

Between Mauritius and Cargados there was a depth of 1962 fms., there being no marked connecting ridge, though the bottom tails off very gradually from each bank. At Cargados we remained for six days, examining the reefs and islets, and dredging. It is a crescentic-shaped surface reef, 31 miles long, on the south part of the Nazareth Bank, which is roughly 220 miles long by 60 broad, with an average depth of 33 fms. The land is of coral rock with no signs of elevation, and is a great breeding resort for tern. It is covered with guano, owing to which the land flora is very scanty, only 18 different plants being found. Naturally land animals were scarce, but 42 insects were secured, four-fifths from the guano.

Cooper for the most part took the dredgings, and he reported to me that he found near Cargados "a wonderfully constant depth of 30-35 fms. over the body of the bank, while towards its western edge there is a slight but uniform rise to 27 fms., thus suggesting an incipient atoll with its eastern side slightly tilted up above its western. Over the plateau, where 30 hauls were made in different directions, the bottom was either coral-rubble, white sand, shell-rubble, or weed. The three latter occurred only in the central parts of the bank, while the coral-rubble, though also found there, alone formed the raised edge of the western side, being mostly in the form of large lumps. From this rubble, which is of a bright red colour due to an encrusting nullipore, we obtained a rich variety of animal life, nearly all forms tinted with red. The absence of living corals from the rim as well as from the plateau in all depths over 20 fms. was a noticeable feature." About 25 different species of algæ (not lithophytes) were dredged, several from 40-50 fms. on the outer slope, though none have so far been secured from more than 60 fms.

In the channel midway between Nazareth and Saya de Malha banks we found a depth of 222 fms., the connection being a ridge rapidly tailing off on its western side to more than 800 fms. Saya de Malha itself really consists of three banks, a northern, a very large central, and a small south-eastern. The north bank we found to be separated by a channel of 636 fms. from the central, while the depth between the latter and the southern bank is only 130 fms. All are of more or less atoll form, but the south side of the central bank differs from all other parts of the same banks and from the Nazareth Bank in tailing off *very gradually* from 65 fms., the general depth in its centre, to 200 fms. The area in this part beyond 120 fms., which is to some degree protected from the prevailing south-east winds and currents, formed a rich collecting ground, the bottom being composed of a white rubble of bivalve and sea-urchin shells, evidently all swept off the shallower bottom above. From 80 to 100 fms., where it is more exposed, the bottom is hard, being swept bare by the currents, but still further north at 60 fms., where the eastern edge of the bank has only 10-20 fms. of water, is soft mud with casts of pelagic foraminifera. A considerable number of dredgings were taken at depths above 20 fms., and fair collections have been obtained. Only the regular deep-living corals were secured, but two hauls at 26 and 29 fms. gave between them more than 20 species of corals, typical of shallow reefs. To the north of the banks we dredged between 300 and 500 fms., the bottom being of the usual character at such depths off coral reefs, though with rather more rubble.

Leaving the Saya de Malha banks we ran a line of soundings to the shallow bank, which surrounds the Seychelles, the greatest depth found being 961 fms. Thus our soundings prove the existence of a crescentic-shaped ridge, 1100 miles long, with less than 1000 fms. of water, arising on either side from a general depth of 2200 fms.

Now we are at Coetivy, the most southerly island of the Seychelles Group. It is an atoll bank with a large island to the east, where we shall camp for ten days, while the ship goes to the Seychelles for coal. On her return we propose to examine the line connecting the Seychelles to Madagascar.

J. STANLEY GARDNER.

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SOME CHARACTERISTICS OF AMERICAN UNIVERSITIES.¹

THE total amount of private benefactions to university education in the States during the last thirty years reaches the amazing figure of forty millions sterling; and this is quite apart from the large annual appropriations made by the Federal Government and by the State Governments for technical colleges and State universities. The total amount contributed by private benefactions in the same period in these islands was about five millions.

The number of professors, lecturers, and other teachers in the American universities and institutions of university standing is very little short of the total number of university students in the British Isles; the figures are respectively 17,000 and 20,500.

