

routes of Cameron, Livingstone, Magyar, and the Pompeiros, Cameron's camping stations, all the rivers observed by Cameron, and is coloured to show the orographical features. It extends from 3° to 13° N. lat.

IN Monday's *Times* is a long letter from the Rev. S. Macfarlane, giving an account of an interesting trip in the missionary steamer *Ellangowan*, for 170 miles up the Fly River, New Guinea. The account seems to be essentially the same as that read at the last meeting of the Geographical Society. Signor D'Albertis was on board and obtained a considerable number of natural history specimens. Mr. Macfarlane sums up the results of the trip as follows:—"Several important ends have been gained by our visit to the Fly River. We have proved that there really is a navigable river there extending far into the interior of the country. We have opened up the way, which has hitherto been guarded with great determination by savages, and have taught them the danger of attacking European vessels. On our return we succeeded in establishing what appeared to be a genuine friendship between the natives and ourselves, exchanging presents. We have learnt something of the character of the interior; and, although we found it low and swampy up to the highest point we reached, we have at least proved that high land is not to be reached within at least two hundred miles by the course of the river, the first hundred being thickly populated by a mixed race—Papuan and Malayan—speaking different dialects, and at war with each other. They are an intelligent-looking, energetic people. We obtained a considerable number of specimens of natural history. We were disappointed at not reaching high land with populous and healthy villages suitable for stations."

THE death is announced of the widow of the late Hugh Miller at the age of sixty-four years. She took a chief part in editing her husband's works after his death, and gave much assistance to Mr. Peter Bayne in the preparation of the sturdy geologist's biography.

DR. PARKES, F.R.S., the distinguished professor of hygiene at the Army Medical Schools, died on the 15th inst.

THE Oxford Burdett-Coutts Scholarship has been awarded to Mr. A. H. S. Lucas, of Balliol College.

SEVERAL letters have appeared in the *Daily News* calling attention to the fact that on Sunday week red snow was observed to have fallen in several parts of the country—at Forest Hill and Streatham in the south of London, at Reading and at Thurston in Norfolk. This phenomenon was observed in ancient times, and is referred to by Pliny; in modern times it has been frequently observed in all parts of the world, and is familiar to Arctic explorers. The phenomenon is generally ascribed to the presence of an algæ, *Protococcus nivalis*.

WE have received from the U.S. Geological and Geographical Survey of the Territories one of these valuable publications, which it is grievous to think the caprice of a political party may soon bring to a stop. This is a preliminary map of South-west Colorado, and part of Utah, Arizona, and New Mexico, showing the location of ancient ruins. The map is on the scale of five miles to an inch, and shows not only the sites of the prehistoric ruins which abound in the region, but the courses of the principal rivers and of dry gulches, and by means of lettering the general character of the surface of the country.

Bulletin No. 1, vol. ii. of the Geological and Geographical Survey of the Territories, under the direction of Prof. Hayden, is one of unusual interest. It contains seven articles, with the following titles:—1. A notice of the ancient remains of South-western Colorado examined during the summer of 1875. 2. A notice of the ancient ruins in Arizona and Utah lying about the

Rio San Juan. 3. The human remains found near the ancient ruins of South-western Colorado and New Mexico. 4. Ancient art in North-western Colorado. 5. Bead ornaments employed by the ancient tribes of Utah and Arizona. 6. Language and utensils of the Utes. 7. Fossil Coleoptera from the Rocky Mountain Tertiaries. The text is illustrated with twenty-nine octavo plates, embracing cliff and cave houses, arrow-heads, pottery, human skulls, &c. Mr. Scudder's article contains descriptions of thirty-one new species of fossil Coleoptera.

