tibet expedition practically settled the question of the sources of the Brahmaputra, and laid down its central and upper course. I do not know whether we should regret that they were not able to fill in the long gap in the lower course of that river, for we shall still enjoy the pleasures of hope of solving this interesting problem, which, with some equally unsolved problems in other parts of the globe, reminds us that explorers need not yet sigh, like Alexander, for other worlds to conquer. Numerous travellers have crossed China in all directions, and have done much for its accurate mapping, as have also the French in their Indo-Chinese possessions. Even in Turkey in Asia, where serious difficulties are encountered by explorers, such men as Ramsay and Maunsell have done much valuable work.

Turning to America, the surveys of Canada and of the United States have made great advance in the accurate mapping of their respective countries, while much has also been done in Mexico and in Central America. The Argentine Republic and Chile have made great progress in the exploration and mapping of their territories, and Peru and Bolivia have within recent years shown creditable diligence in this respect; but there remain in the southern continent areas covering from two to three million square miles still practically unexplored, so that to-day, as far as preliminary exploration is concerned, there is more to be done in South America than in Africa.

I have, perhaps, sufficiently indicated the marvellous progress of exploration of the lithosphere. I have naturally less to say of the advance of oceanography, for the *Challenger* expedition had completed its voyages before the jubilee meeting of the Association in 1881, although the results were not then worked out. It is, indeed, only within the last few years that Sir John Murray has been able to complete this immense work, which occupies no less than fifty volumes. Since the voyages of the *Challenger* there has been no equally extensive expedition for oceanographic work, but the study of the oceans has been carried on steadily, if slowly. The German expedition in the *Valdivia* added much to what the *Challenger* had achieved, especially in the Indian ocean; where also, only within the last year, Mr. Stanley Gardiner has carried out an enterprise which promises to yield results of the first importance. Further east, in the seas around the Malay archipelago, the Dutch *Siboga* expedition added something to our knowledge of the ocean bed; and not less important than any of these later expeditions was the enterprise carried out over a series of years in the Pacific and in the Gulf of Mexico by Mr. Alexander Agassiz, entirely at his own expense. The cable-laying companies have also done a good deal on behalf of oceanography, and some of the results of their investigations have been published by the Royal Geographical Society, under the superintendence of Sir John Murray. The immensely valuable work constantly carried on by His Majesty's surveying vessels, under the direction of the Hydrographic department of the Admiralty, is so generally known as to make it unnecessary for me to dwell upon it.

Long before the close of the nineteenth century, however, oceanic navigation had ceased to be of a pioneer or exploratory character, except in the polar regions, and had devoted itself to the no less important tasks of filling in details and of undertaking scientific research, while the comparatively new subject of limnology, which deals with those other portions of the hydrosphere known as lakes or inland seas, and which has had such immense and valuable labour devoted to it in this country by Sir John Murray, falls strictly within the limits of scientific research. To this end all geographical travel and all geographical study must come; and I am thus led to the second branch of my address, dealing with the growth of the scientific side of our subject and the concurrent spread of interest in its study. On these points I propose to deal mainly with our own country; but I shall be compelled to draw certain comparisons, however unwillingly, with the more advanced conditions, in this respect, of other countries, and notably of Germany. No one, indeed, could assert that the importance of problems relating to the geomorphology of the lithosphere, to the distribution of land and water, and to the influence of these (combined with climatic conditions) upon the distribution of life and on human interests were not recognized amongst us long before the last meeting of the British Association at York. The underlying principles of scientific geography have been perceived in all ages and in all countries by a few thinkers; but so late as twenty-five years ago a true conception of the functions and scope of geography was confined to a very limited circle of specialists. In confirmation of this, I may remind you of an inquiry

which the Royal Geographical Society undertook about that time into the position of geography at home and abroad.

