

minds. The standard of quantity in learning, like the price of food, seems to be perpetually rising, and as the human mind shows no very lively signs of expanding in direct proportion, but, on the contrary, shows some tendency to collapse, it would seem to be well to think more of quality in work and less of quantity. We must remember that forced growth in plant or man is in the end destructive. The day of the grammarian, celebrated by the poet, is perhaps gone, and it is more than doubtful if we want to read his whole book; but we should do well to take at least a page out of it, and allow our ideals to be, not shaped, but modified by the splendid sentiment, "Leave now for dogs and apes, man has forever."

If, then, we could plan our curriculum with more provision for this training of the powers, as apart from actual professional work, and with at least a tacit recognition of the fact that rest and recreation must follow mental exertion, and precede more exertion if that "more" is to be effective, I think it would be possible to require a much higher quality of work and make up for omissions in detail of direct training, which, after all, if one knows how, can be learned in the first stages of practice which follow college life. This little phrase, "if one knows how," should really indicate the difference between the man who enters shops direct and the man who enters them after college work. Our results in practical work should, if we are on the right track, prove, what is not questioned any longer in many places, that the college graduate is the man who is wanted in business life.

As to those higher elements of character, without which no education is of much avail, in these especially the training must be indirect, but never neglected. In every college there are endless opportunities for self-knowledge, self-control, and, if a man so choose, for self-sacrifice. In a scientific college there are special influences making for the development of character. The constant effort to eliminate error tends towards the development of truth and accuracy. The cultivation of the will in overcoming obstacles should produce the sturdier manly virtues; the patient waiting on nature's working encourages the gaining of a wise self-restraint, which we may hope to see employed in the directing of life; and the emphasis laid on the pursuit of truth for its own sake should help to overcome the spirit of commercialism—that caring for scientific success mainly for what it will bring in financial success—which is an ever-present danger of the application of science to life.

We see then, in general, that we should like to make it our aim in the Imperial College to develop scientific education both on the imaginative and on the practical side by, on the one hand, bringing our men into somewhat closer touch with the noblest thoughts of the past and with the world-wide strivings after truth which characterise our present age; on the other hand, by inviting the advice and cooperation of men of business and of professional men in actual practice, so as to keep our courses in accord with their methods, and, if possible, to earn the reputation of being the place where an employer must easily find the man he requires.

Finally, we consider that if we can succeed in training men to be at once good scientific men and good citizens, we shall have done the best that is possible to serve our country by giving to it a class of workers who can be trusted to put the true service of man above their personal success, who are willing patiently to search for truth in hidden and dangerous places, who will be able to follow true laws of economy, and to prevent some of that waste which we now see going on in painful contrast to the destitution which runs parallel with it. Such men often show a capacity for leadership through individual force of character, and are no less ready to follow with unselfish devotion the path of common duty.

With grateful pride we may say that, to a high degree, these things have been already achieved by the associates of the several institutions now uniting in the Imperial College. We recall the eagerness with which some of our students went to serve their country in South Africa. A tablet has recently been set up in the Royal College of Science to keep their memory before us. We believe that of very many, had they found a chronicler similar things might have been written as were actually penned by a

western poet about one of the Associates of the School of Mines:—

The men he worked or  
Say judging as best they can,  
That in lands which try manhood hardest  
He was tested and proved a man.

In conclusion, I am permitted to make some very pleasant announcements. The Bessemer committee has provided, as most of you are aware, for the equipment of the mining and metallurgical laboratories in the new building, of which the first plans have already been prepared by Sir Aston Webb, and the erection of which is to be commenced in the near future.

Again, a gentleman [Mr. C. Hawksley], who I am glad to see is with us to-day has very generously consented to equip and endow a hydraulic laboratory, which, we hope and believe, will render it possible to investigate many problems of flow which have not heretofore been attempted.

I am sure, too, that it will be no small satisfaction to all those present that, with His Majesty the King's hearty approval, steps are being taken to equip and endow certain other important laboratories.