THE first section of the building for the American Museum of Natural History, in Central Park, New York, will be ready for occupation in the coming summer. Some time ago, our readers may remember, New York appropriated 700,000 dollars to commence this edifice, and it has also set aside for this section and its future extensions, 18½ acres of land worth from 5,000,000 dollars to 8,000,000 dollars. The whole edifice when complete will be about eighteen times as large as that now nearly ready, and will cost about 15,000,000 dollars. The collection is at present in a wooden building, which is visited by an average of 13,600 people per week—2,000 more than the average weekly number of visitors to the entire collections in the British Museum.

THE additions to the Zoological Society's Gardens during the past week include two Suricatas (*Suricata zenib*) from S. Africa, presented by Mr. G. Thorburn; a Knot (*Tringa canutus*), European, presented by Mr. C. Clifton; a Rhesus Monkey (*Macacus erythraeus*) from India, presented by Mr. Robert Law Ogilby; a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. J. Shortland; a White-Cheeked Capuchin (*Cebus lunatus*) from Brazil, presented by Dr. Lynn; an Aztec Conure (*Coucurus aztec*) from Mexico: two All Green Parrakeets (*Brotogeris tiriacula*) from S. America, purchased; a Collared Fruit Bat (*Cynonycteris collaris*), born in the Gardens.

REPORT OF THE CAMBRIDGE STUDIES' SYNDICATE

THE Syndicate appointed in May last year to consider the requirements of the University of Cambridge in different departments of study, have just issued their Report. This contains many features of interest. We reprint the answers of the Board of Natural Science Studies to the questions sent by the Syndicate. What the nature of these questions is may easily be gathered from the answers.

1.—A—(a). The Board is of opinion that lectures are required in the University on the following subjects:—1. Principles of chemistry and inorganic chemistry, organic chemistry, physical and thermal chemistry, &c., analysis, elementary qualitative, analysis, elementary quantitative, analysis (1) of minerals (metallurgy, &c.); (2) organic; (3) volumetric; (4) spectrum.

Catechetical lectures are also required, suited for students of different degrees of attainment. There should be also laboratory teaching in practical chemistry, including qualitative and quantitative analysis and instruction in chemical research. Probably one term would suffice for each course of lectures, except the general course on chemistry and perhaps the course on organic chemistry which might occupy two terms each. For the special courses on analysis one or two lectures a week or three lectures a week for part of a term would suffice.

2. An elementary course on physics, occupying two terms. Special courses:—(1) General physics, dynamics, &c. (1 term). (2) Heat and thermodynamics (2 terms). (3) Sound and Light (2 terms). (4) Electricity and Magnetism (3 terms). (5) Methods of observation, &c. (1 term). Higher courses (chiefly mathematical):—(1) Heat and thermodynamics (1 term). (2) Sound and light (1 term). (3) Electricity and magnetism (2 terms). There should be a course of practical laboratory instruction extending over three terms, and special laboratory teaching for advanced students.

3. A course on elementary crystallography, and one on mineralogy, together occupying about two terms.

4. General geology, physical geography, and geological physics. Stratigraphical geology. Petrology. Palæontology—general.

Special Palæontological lectures and demonstrations in connection with the lectures on stratigraphical geology.

5. *Elementary biology.
6. Systematic botany:—(1) *Elementary and (2) Advanced.
7. Vegetable morphology and physiology:—(1) *Elementary, and (2) Advanced.
8. Zoology:—General. Special, (1) Vertebrates. (2) Molluscs. (3) Insects. (4) other Invertebrates.
9. Comparative anatomy:—(1) Elementary and (2) Advanced. *Embryology. Osteology.
10. Physiology:—(1) Elementary and (2) Advanced. *Physiology of the senses. *Physiology of nutrition.
11. Human anatomy, including animal mechanics, &c.:—(1) Elementary and (2) Advanced. *Ethnology.

Each of the courses on the subjects numbered 5 to 11 would probably require two terms, except those marked *, each of which might be concluded in one term. In many of these subjects more or less catechetical teaching would be desirable.