For many years previously the Society had been endeavouring to awaken the public mind as to the high capabilities of geography when dealt with on scientific lines, and to encourage the teaching of the subject on a higher plane by the award of medals on the results of examinations. The failure of these attempts induced the Society to make the investigation to which I refer, and its report (published only a few years after the York meeting) may be regarded as the starting-point of the revolution that has since occurred. It was found that Germany even then had professors of geography in nearly all its universities, and a number of thoroughly trained and earnest students who devoted themselves to investigation of the subject in all directions; and that in Austria, as well as in Germany, geography had attained a position, both in universities and in schools of all grades, practically on a level with other subjects of education; while in this country it was generally regarded with apathy, and even contempt. It had no place in our universities; it was barely tolerated in our secondary and higher schools; while in the simple geography of our elementary schools there was great room for improvement. Practical work in geographical research scarcely existed, except in so far as it was an outcome of geology. There was no encouragement for students, there was no high-class geographical literature, such as existed in Germany, and for standard works we had to resort either to that country or France. The great treasure-house for geographers was Elisée Reclus's '*Géographie Universelle*,' which, fortunately, was translated into English. There existed, indeed, a few popular works in this country, but these were more or less of a purely descriptive and unscientific character, excluding altogether the fundamental data of the subject. In the Society's report to which I have referred were also given very interesting quotations from the opinions of head masters of English public schools as to the value of geography and the educational position which it ought to have. It was melancholy reading. Only a few of them took a favourable view of the subject, while the majority treated it with little respect. The remarks of those who favoured its study are to-day chiefly interesting as showing the entire inadequacy of the methods of geographical tuition in those days, and the little importance attached to it in educational circles. I must, however, quote with approbation the words of one master, who said, "I feel strongly the great importance of the subject, not only as a mental discipline, an essential part of a liberal education, but as more especially necessary for Englishmen, many of whom will be called upon in after-life to turn their geographical knowledge to practical and serious account;" and he added, "One of the difficulties in doing justice to the claims of the subject is the somewhat absurd prejudice in teaching geography, as if it were less worthy of first-rate men than Latin prose, or essay writing, or criticism." On the other hand, most of the head masters throw cold water on any attempt to give geography a substantial place in our great public schools. They considered it not sufficiently important as an educational instrument; it was hardly a discipline; it was little more than an effort of memory; it was quite worthless educationally till it became a branch of history; problems in it could not be set. These masters were supported by the opinion of a distinguished geologist that geography was not suitable as a university subject because it was a "graphy," and not a "logy." Nor, indeed, can it be contended that these depreciatory views of geography, as it was then generally taught, were unreasonable. The text-books of that time were, as a whole, worthy of the position which the subject held in the education of the country, and on a par with its reputation among the educated public. The use of maps in the daily newspapers was almost unknown; while as regards military geography, the late Lord Napier of Magdala, at the opening of the

Education Exhibition of the Society, forcibly contrasted the position at home with the importance attached to the subject in the German army, where at the manœuvres every third soldier has a map of the ground, and where in the Franco-German war maps formed part of the equipment of every company. If the position of geography in this country was so unsatisfactory a quarter of a century ago, it was not because its raw material was wanting in our language. On the contrary, few countries then possessed a literature of travel and exploration so wide and of so high a class as ours. The source of our weakness was the paucity of men qualified to apply scientific method to this raw material, and there was no institution where it was possible to obtain a thorough training in geography, such as could be obtained at a score of universities in Germany, Austria, and France. This was the position which had to be faced before placing the subject on a more satisfactory footing.