A large and increasing number of the greatest industrial and commercial firms in America restrict their highest posts to college graduates. In Montreal two great railway companies—the Canadian Pacific and the Grand Trunk—have just clubbed together to establish and endow in McGill University a department of railway engineering for training the first-rate staff of officials, which they feel to be indispensable to the rapid extension of their lines in the great north-western territories now awaiting development. Of our own industrial leaders, it would be safe to say that at least nine out of ten would regard a college training as an absolute disqualification.

The vigour of the professional schools is to be explained by two features which differentiate them from our own:—(1) The presence of a culture element; (2) the close and almost organic connection between academic and industrial life.

(1) Where a professional or higher technical school is established in England, the tendency is to make it purely technical, to banish all literary studies, and confine the student's attention strictly to scientific study directly bearing on his future profession. In America a broader view is taken.

The great Morrell Act for agricultural and mechanical colleges was thus expounded by its author:—"These colleges were not established for the sole purpose of teaching agriculture. It was never intended to force the boys of farmers going into these institutions so to study, that they should all come out farmers, but to give them an opportunity to do so if they saw fit. Secondly it was a *liberal education* that was proposed. Classical studies were not to be excluded, and must therefore be included."

But further, the technical course itself in the great majority of cases includes a culture element, supplied not by Latin and Greek, but by French or German, history, civics, and economics. The Massachusetts Institute of Technology in Boston, the greatest school of the kind on the Continent, the Pratt Institute (Brooklyn), the Armour Institute (Chicago), all make literary studies of this kind an indispensable part of the curriculum for their diplomas. The same is true of the great Guelph College of Agriculture in Ontario: French, German, and English literature have to be studied before the student can graduate as B.S.A. of the University of Toronto; and the reason was well put by the principal:—"It is not sufficient that our graduates should know their professional work, they must have some knowledge of their fellow-men and power of holding their own and of presenting their subject to the educated public, which a purely technical training cannot give." These are the words of a remarkable man who found Guelph in 1884 on the verge of extinction, and in twenty years has raised it to a position of almost undisputed primacy among the agricultural colleges of the continent, and transformed thereby the agricultural industry of central Canada.

(2) Both professors and students are in the closest touch with the industry which the school is intended to feed. The former are not merely permitted, but encouraged to take private outside work. The latter are required to spend some part at least of their vacations in working in mines, engineering works, on farms, &c., as the case may be, and their reports on the work thus done contribute

¹ Abridged from an address delivered before the Guild of Graduates of the University of Wales at Aberystwyth, by Principal H. R. Reichel.

to form the professors' estimate of their fitness for the degree.

The universal length of the undergraduate course is four years, not three as with us; and I am bound to say the lengthened period seems to me to have a decided advantage in avoiding hurry and encouraging maturity of growth. For several years the doubt has been growing in my mind whether our qualifying period of three years can be regarded as satisfactory. We owe it, no doubt, to the habit of mind inherited from the old London University of regarding ability to pass a written examination as the true test of training. From this incubus the American university is almost wholly free. A student gets his degree for the regular work he does throughout his university course, and though there is a test at the end, that test hardly ever takes the form of a cumulative examination in all he has been studying for two or three years; often it is a thesis. The effect of this on the course of study is very marked.

Post-graduate study is of comparatively recent growth in the States, and largely the outcome of the foundation and development of the Johns Hopkins University.

Like the Owens College in Manchester, Johns Hopkins owes its origin to the philanthropy of a wealthy merchant of Welsh descent. Its peculiar character, however, is due to the academic prescience and statesmanship of its first president. He saw that there were plenty of universities and colleges of the ordinary undergraduate type, and that what the country really needed was a university for "graduate study," which at that time could only be secured by going to Germany.