Many and valuable donations, too numerous to mention in detail, have also been received from Canada and the United States, for which we are most grateful.

Lastly, the roll of honour of those who have occupied the chairs in the different sections of the Imperial College is a very long one, and includes many names which have made England famous in the world of science. I cannot but think that many would like to have a permanent memorial to the names of such men in the form of chairs, laboratories, scholarships, or library endowments. In this matter of giving I should especially wish to enlist the sympathy of the Associates who leave these halls year after year. None have contributed more to the success and advancement of the universities of America than their own graduates. Every college of importance has an alumni association. The class sent out each year appoints its own secretary, who is expected to keep in touch with all its members, each of whom contributes a small sum annually to a special fund intended to help his alma mater. Most excellent has been the result of the scheme. Thus, at one of the great universities, a sum of 10,000*l.* is annually given for general purposes, while a large reserve is always available for any special need. A further advantage is found in the fact that the alumni are always kept in close touch with their college, are imbued with a real *esprit de corps*, and consider it not only a duty but a pleasure to help the institution which has prepared them for their life's work.

There is a grand opportunity for benefactions in the Imperial College if progress is to be maintained and if, as we hope and expect, we are to become the central, the Imperial Scientific School, imperial in conception, imperial in our sphere of work.

#### GEOGRAPHY AT THE BRITISH ASSOCIATION.

THE geographical section of the British Association this year was particularly fortunate in the meeting place allotted to it, for better accommodation could not be desired than that afforded by the theatre in the Royal Dublin Society's building in Kildare Street.

Opening the sectional meeting on Thursday, September 3, the president, Major E. H. Hills, took as his subject the survey of the British Empire. His address amounted to a plea for the more thorough organisation of the Imperial survey, and he dealt with the work, not only retrospectively, but prospectively, analysing present methods, discussing their shortcomings where such exist, and suggesting plans for the future. One of his most notable recommendations was that the re-measurement of the two principal arcs, meridional and longitudinal, should be undertaken by the British Ordnance Survey, and this recommendation was afterwards embodied in a resolution forwarded by the sectional committee to the council of the association, suggesting that the Board of Agriculture and Fisheries (which controls the Ordnance Survey department) should be memorialised to this effect, and the committee

of Section A (Mathematics) gave support in a similar resolution. Major Hills alluded to the adverse effect of the lack of good maps on British operations during the South African war, and showed that the possibility of a similar occurrence in future was not yet removed. Major Leonard Darwin and Sir David Gill, who respectively proposed and seconded a vote of thanks for the address, urged the same point, which was commented upon by a section of the Press as an adverse reflection on the work of the British Government offices in this direction. Major Darwin, therefore, on the following day, with Major Hills's support, made it clear that no such reflection was intended. Where the work of the Colonial Office was unfettered, they said, it was now admirable.

Prof. W. M. Davis, of Harvard University, who subsequently during the meeting gave a brilliant evening lecture on the Colorado canon, now gave a short lecture on the physiographic subdivisions of the Appalachian mountain system in the east of the United States. He divided the system into a crystalline longitudinal belt to the south-east and a stratified longitudinal belt to the north-west, distinguishing from both the Appalachian plateau to the north-west again. After elaborating the physical aspect of the system, Prof. Davis went on to demonstrate its effect on early settlement, and showed the peculiar interest of the Appalachians as offering the first barrier to the penetration of the country from the east, but he also showed how certain clearly defined routes were afforded through the barrier. The afternoon lecture was popular in character, and attracted a very large audience for a sectional meeting; it was given by the Rev. W. Spotswood Green, of Dublin, who, under the title of "Ireland: her Coasts and Rivers," addressed himself mainly to those visitors who might be enabled, through the organised excursions of the association or by subsequent travel, to see more of Ireland than its capital. Following geographical methods, he appended to a brief physiographic description of the island remarks on a variety of historical (mainly antiquarian) topics, and illustrated all with admirable lantern-slides.