It is unnecessary for me to describe in detail the methods adopted by the Royal Geographical Society—so far as its resources and influence permitted—in carrying out the work of reformation. I need only bring before you the general results. No one will now doubt that the active minds in this great movement were right in believing that the surest means of influencing our schools of all grades, and also of obtaining in the country generally a recognition of the subject as a department of science, as a field for research, and as a subject of practical importance in various spheres of national activity, was to obtain, in the first place, proper recognition at our great universities. Attempts had, indeed, been made in the same direction as far back as 1871 and 1874, but without effect. I need hardly remind you that the later efforts of the Society had a very different result. For many years now there has been a school of geography at Oxford, while a readership established at Cambridge several years ago has also developed into a fairly well-equipped school. At Oxford there is a reader with a staff of three lecturers, and a diploma in geography is granted which practically amounts to honours in the subject. The field covered may be seen from the subjects of examination for this diploma. They are: (1) Regional Geography; (2) Climatology and Oceanography; (3) Geomorphology; (4) Ancient Historical Geography; (5) Modern Historical Geography; (6) History of Geography; and (7) Surveying. It may give a more complete idea of what English students regard as included in their subject if I mention the principal topics in the examination on regional geography—the cartographical analysis of the physical regions of the world—an elementary knowledge of the chief generalizations regarding the surface forms of the land; the movements of air and water, and the distribution of plant associations, animals, and man; the chief facts of modern political and economic geography, considered in relation to the influence of physical features. Candidates are also required to be familiar with the principles of map-making by plane-table, prismatic compass, and clinometer, with the representation of relief, and with the orientation, reading, and measurement of maps. Equally thorough and exhaustive are the various topics included under the other heads of examination. Both in ancient and modern historical geography the subject has to be considered in relation to the influence of physical features. The standard adopted at Oxford is as high as that which exists at any university in Germany. The establishment of a school at Cambridge being recent, one cannot yet speak as positively of its success as in the case of Oxford. But Cambridge has gone a step further than Oxford in placing geography as a subject in the examination for its B.A. degree; and while that may be regarded as a simple pass, the student may also enter for the examination for the diploma in geography, the standard of which is no less high than that at Oxford, while the ground covered is essentially the same. In both universities the training in cartography and surveying is thorough, and it is to be hoped that such students as propose to follow either a military or a colonial career

will take advantage of the opportunity thus presented. The example of Oxford and Cambridge has been followed elsewhere, though to a lesser extent. In the University of London there is a board of geographical studies, and the subject holds a substantial place in the University examination, and is a compulsory subject for a degree in economics. There are chairs or lectureships of geography at Victoria University, Manchester, at the University of Liverpool, and at the University of Birmingham. Steps are being taken to establish a chair at the University of Edinburgh; while other institutions of a similar kind would be glad to follow the example of the great universities if only their funds permitted. In the elementary schools the programme is nearly all that can be desired, the one thing needed here, as elsewhere, being a sufficiency of teachers who have been thoroughly trained in the subject. In the secondary schools progress has been somewhat more slow; but there has been a steady advance in recent years, and a step recently taken by the Board of Education, in issuing a very satisfactory syllabus for the teaching of geography, is certain to give a strong impetus to the subject. In the London School of Economics, under the directorship of Mr. Mackinder, which is attended annually by over a thousand students, geographical teaching holds a place of the first rank. The publishers have kept pace with this great revolution in the schools, so that to-day there is no difficulty whatever for any one, from the elementary school up to the university, in obtaining a text-book, or an atlas, or special maps suitable for his requirements. The country has been, indeed, almost flooded with cheap atlases issued in parts, some of them of a highly creditable quality, while the slides of photographs taken by explorers are sold by the thousand for educational and lecture purposes.