The method of teaching is based on that of the German seminar, of which it has adopted the name, but it provides for more constant and systematic intercourse between professor and student. While the German seminar meets weekly, the American meets every day, and the student receives far more individual attention. The course again is more exacting, the minimum length being three years, and the average four and a half, starting, be it remembered, from the completion of the B.A. degree. The aim is to train in methods of original investigation—in short, as it was well put to me by one of the professors, "to transfer to literary studies the methods of higher work in science." The work is based on the preparation of the student's dissertation for the doctorate. At every stage, first in outline and subsequently in complete form, the dissertation is discussed section by section, chapter by chapter. Each department of study has its own seminar room furnished with a departmental reference library. The arrangement is not that of the lecture theatre, which implies an orator and an audience, but rather that of the committee room with a chairman and a ring of debaters. The class, which would never exceed from twelve to fifteen, sits at an oblong table, the professor, so to speak, occupying the chair of the meeting at one end. Round the walls at their backs are the shelves containing books of reference, often running to several thousand volumes, and these, it should be noted, are quite independent of the central university library.

This seminar study was at first the sole, and is still the main, work of the university, and that which has made the name of Johns Hopkins famous throughout the civilised world. An age more given to omens might have seen in the remarkable fact that in the gigantic conflagration which recently swept away the centre of the city of Baltimore, the university was the only public institution the buildings of which escaped scot free, a tribute to the powers of nature to the unique position it holds in American academical life. Its influence on higher study through the whole North American continent has been rapid and profound. It is not merely that a large number of distinguished specialists has been produced whose labours have raised the level of American learning; post-graduate study has become the ambition of the American university, and more and more is being accepted as that which differentiates it from the mere college. There are few universities now which have not their seminar rooms and departmental libraries, though it must be admitted that in many cases these are at present only utilised for undergraduate study of the third and fourth years. But the growth in post-graduate work since Johns

Hopkins was founded has been fairly staggering. In 1871 there were only 198 post-graduate students in the States; twenty-five years later the number had risen to 4919, or very nearly one quarter of the total number of university students of all classes in the British Isles.

The great bulk of those who win the Johns Hopkins doctorate naturally become university professors and lecturers. At the same time there is a rapidly increasing demand for them from the high schools, which are all organised on the basis of specialist teaching in each department. The evidence, both at the schools and the universities, supports the view that the Ph.D. candidate for a school post would have the advantage over a B.A. who had also been through a course of training in teaching, and would command a higher salary, and that this tendency is on the increase. It is felt that the man whose knowledge is deepest is likely to make the best teacher, and that lack of pedagogic skill at the start will be made up for in the long run by greater inspiration.

The system of our own older universities—at least of Oxford—is, it must be confessed, less favourable to post-graduate work. The explanation is to be found largely in the difference of the undergraduate course. The American university has no "honours" schools for the initial degree in which the energies of the best men are devoted rather to amassing the results of other people's investigations over an immense area than to cultivating the power of acquiring knowledge by their own. One of my fellow commissioners, who had examined at Cambridge in the law tripos, and bears a name of European reputation, told me he was often perfectly "horrified" by the amount the young men knew; such a mass of knowledge must have a most deadening effect on intellectual vigour. Thus, while the actual attainment at the initial degree is by no means so high as at Oxford and Cambridge, at all events for the best students, there is a far truer conception of learning, and an enormously larger proportion of men go on to higher work and research. In my visits to the universities the question was repeatedly asked of me, "What kind of men should we select for the Rhodes scholarships?" My answer has always been, "By all means, send us graduates. Undergraduates will do Oxford little good, and may get out of touch with American life; graduates will gain a wider experience without being de-americanised. Nothing, at the same time, would do so much for the revival of higher study at Oxford as a steady supply of picked graduates of an inquiring type." "But does Oxford want graduates?" has been the usual reply. "The experience of many men we know who have been there is that it is practically impossible to get assistance for post-graduate work; after a short trial they have generally gone on to Germany." The justice of the criticism it is difficult to question. Though the University of Oxford has created special post-graduate degrees in order to attract graduates of other universities for advanced study or research, the Oxford college with its pot-hunting instincts stands in the way. It makes, or thinks it makes, its name by the number of first classes won by its undergraduates, and will, therefore, give no encouragement to the higher learning which our Philistine upper class neither understand nor care for. I have known a case where the whole tutorial influence of a college was used to prevent one of its scholars competing for a university prize essay involving original research. It was not denied that the work might be intellectually better for him, but then it might endanger his "first." The scholar, I am glad to say, had the strength of mind to take his own line, and gained the prize.