With respect to the distribution of these courses among different teachers:—

1. The general superintendence of the chemical laboratory with the delivery of one course of lectures, usually those on general chemistry, would sufficiently occupy the time of the professor. Organic chemistry, including the superintendence of the practical work in this subject, would occupy the greater part of the time of a second professor. He might, however, in some cases also deliver one of the special courses. Some of the special departments of chemistry might perhaps be undertaken by demonstrators, but for the remainder, and for catechetical instruction with a proper division of classes, two additional teachers are at present needed who may very well be inter-collegiate lecturers.

2. The superintendence of the physical laboratory, with the teaching of such branches of mathematical physics as are not provided for by other professors under the jurisdiction of the Mathematical Board, would probably occupy all the time of the Professor of Experimental Physics. The special experimental courses might, if necessary, be given by demonstrators, but at least one regular teacher of experimental physics in addition to the professor would be desirable.

3. The mineralogical teaching at present required in the University might be given by the professor, the students being referred for the chemical part of the subject to one of the teachers of Chemistry.

4. Stratigraphical geology, petrology, and Palæontology would each require a separate teacher. Lectures on different portions of stratigraphical geology might be delivered in different years. Parts of the course on general geology (e.g. that on glacial phenomena, earth movements, &c.) might be given by the lecturer on stratigraphical geology. Some parts (e.g. that on volcanic phenomena) being undertaken by the petrologist. Special demonstrations on Palæontology in connection with the course on stratigraphical geology might be given by curators or demonstrators.

5. The course on elementary biology might be given by a demonstrator acting under a Professor of Physiology or of Comparative Anatomy.

6. The elementary and advanced courses on systematic botany might be given by one teacher.

7. The elementary and advanced courses on vegetable morphology and physiology might be given by one teacher. A third botanical teacher (for cryptogamic botany) will probably be required at a future time.

8. The general course of zoology requires one teacher. The teaching which is at present required in the special departments of zoology might be given by Curators of the Museum, who should also act as demonstrators; but special teachers of each of the four departments will be required eventually.

9. The elementary and advanced courses on comparative anatomy might be undertaken by one teacher. The courses on embryology and osteology might be given by demonstrators; but each subject is important enough to occupy the whole time of a teacher if a suitable one is available.

10. The elementary and advanced courses on physiology require one teacher. The remarks made on embryology and osteology apply also to the subjects of the physiology of the senses and the physiology of nutrition.

11. Elementary and advanced courses on human anatomy might be undertaken by one teacher. The subject of ethnology would be best undertaken by a separate teacher if circumstances should admit.

A (b). It is desirable that the University should have the opportunity of inviting men who have devoted themselves successfully to the prosecution of special departments of science to give lectures in the University; but the delivery of such lectures must depend rather upon the men being forthcoming than upon any *à priori* consideration of what subjects require elucidation.

B (a). Viewing this question with reference simply to the numbers of students, there appear to be no branches of natural science in which the classes which require to be put through exactly the same course in the same term are so large as to require division.

B (b). The approximate number of students in the University classes in most of the above great groups of subjects is from twenty to thirty; in the class of elementary biology the number is larger; in chemistry the number is nearly a hundred. The number may be expected to increase.

C. In most of the natural science subjects opportunities for individual personal intercourse between teachers and students occur in the course of laboratory and field work. Most of the professors encourage the students to ask questions after lecture, and some give short catechetical lectures before the ordinary lecture.

D. For the superintendence, under the professors, of the laboratory work, and for giving instruction in such of the special chemical subjects as may not be otherwise provided for, four demonstrators are required. If the number of students increases, more demonstrators will be required. In physics not less than three demonstrators will probably be required. Each of the professors or other principal teachers of chemistry and physics will require a lecture assistant, and boys to do general work in connection with the laboratories will be required in the proportion of about one to each demonstrator. In the geological Museum three curators or demonstrators will be required—one of these at a time would be occupied as a demonstrator in assisting the professor and the Palæontologist—the others would be engaged in the general work of the Museum. The petrologist would require a curator who should also act as demonstrator. The Professor of Geology also requires an assistant to prepare and keep in order diagrams, maps, models, &c. The teacher of systematic botany requires a demonstrator. The teachers of vegetable morphology, of comparative anatomy, and of physiology will each require demonstrators in the proportion of one to every ten or fifteen students. Assistance in the same proportion will be required for the class in elementary biology, but this may probably be provided from the staff of the teachers of comparative anatomy, physiology, and vegetable morphology. Four curators, who might also act as demonstrators, will be required for the special departments of zoology. One or two demonstrators in human anatomy will be required.