On Friday morning (September 4) a full audience was attracted to two papers on different aspects of geographical education. Prof. R. A. Gregory, treating the subject in a general manner in his paper on "School Geography as a Mental Discipline," brought out the fact, which, though being slowly realised, must still be constantly insisted upon, that the proper teaching of geography does not consist in the impression of lists of names and disjointed facts on the student's memory. In his paper, and the remarks of speakers who followed him, it was shown that geographical causes and their political, economical, or other effects must be taught in an orderly perspective. Moreover it is desirable, not merely to present facts and their reasons to the student, but also to train him to deduce reasons from facts for himself. Dr. A. J. Herbertson, in opening a discussion on the paper, supported the reader in laying stress on the utility of work in the field and also of instruction in the reading of maps, and all the inferences to be drawn from cartographical representation. The difficulty of finding teachers qualified to teach geography properly was insisted upon by more than one speaker, and finally Major W. L. Forbes enlarged upon the necessity of establishing geographical lectureships at all universities, where training for teachers might be obtained.

Prof. J. L. Myres' paper, which followed, was an admirable disquisition on the value of geographical study applied in a special connection. Speaking on the geographical study of Mediterranean man, considered as an element in a "classical education," he said that the "classical education" as generally conceived and given took no account of geographical environment. Yet only the study of that environment could provide a proper background for the picture which it was desired to impress upon the minds of students. His argument led finally to the conclusion arrived at in the preceding discussion—that classical teachers are not yet generally equipped to give geographical instruction. The Rev. T. Corcoran pointed out a fact both novel and of interest to many of his hearers—that German classical cartographers appear by their work to have been at fault in confining their studies to the Latin, to the exclusion of the Greek world. At the

conclusion of this educational discussion Dr. W. S. Bruce showed lantern-slides illustrating the expedition of the *Scotia* in the Antarctic, and alluded to the publication, now in progress, of the scientific results of that expedition.

Mr. W. L. Grant, assistant to the reader in colonial history at Oxford University, lectured in the afternoon on the northward expansion of Canada. His lecture was framed with especial reference to the visit of the association next year to the Dominion, and he pointed out the particular importance of Winnipeg, the place of meeting, as the point of junction in the lines of communications between east and west. As these lines are at present laid down, the developed portions of Canada resemble a wasp in shape, and Winnipeg is situated at its narrow waist. A noteworthy point made by the lecturer was that in the development of the North-West railway construction must precede settlement, not follow it—a sequence hardly to be conceived by those without experience of pioneer work.

On Monday morning (September 7) Mr. E. A. Reeves exhibited and explained three instruments recently designed by him for the use of surveyors and travellers:—(1) a distance-finder alidade for plane-tableing; (2) an astronomical compass and time indicator; (3) a new form of reflecting artificial horizon. Mr. H. G. Fordham read a paper entitled "Notes on the Cartography of the Counties of England and Wales." This paper has been privately printed, and is of great value for reference in a subject which has not hitherto received deserved attention. Mr. Fordham stated that, taking Hertfordshire as an illustration, no less than about 400 maps of that county have been published, about half of which, however, are re-prints, more or less altered from the original plates. In this connection it was interesting to recognise, in some of the less reputable maps which are issued to-day for road-users, plates about a century old, though of course brought up to date. Mr. Fordham exhibited a large number of maps, which were inspected with great interest at the conclusion of his paper. In the afternoon Captain H. G. Lyons, of the Egyptian Survey, who was the recipient of an honorary degree of Trinity College during the meeting, read a paper on the longitudinal section of the river Nile. He showed that an almost complete line of levelling existed along the river from Victoria Nyanza to the Mediterranean Sea, a distance of 3500 miles. After the main river debouches from the elevated equatorial plateau upon the level plain of the Sudan, and its tributaries have the very slight slope of 3 inches, or little more, to the mile. But the flattest part of the whole course is between the Sobat and Khartum, where the slope is from one-half to one-third of an inch per mile. The well-known cataracts are rapids where the river erodes the crystalline rocks which alternate with sandstone. The latter is, of course, laid over the crystalline rocks, but these are not of level surface, and the river has cut down the land far enough to expose their greater elevations. Below Assuan, where the lowest of these cataracts occurs and the great irrigation dam is situated, the river has formed alluvial plains, and is building them up at the rate of about 4 inches per century. The work of the river is erosive in the equatorial plateau region; in the plain of the Sudan it deposits its load of solid matter, and thus raises the land; in the cataract reaches it erodes again, and below these, down to the delta, it again builds up.