Let me conclude with a word about the ideals of the students and their attachment to their old college or university. I have said that the course is never less than four years; when I add that there are hardly any scholarships and that a large proportion of the students are distinctly poor, you will doubtless ask how they manage to do it? This brings me at once to what I unhesitatingly affirm to be the most admirable feature of life on the other side of the Atlantic, whether in the States or in Canada, viz. the entire absence of the feeling that honest work of any kind can be derogatory to an educated man. The American and Canadian student whose friends

cannot afford to keep him at college, pays his way either by working during the long vacation in all sorts of manual employment or by rendering what we should regard as menial services to his fellow-students during term time, much like the old "servitors" at Oxford and Cambridge. Nor does this create any social barrier. At one university visited by some of my Mosely colleagues they were waited upon during the college dinner by some very intelligent looking young fellows, and found on inquiry that these were students. Somewhat surprised at this, one of the party asked if this would not tell against them socially. "Not in the least," was the answer. "That man over there is president of one of the chief debating societies; that other is one of our best athletes and much looked up to." It is the same in the women's colleges. At Vassar one girl keeps a bicycle cleaning shop; they act as room-tidiers, clean shoes, &c. In Canada I was informed that at Queen's University, Kingston, no less than 70 per cent. of the men students earn their fees and maintenance for the coming session by working through the summer on farms, on the railway, in mines, river steamboats, &c. The fact is, the Transatlantic youth is rather proud of being able to earn his own living; it makes him feel himself more of a man, and it is not at all uncommon for the son of rich parents to take work in this way for the sense of independence it brings. It is a fine spirit, and makes one blush when one thinks how very different a reception such conduct would probably meet with over here.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The committee for the supervision of instruction in geography has appointed Dr. A. J. Herbertson, director of the school of geography, for the remainder of the term of five years for which the grants to the school of geography have been voted. A syllabus of the examination for the diploma in this subject has been issued, which includes regional geography, climatology and oceanography, geomorphology, historical geography, and surveying.

The delegates of the common university fund have elected Mr. G. W. Smith, New College, to the biological scholarship at Naples for the year 1905-6.

Mr. M. H. Godby has been elected to a Dixon research scholarship in chemistry at Christ Church.

CAMBRIDGE.—An interesting insight into the way the university is governed is given by the following figures. A careful analysis of the poll-book of the recent vote on "compulsory" Greek gives the following results:—(1) Of the residents, 288 voted in favour of the recommendation that Greek should no longer be compulsory in the previous examination; 240 voted against the recommendation—majority of residents in favour of the recommendation, 48. (2) Of the total number of members of the senate who voted, residents and non-residents included, 1591 were laymen, 1021 were clergymen. Of the laymen, 923 voted in favour of the recommendation; 668 voted against it—majority of laymen in favour of the recommendation, 255. Of the clergymen, 132 voted in favour of the recommendation; 889 voted against it—majority of clergymen against the recommendation, 757.

The report on the proposed diploma of forestry was discussed on Thursday, November 2. Among the speakers were the professor of geology, the professor of botany, the secretary of the financial board, and the master of Gonville and Caius College. The proposal was warmly welcomed.

The State medicine syndicate reports that last year seventy-one candidates presented themselves for the diploma in public health, and that twenty-four candidates entered for the diploma in tropical medicine and hygiene, sixteen of whom were successful.

The following have been nominated examiners for the natural science tripos in 1906:—in physics, Mr. R. T. Glazebrook and Mr. C. T. R. Wilson; in chemistry, Mr. H. O. Jones, and Mr. H. B. Baker, Oxford; in mineralogy, Prof. Lewis, and Mr. H. L. Bowman, Oxford; in geology, Mr. P. Lake and Dr. F. A. Bather; in botany, Mr. A. C.

