

sometimes continued much further. I do not know whether this annelid has previously been noticed or described, but, if so, I shall feel obliged to any of your readers who can refer me to a description.

ARNOLD T. WATSON.

Sheffield, August 19.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

THERE was at least one very satisfactory feature about the Geographical Section at the Cardiff meeting. It has been the practice in all the other Sections to appoint as Presidents men who have gained a high reputation as specialists in their own departments. For some reason this practice has not been followed in the Geographical Section. True, in past years we have had such men as Murchison, Markham, Galton, General J. T. Walker; but too often the President of this Section, while eminent as a soldier, or a colonial Governor, or as a Society man, has known as much about geography as "the man in the street." It must be admitted that this has in part arisen from the fact that scientific geographers in England could have been counted on the fingers of one hand. Happily, through the recent efforts of the Royal Geographical Society, this is ceasing to be the case, and when the Chairs at Oxford and Cambridge, and the other influences which are at work, have had time to produce results, geography, in one or other of its aspects, may become as much of a career in England as it is in Germany. It was regarded as to some extent a triumph, and an earnest of what is coming, that the President of the Section at Cardiff was a geographer pure and simple. Mr. E. G. Ravenstein has long been regarded as the one scientific cartographer in the United Kingdom (where he has been naturalized for many years); and as a geographer, in the best sense of the term, he is not surpassed. It was natural that in his address he should deal with the progress of the subject in which he is master. His address, while ostensibly dealing with cartography, really showed the growth of our conception of the earth's surface, and indicated the most profitable aspects in which we may deal with that department of knowledge whose business it is to investigate.

Amid a good deal that was trivial, and notwithstanding the usual modicum of sensation, Section E did some solid work at Cardiff. The fact is that the only incident which could be regarded as sensational was the appearance on the platform of Mrs. French Sheldon, evidently suffering greatly from the accident with which she met on her return from Kilimanjaro. But Mrs. Sheldon was able to tell us some things about the people in East Africa that had never come within the ken of the male traveller. Moreover her account of the curious crater lake Chala, at the south-east foot of Kilimanjaro, was a real contribution to geographical knowledge. With immense difficulty she and her companion descended the dense vegetation which covers the precipitous sides of the crater, and navigated the tiny lake on a raft, which was continually in danger from the swarms of crocodiles. Mrs. Bishop (Miss Isabella Bird) was anything but sensational. With perfect calmness and clearness she gave an account of an almost unexplored portion of the Bakhtiari country visited by her, and especially of its interesting inhabitants. Miss E. M. Clerke's paper on the aborigines of Western Australia was more suited to the Anthropological than the Geographical Section, and still more suited to a missionary meeting.

Mr. John Coles's paper on the art of observing showed how comparatively easy it is for any man of average intelligence, and even pupils in the higher classes of our schools, to acquire a knowledge of the use of the more common survey instruments. An excellent paper on the homology of continents was read by Dr. Hugh Robert Mill, who showed that in many respects there is a remarkable family likeness among the continents, arising from the fact that they have been subjected to essentially the same influences. Mr. Silva White, in his paper on the comparative value of African lands, attempted, by a statistical method, to indicate the lines of least resistance against the European domination in Africa. Mr. Miller Christy gave an elaborate and highly instructive paper on the absence of trees from prairies; his conclusion being that the main cause of the treelessness of American prairies has been forest fires. The paper was highly suggestive, showing, as it did, that if proper measures were taken even our great deserts might be made to blossom as the rose.

The greater part of one morning was devoted to a discussion

on acclimatization, introduced in a valuable paper by Dr. Robert Felkin. The author showed that there are two schools of thought, the one regarding acclimatization as impossible, the other more sanguine and pronouncing it possible. Probably the truth will be found to be a mean between the two. In considering the subject, it is necessary to specify, first, the various nations who are to be acclimatized, and secondly, the places where they are to be located. As regards the first point, the national characteristics, habits, customs, and environment must be taken into account, and with respect to the second, the nature of the country, its climatology, its inhabitants, their mortality and endemic diseases must be brought under survey. The next point is to classify the various European nations, and it becomes evident that they can only become readily acclimatized in the temperate zone, where climatic and other conditions are approximately akin to their present habitat. In reference to Europeans becoming acclimatized in the tropics, what are those factors which prevent it, or which must be overcome before it is possible? They are as follows: heat, cold, damp, various endemic diseases, especially malaria, and those constitutional conditions induced by climate which either destroy the immigrants or diminish their fertility after one or two generations. Progress has been made during recent years in enabling persons to reside longer and to enjoy greater health in the tropics. What probability is there that science will accomplish still more in rendering acclimatization possible for Europeans in tropical countries? It must be said that both Dr. Felkin and those who followed him in the discussion occasionally lost sight of the real point at issue. The adaptation of a European to tropical conditions for a few years is one thing; the acclimatization of a race in a climate totally different from that which has been its inheritance is another. About the former there need be now no difficulty: what scanty experience we have leads to the conclusion that the latter is practically impossible. What we really want are experiments continued over three or four generations.