As a whole, the papers given on Tuesday, September 8, proved the most popular. They were of the sort to do so, as all were mainly descriptive and all were illustrated with lantern-slides. The Rev. George Furlong's paper, entitled "Unique Experiences at the Birth of a Volcano," attracted the largest audience of any attending the section; the number present did not fall far short of 400. They were kept fully interested, for Mr. Furlong showed that his claim to unique experiences was justified. He was a missionary in Savaii, Samoa, when the volcano of O Le Mauga Mu, after a period of earth unrest, first broke into life, and he witnessed, and carefully observed and photographed, often under great difficulties, the phenomena accompanying the outbreak and the opening and building up of the crater. Some of his photographs were highly impressive, especially those of the eruption of steam where the hot lava flow reached the sea; and though he disclaimed scientific ability, some of his observations were

of much scientific interest. For example, he had no doubt that the volcano was more active during the period of full than of waning moon; he noted a marked variation in the character of the fumes from the volcano at different times, and he was able to correlate the occurrence of a succession of tidal waves with periods of more than usual activity on the part of the volcano.

Mr. L. C. Bernacchi, well known in connection with the voyage of the *Discovery* in the Antarctic, now brought forward an account of his journey in the little explored Rio Inambari region of Peru, where a new field for the rubber trade is opening up. Dr. W. S. Bruce gave an account of his surveying and accompanying scientific work on the island of Prince Charles Foreland in the Spitsbergen group, an island known for three centuries, but never hitherto surveyed. A committee of the section, with a grant from the association, had assisted Dr. Bruce in his work, and his lecture was an elaboration of the report of the committee. He has produced an almost complete detailed map of the island, which has an area of 271 square miles, and has studied its geology, zoology, botany, and meteorology. It may be added here, with regard to the other committees of the section appointed for scientific research, that Mr. R. T. Günther has practically completed his investigation of the oscillation of the land-level in the Mediterranean region, and that Mr. J. Stanley Gardiner's investigations in the Indian Ocean and Dr. A. Strahan's study of rainfall and run-off in certain English rivers are in active progress.

On Tuesday afternoon the meeting of the section was brought to a close with two papers on a subject of local interest, which pointed to a field for new investigation lying at our doors. Mr. Harold Brodrick gave the results of his explorations and measurements in some of the limestone caves of the county Fermanagh—Marble Arch Cave and others in the vicinity; while Dr. C. A. Hill spoke of the Mitchelstown caves in the county Tipperary, one of which, though frequently visited by tourists, is far from having been explored in its entirety, while the other, though discovered at a much earlier date, is never visited now. These caves, unlike those described by Mr. Brodrick, which are underground water-courses, are the product of a hydrographic régime no longer extant; they are no longer subject to water action, being practically dry, and their high antiquity, thus proved, gives them a peculiar interest.

#### EDUCATION AT THE BRITISH ASSOCIATION.

A VERY full programme was arranged for each of the four morning meetings, and the attendance of members, although never very large, was remarkably sustained throughout the sessions. In the afternoons visits were paid to schools of varied types, and no pains were spared by the staffs of the institutions in their endeavour to make these visits as instructive as possible. It was evident that the majority of those present at the discussions were engaged in teaching or in educational administration. The "popular" side of Section L has given way to the professional side, which is as it should be.