Seward, and Mr. A. G. Tansley, of University College, London; in zoology, Mr. A. Sedgwick, and Prof. MacBride, of Montreal; in physiology, Mr. W. M. Fletcher, and Prof. T. G. Brodie, of the Brown Institute; in human anatomy, Dr. Barclay Smith, and Dr. A. Robinson, of Birmingham University.

The Vice-Chancellor announces that Sir Archibald Geikie will, on behalf of the board of geographical studies, deliver a public lecture in the Sedgwick Museum on November 21, at 5 p.m., on "The Evolution of a Landscape." On the evening of the same day, and at the same place, Dr. C. Hose, of Sarawak, will lecture on Borneo.

The next combined examination for sixty-two entrance scholarships and various exhibitions at Pembroke, Gonville and Caius, King's, Jesus, Christ's, St. John's, and Emmanuel colleges will be held on Tuesday, December 5, and following days, commencing at 9 a.m. on December 5. Mathematics, classics, and natural sciences will be the subjects of examination at all the above-mentioned colleges. Scholarships and exhibitions will also be offered for history, for modern languages, and for Hebrew at some of the colleges. A candidate for a scholarship or exhibition at any of the seven colleges must not be more than nineteen years of age on October 1, 1905. Forms of application for admission to the examination at the respective colleges may be obtained as follows:—Pembroke College, Mr. W. S. Hadley; Gonville and Caius College, the Master; King's College, Mr. W. H. Macaulay; Jesus College, Mr. A. Gray; Christ's College, Rev. J. W. Cartmell; St. John's College, Dr. Donald MacAlister, Dr. J. R. Tanner, Mr. E. E. Sikes; Emmanuel College, the Master; from any of whom further information respecting the scholarships and other matters connected with the several colleges may be obtained. The forms of application must be sent in on or before Tuesday, November 28.

MR. F. S. PINKERTON has been appointed professor of applied mathematics at the University College of South Wales, Cardiff.

By the will of Mr. J. E. Williams, of Chester, who died on July 15, a legacy of 10,000*l.* is bequeathed to the University of Wales, the income to be used in founding new scholarships and prizes in his name, to be held upon certain terms and conditions. In the event of the University of Wales not accepting the legacy within six months, the same is to be paid to the trustees of the University College of North Wales at Bangor upon the same conditions. He also bequeathed 10,000*l.* to the University College of North Wales at Bangor upon the same conditions, and 2000*l.* for the building fund of this college.

At the last meeting of the council of the University of Birmingham, the Vice-Chancellor (Alderman C. G. Beale) in the chair, the Chancellor (Mr. Chamberlain) announced that a friend of the university, who desired to remain anonymous, had promised a donation of 50,000*l.*, the amount to be applied towards the completion of the new buildings at Bournbrook. The council desired the Chancellor to convey its best thanks to the generous donor for his munificent gift. This is the fourth amount of 50,000*l.* already contributed to the university endowment fund, the other sums having been received from Mr. Andrew Carnegie, Sir James Timmins Chance, and an anonymous donor. The total fund is about 450,000*l.*, to which must be added annual contributions from the City Council (6000*l.* per annum), and 500*l.* each from the county councils of Staffordshire and Worcestershire. The council has already approved of expenditure upon the site and buildings amounting to about 280,000*l.*, in addition to upwards of 80,000*l.* on equipment. It is hoped that a formal opening of the new buildings may be possible in about eighteen months' time.

THE Board of Education has issued the following list of candidates successful in this year's competition for the Whitworth scholarships and exhibitions:—(1) *Scholarships*, 125*l.* a year each (tenable for three years): H. Topham Grantham; C. W. Price, Devonport; W. F. Paffett, Portsmouth; R. W. Bailey, Goodmayes (Essex). (2) *Exhibitions*, 50*l.* (tenable for one year): W. White, Southsea