The main cause of this remarkable growth of interest in geography amongst our educated classes dates back to about three years after the last meeting of the Association at York. In 1884, Germany, which in the middle of the century had been still said to rule the air (while France ruled the land, and Britain the sea), and which in later years had been absorbed in the process of unification by blood and iron, suddenly launched out as a world power, and gave the signal for the partition of Africa. England and France, in both of which countries a few men had been carefully preparing, during several years, for this inevitable partition, hastened to join in the international race, and the spirit of colonial expansion, long dormant, reawakened, and reached out to all parts of the Earth where settled government did not forbid advance. We, who have lived through the last quarter of a century, are apt to underestimate the revolution through which we have passed, for a true analogy to which we must go back to the Elizabethan age. The impulse given by this movement to the study of geography can hardly be overestimated. War has been called the best teacher of geography, and certainly Napoleon, the highest exponent of the art of war, was as ardent a student of geography as he was of mathematics; but now it appears that empire-building is an even greater factor than war in advancing and popularizing geographical knowledge. Amongst the educated classes of England, France, and Germany, and, in a lesser degree, of Italy and Belgium, there are few persons who have not had relatives or friends engaged as explorers, or missionaries, or officials, or soldiers, or traders in previously little-known parts of the world, while countless numbers have been concerned in the new movement through vast shipping and other interests that shared in it. The Press, which prior to 1884 had paid little attention to the outlying lands in question, gradually devoted more and more space to everything connected with them, and continually produced most useful maps, showing not only their physical features, but also their economical conditions. It is not my business here to attempt to forecast the judgment of the future historian on the more general results of this colonial expansion, but he will assuredly recognize

its enormous effect on popular attention to geographical subjects, as well as, or even more than, on exploration.

It must not be inferred that the popularity of a subject is taken by me as a test of its place in the ranks of science; but, owing to the widening of the area from which students can be drawn and men of genius evolved, this democratization of geographical ideas is, to my mind, a very hopeful feature as regards the future of the scientific treatment of the subject.

I should have to extend my address to undue length if I attempted to demonstrate the recent growth of the scientific method at home by giving you even an imperfect catalogue of the geographical books and papers of a scientific nature published during the period under consideration, and especially in later years. I can only select for mention a few typical books, such as Dr. Mill's 'International Geography,' Mr. Mackinder's 'Britain and the British Seas,' Mr. Hogarth's 'Nearer East,' and Sir Thomas Holdich's work on 'India,' and other works in Mr. Mackinder's series entitled 'The Regions of the World.' As to papers dealing with this kind of work, I will mention those by Messrs. Buckman and Strahan, giving the results of their investigations on the river systems of the west of England; by Mr. Cooper Read on the river system of East Yorkshire; by Dr. Herbertson on the major natural regions of the world, and on the distribution of rainfall over the Earth's surface; by Mr. Chisholm on the distribution of towns and villages, and on the geographical conditions affecting British trade; by Messrs. Smith, Lewis, and Moss on the geographical distribution of vegetation in England and Scotland; by Mr. Marr on the waterways of English Lakeland; and last, but not least, by Dr. Mill on the Clyde Sea Area, on a fragment of the geography of England and Wales viewed geographically. It must, indeed, be confessed that in this respect we are still behind Germany, which has been pouring forth a mass of geographical literature of the highest scientific value. But this backwardness is the result of past neglect of the subject, and not of present apathy. There was a current saying a quarter of a century ago that the schoolmaster was abroad. I have shown you that, in a different sense, the geographer was then abroad; but I believe that we may now say that the geographer is at home and has come to stay. There is a whole school of young geographers—not yet very large, but zealous and active—full of the new ideas, the new methods, the new hopes of our rising science, and I do not think it too sanguine to expect that when the British Association holds its centenary meeting, twenty-five years hence, perhaps in this very city of York, our countrymen will be found to occupy the same position in the front rank of scientific geography that their forefathers held in pioneer exploration.

THE RECENT CALIFORNIAN EARTHQUAKE.

THE Commission of Inquiry into the earthquake phenomena in all parts of the state of California, which was appointed immediately after the earthquake of April 18 last, has issued a preliminary report, the most interesting part of which is a description of the proximate cause of the earthquake. The coast ranges of California are crossed obliquely by a peculiar set of surface features, not due to atmospheric or stream erosion, but to a dislocation, or rather a series of dislocations, of the Earth's crust, with a differential movement on either side of the plane of rupture. In general this line follows a system of long narrow valleys, or, where it passes through wide valleys, it lies close to the base of the confining hills; but in some cases it passes over mountain ridges or crosses a spur or shoulder of a mountain. Along this line are abrupt changes in the normal slope of the ground, giving rise to scarps, to small basins or pools, and occasionally to trough-like