Colonel Holdich, of the Indian Survey, gave some valuable hints in his paper on the application of Indian geographical survey methods to Africa. An outline of the methods proposed may be summarized as—(1) The adoption of a rapid system of triangulation along the most important lines for first survey. (2) The extension of a graphic system of mapping from these lines by means chiefly of native labour. The most important lines for first survey are the international boundary lines. Until lately England has been peculiarly free from the necessity of demarcating or maintaining national boundaries. Even India offers but a comparatively short line for defence. The new partition of Africa largely increases her responsibilities in this respect, though there may be no immediate cause for action. There is, however, a great necessity for a topographical acquaintance with the boundaries adopted. Only a small portion of them apparently follow permanent natural features, the rest being defined by rivers, &c. It would appear, then, advantageous to commence triangulation along the boundary lines. This is, however, so far a national or international question, and consequently in these preliminary stages of survey State assistance might very well be expected, and Imperial resources drawn upon for carrying it out. (1) What are these resources? (2) What is the nature of surveys already existing in Africa? (3) What is the nature of the survey we ought to build up? Replying to (2) and (3), we find that if a continuous and comprehensive scheme is to be adopted, with unity of design for all the scattered districts of the African colonial system, nothing has been done as yet which would assist us in carrying out our scheme. This scheme should be largely borrowed from experiences in Asia. A consideration of it shows, in reply to (1), to what extent Imperial survey resources might be utilized during the processes of laying out the preliminary lines of triangulation. From this triangulation the extension of topography would thereafter probably depend on private enterprise. Then followed a short consideration of the general topographical processes as carried out by natives of India, of the value of such native labour, and of the possibility of raising survey establishments in Africa similar to those which have done such excellent work in Asia.

The subject of reform in our Ordnance Survey was again introduced this year in an elaborate paper by Mr. H. T. Crook, who was strongly supported by a number of speakers. Mr. Crook pointed out many defects in the large-scale maps. Some of them are notoriously behind date; they are issued in a most

inconvenient form; they are far too expensive; they are difficult to obtain outside of London. The Committee of this Section sent a strongly worded resolution to the Council of the Association, recommending, among other things, that the Directorship of the Survey, instead of being merely a staff appointment, should be made a permanent office. Unfortunately, the resolution submitted to the General Committee omitted this and other important points, so that in its final form it does not amount to much.

Mr. James Thomson's paper on photography applied to exploration contained suggestions of great practical value. He showed the value of the camera, not only in recording geographical features and types of people, but even as an adjunct to regular surveys.

The subject of geographical education was introduced in a short paper by Mr. J. Scott Keltie, who spoke of the results which had followed the action initiated by the Royal Geographical Society a few years ago. Advances have been made in many directions; Chairs have been established in Oxford and Cambridge; and a higher conception of geography and of its practical utility has begun to prevail. Happily, the attempt to obtain the Section's approval for the foundation of a local Geographical Society in Cardiff failed.

Among other papers worthy of mention were two by Colonel H. Tanner, of the Indian Survey—one on a new method of Bar-Subtense surveying, and a second on some of the principal tribes of the Himalayas.

MECHANICS AT THE BRITISH ASSOCIATION.

IN Section G, Mr. T. Forster Brown, an engineer well known in the locality in connection with mining industry, was the President. There was an average list of papers, but the discussions were not so full as is sometimes the case in this Section. As a consequence, the sittings were got through with more than ordinary speed; there being no meeting on the Saturday, and the whole business of the Section was completed by two o'clock on the Tuesday of the meeting. The President's address was given as usual on the Thursday, and referred to mechanical details in connection with mining. In character with the meeting it was brief. The usual vote of thanks having been moved and seconded, Prof. Osborne Reynolds proceeded to read the third Report of the Committee appointed to investigate the action of waves and currents on the beds and foreshores of estuaries by means of working models. It will be remembered that this Committee arose out of a paper read by Prof. Osborne Reynolds at the last Manchester meeting of the Association; and this, in turn, arose out of the investigations made upon a working model of the Mersey estuary in connection with the then proposed Manchester Ship Canal operations. The further investigations referred to in the last report have been conducted on the same system as previously described. The chief object of this series has been to obtain further information as to the final condition of equilibrium with long tidal rivers entering the head of a ∇ -shaped estuary; to obtain more complete verification of the value of the criterion of similarity; to investigate the effect of tides in the generator diverging from simple harmonic tides; and to determine the comparative effect of tides varying from spring to neap. It would be impossible in this brief report of the proceedings of the Section to give an idea of the results at which the Committee arrived, or rather the results shown by the experiments, more especially without the aid of the diagrams by which the Report was illustrated.