The thoughtful address given by Prof. Miall sounded the right note of scientific investigation and careful criticism (*vide NATURE*, October 8). Prof. Armstrong followed the president with a paper entitled "The Outlook: a Grand Experiment in Education." The author took an optimistic view, chiefly based on his observation that a more practical treatment of the scholar prevails than was the case a few years ago. Schoolmasters and mistresses were beginning to recognise that English really was a language, but the brightest spots were the schools at Osborne and Dartmouth. With the advantages of naval discipline and *esprit de corps* the sailor had cut the Gordian knot and broken down the old tradition that the school was a place for literary study. Experimental schools should be introduced into the country, but the hand of the builder should be stayed until it was known what was required. He asked for a Royal Commission of Inquiry, consisting of a few competent persons, who should study existing methods of education and make recommendations.

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Mr. R. Blair (executive officer of the London County Council) followed with a paper dealing with the progress made in the organisation of education in the area under the authority of the council. Some idea of the magnitude of the task performed may be gleaned from the annual expenditure, which is four and a half millions sterling on elementary and one million on higher education. In the elementary schools the subjects of instruction, in addition to those usually found in public elementary schools, include elementary science, nature-study, domestic economy, manual training, physical exercises, swimming, and in certain cases modern languages. By means of conferences and consultative committees the twenty thousand teachers employed have opportunities of expressing their views on the management of the schools. In addition to training their own teachers to the standard of professional qualification required by regulation, the council provides for further training of practising teachers in connection with London University. The extensive and highly varied work of technical education, from the ordinary evening school to the polytechnic, is being coordinated. With regard to secondary education, the policy of the council is to provide, or assist in providing, secondary education at a moderate fee for those who are able to avail themselves of it, and to offer the advantages of secondary education free of charge to the most promising children from the elementary schools. Omitting private schools, half the pupils are in secondary schools aided by, and nearly one-tenth in those belonging to, the council. Physical education, organised games, and medical inspection are now receiving a large amount of attention, and open-air schools have been included in the experiments made to deal with physical defects. Necessitous children receive meals through voluntary funds. As an instance of the scale on which the authority works, we note the item of 900,000 plants and other nature-study specimens supplied monthly by a small botanical department. We can only mention that Mr. Blair expounded clearly the principles which guided the authority (1) in its provision of accommodation for pupils in elementary schools; (2) in its provision and award of scholarships; (3) in the training and promotion of teachers.

Mrs. E. M. Burgwin then read a paper on special schools for the physically defective and the mentally deficient. The permissive Act known as the Elementary Education (Defective and Epileptic Children) Act, 1899, enables an education authority to take charge of feeble-minded children (not imbeciles) until the age of sixteen. The late London School Board opened its first special school in 1892, and there are now in London eighty-four schools, with a roll of 6006, for the mentally deficient, and twenty-eight schools, with a roll of 2255, for the physically defective. In the case of the mentally deficient, the schools aim at developing intelligence through the motor senses. The aim in teaching the physically defective is to train them to become good workers in spite of their infirmity; for this, expert trade teaching for four years before leaving school is necessary. Only by decreasing tuberculosis can we reduce the number of cripples.

The second morning was devoted to practical instruction in elementary schools and to education in relation to rural life. Sir Philip Magnus prefaced the reports of the committee on elementary experimental science studies in elementary schools with a review of work accomplished since the appointment of the committee at Southport in 1903. He took the opportunity to congratulate the Irish people on the passage of the Irish Universities Act, and on the prospect thereby afforded of securing for all classes of citizens further opportunities of higher education. He sincerely hoped that those who were training to become teachers in elementary schools might reap the advantage of the wider learning and broader views of life which residence at a university offered. Mr. W. M. Heller read the report of the subcommittee, which insisted upon including in the curriculum experimental work to be performed by the pupils. More attention should be paid to aims and methods in teaching elementary science, and inspectors should understand both subject-matter and methods. Particular emphasis was laid on the importance of training girls in the methods of experimental inquiry. With the report are four appendices containing alternative syllabuses and a list of apparatus.