E. In addition to special libraries attached to the different departments, a general scientific library, easily accessible from the Museums is required. In *Chemistry*. A new and more spacious laboratory is urgently required. To this should be attached a museum of chemical preparations. In *Geology*. A new museum has long been an acknowledged want. In *Botany*. Workrooms are required in connection with the Herbarium; also a laboratory for vegetable morphology and physiology, including rooms for microscopical work, &c. In *Zoology*. Workrooms are required for the professor, superintendent of the museum, curators, and demonstrators. In *Comparative Anatomy*. A laboratory is required, including dissecting-rooms, rooms for microscopical work, &c. In *Physiology*. A laboratory is required, including chemical laboratories, rooms for microscopical work, &c. In *Human Anatomy*. Dissecting-rooms are required, and rooms for microscopical work. Each department will require rooms for research, microscopes and other apparatus, as well as diagrams.

Such are the requirements necessary to make instruction in natural science fairly complete. In the physical departments the wants of chemistry are the most urgent; teachers of palæontology and petrology are urgently required. In reference to more immediate wants of the biological departments, it may be stated that the present teaching staff consists of the Professors of Anatomy, Botany, and Zoology and Comparative Anatomy, each of whom, except the Professor of Botany, has a demonstrator.

The chief teaching of physiology is at present conducted by the Trinity Prælector in Physiology. The additions to the teaching staff most urgently required are (1) a professor or teacher of comparative anatomy; (2) a more definitely recognised teacher of vegetable morphology and physiology; (3) two

curators in zoology (molluscs and insects), to act also as demonstrators; (4) two Demonstrators of Physiology; (5) an additional Demonstrator of Comparative Anatomy; (6) an Assistant-Curator of the Herbarium, to act also as Demonstrator of Systematic Botany; the Professor of Botany being *ex officio* Curator of the Herbarium. The appliances most urgently needed are laboratories for chemistry, comparative anatomy, physiology, and vegetable morphology, and workrooms for the zoological museums.

II. (a) It is desirable that all the teachers in each of the several departments should be grouped in one organisation.

(b) The Board considers that while there is room in the University both for professors and lecturers, appointed directly by the University, and for inter-collegiate lecturers, it is undesirable to have lecturers in natural sciences teaching members of their own colleges exclusively.

(c) It appears that physiology, comparative anatomy (as distinguished from zoology), and vegetable morphology and physiology (as distinguished from systematic botany), are so important and so distinct that they should be entrusted to independent professors, but till this can be done the subjects may be undertaken by other lecturers.

(d) It seems desirable that the selection of University professors should be entrusted to a body of about seven electors, of whom a majority should be residents in the University; that such electors should be appointed either for life, for a term of years, or by virtue of holding some official post, and that those who are not *ex-officio* electors should be nominated by the Board of Studies with which the professorship is connected, and be elected by the Senate. Further, that the selection of other teachers appointed by the University, but not directly subordinate to the professors, should be made by similar bodies of electors resident in the University, or by the several Boards of Studies, and that demonstrators should be appointed as at present.

(e) It seems desirable that in the case of the recognition of individual inter-collegiate lecturers by the University, the appointment of such lecturer should receive the confirmation of the several Boards of Studies.

III. (a) It seems highly desirable that the professorial and inter-collegiate lectures should be brought into closer relations with each other; and it seems probable that this may be effected, in part at least, by organising meetings of the professors and other teachers in each department, in order to arrange a plan of combined action in teaching, and to consider and determine a scheme of lectures, such scheme to be submitted to the Board, and, if approved by the Board, published at the beginning of the academical year by its authority.