The next business was the reading of a paper by Mr. G. Chatterton, in which a sewer was described that has lately been constructed to carry off the sewerage of a neighbouring district, and thus relieve the River Taff of some of its present foul burden. The sewer, no doubt, is a meritorious engineering work, but not one of magnitude or especial novelty. The most notable point is that the Taff has to be crossed seven times, and this is effected by means of inverted syphons which go below the river bed. The principle, of course, is not new. The chief interest was in the speech made by Mr. Baldwin Latham during the discussion, in the course of which the speaker exclaimed against the "faddists" who maintain that what is taken from the earth should be returned to the earth. Mr. Latham is of opinion that what is taken from the earth should be given to the sea. The ocean, he says, was given to the engineer as a

receptacle of sewage—presumably among other functions. Moreover, Mr. Latham tells us that it is more profitable to put sewage in the sea than to keep it on the land. It encourages the growth of marine fauna; and it is, so Mr. Latham says, a well-known fact that where there is most sewage there are most fish. As there were no "faddists" present, Mr. Latham had it all his own way.

Mr. L. F. Vernon Harcourt's paper described the engineering operations carried on in the neighbouring River Usk and the harbour of Newport. This paper, again, did not bring forward any points of particular novelty. Mr. Vernon Harcourt is proceeding on the now fairly well recognized lines of increasing the tidal flow. Mr. Abernethy spoke in the discussion, and told the Section how he had once resigned his position in connection with the Swansea Harbour Board because it was proposed to canalize the river. The question might, we think, have been discussed with advantage—although, perhaps, not in connection with the rivers referred to—how far volume of ebb and flow, as compared with velocity, is the ruling factor.

Mr. W. Key, of Glasgow, described the system of ventilation and heating which he had introduced in the Victoria Infirmary, Glasgow. Here, again, we have no new theories enunciated, but the paper was none the less valuable on that account—perhaps more valuable. Mr. Key has taken recognized principles, selecting and arranging in a common-sense manner, and put them into practical shape. The consequence is, we hear, that the atmosphere in the Infirmary is as sweet as that outside—in fact, more so; for, whilst there may be fog in the street and mist on the hill-side, the wards are dry and clear. The circulation of air is by rotary fans driven from a gas-engine. A point upon which Mr. Key strongly insists is a screen down which water is constantly trickling, and which is automatically flushed at intervals. This has the effect of converting dust and other floating particles into mud. The air is heated over steam-pipes in the winter. Admission is 5 feet above ground, and eduction is from the floor-level, so that dust passes off, the air current assisting gravitation.

On the second day's sitting, Friday, August 21, the chief interest was absorbed by Sir Edward Reed's paper, in which he gave certain particulars of the Channel tubular railway, which he proposes some day to construct, supposing the Fates are propitious. If one may believe the eminent engineers who took part in the discussion, the Fates never will be propitious, for Sir Edward violates the first and cardinal rule of engineering enterprise in propounding a scheme that cannot pay. Sir Edward says his double tube, which is to be laid on the bottom of the sea—it is not a tunnel—will cost 12 to 14 millions. Sir Benjamin Baker says that Sir Edward must double his figures, and even then he will not have money enough. It has been stated on the highest authority that the Channel traffic would not pay interest on a million and a quarter spent on harbours; and, if this be the case, there would be a poor prospect for those who would subscribe money for even a Channel Tunnel, far more a tubular railway, and most of all a Channel Bridge, such as Messrs. Schneider and Hersent propose. Sir Edward's scheme is sufficiently heroic. He would construct two mammoth tubes, of steel plate and concrete, 20 feet in diameter. The tubes would be made in lengths, and when two lengths were completed they would be joined together in parallel, 50 feet apart, and floated out into the Channel to be attached to the completed length. The first part of the construction, near the shore, would not be difficult, but if ever Sir Edward gets out into deep water, say 200 feet, he will find troubles enough. All work is to be done above water. Thus the end of the completed part of the double tube will be kept afloat until a fresh length is joined on. Then that will be allowed to sink, and the last attached part will form the end of the completed part. In this way, so long as the work of construction is in progress, the part of the tubes last completed will slope up from the sea bottom to the surface, so that the next length may be attached. The scheme is splendid in its disregard of difficulties. It is worthy of the fervid genius of Jules Verne.

Prof. W. Robinson next read a paper on petroleum engines. It would appear that this description of motor is likely to come to the front, if one may judge from the fact that their manufacture is being taken up by some important engineering firms. Priestman Bros., of Hull, have been at work on the problem for the last year or two, and it is chiefly of the Priestman engine that Prof. Robinson speaks. Crossley Bros., of Manchester, who have made such a brilliant success with the Otto gas engine,