Further, the Board thinks it desirable that the university should appoint, from time to time, on the recommendation of the Boards of Studies, lecturers on any subject or subjects which may not at the time be adequately represented by professors, inter-collegiate lecturers, or other teachers.

(b) The Board is not prepared to suggest any further provision for the organisation of the professorial lectures in its department.

With respect to inter-collegiate lectures, the control exercised by the Board over the authoritative publication of the scheme drawn up after consultation with the professors would, it is hoped, be sufficient for the effective organisation of the whole system.

(c) The power given to the Board of Studies of remitting for further consideration any scheme of professors' lectures which the Board disapproves, may be used to prevent any undue interference of one professor with the departments properly belonging to another.

With regard to competition in a wider sense, the Board does not see that any regulation of it is necessary or desirable.

Considering the importance in many cases of the lectures on natural sciences being delivered in a central building, and of the University collections being made as much use of as possible, it is desirable that power should be possessed by the Museums and Lecture-rooms Syndicaté, or by some other University authority, to allow inter-collegiate or other lecturers, recognised by the University, to make use of University lecture-rooms, museums, &c., with the consent of the professors concerned, and under such conditions as may be found necessary to avoid interference with the work of the professors or risk of injury to the collections.

IV. There seem to be two ways in which the advancement of knowledge may be assisted by organisation. One is by giving

mature students (in which light the Board must regard the professors and inter-collegiate lecturers) some amount of leisure for the prosecution of their studies, and some inducement to pursue them with energy, and to give the results of them to the world. The other is by giving opportunity to younger students, such as our younger graduates, who may show promise of capacity to do original work, and who are anxious to attempt it, the opportunity of making their first essays, under skilled guidance and under favourable conditions, in some place where their qualifications can be judged and their results appreciated.

A considerable part of the original work done by those engaged in the higher teaching at Cambridge must probably be always done during the vacations, but it must be always difficult for a professor, or other advanced teacher, to keep himself well acquainted with all that is being done in his department, to say nothing of advancing knowledge in it, unless the more engrossing kind of work is so distributed and arranged that each of the principal teachers should have one term in the year of, at any rate, comparative leisure. For any additional stimulus that may be necessary in order that such leisure may be employed for the benefit of science we must look to public opinion.

In order to encourage and facilitate the advancement of knowledge by the younger graduates, it seems desirable that most of the rather numerous demonstratorships which are required should be temporary appointments, and should be offered to such of the younger graduates and others as shall have shown a desire to attempt original work, and given promise of capacity for doing it. The work of the demonstrators, however, if it is properly done, takes up so much time and energy that but little original work can be expected from them, unless they too are allowed, at any rate, comparative freedom from work for one term in the year, during which they may be expected to assist the professors in their researches, or to carry on work of their own under the direction of the professors. They should not be allowed to take private pupils. In all branches of natural science it is desirable that the teaching should be continued throughout the terms and not be limited as at present to the middle two-thirds.

SCIENTIFIC SERIALS

American Journal of Science and Arts, February.—The first article is an obituary notice of Sir W. E. Logan, read before the Natural History Society of Montreal last October.—Mr. W. B. Taylor contributes a continuation of his history of recent researches in sound.—Mr. A. H. Rowland continues his studies on magnetic distribution, in which he critically examines M. Jamin's recent work.—On the rifts of ice in the rocks near the summit of Mount McClellan, Colorado, and on the different limits of vegetation on adjoining summits in the territory, by Edward L. Berthond. Mount McClellan is 13,430 feet high, and contains mines which are extensively worked. At a height of 13,100 feet, and about 30 feet from the entrance of the tunnel of one of the mines, were three or four veins of solid ice, parallel with the bedding of the rock, and filling all its inner side with cracks and fissures. In another tunnel 300 feet westward and about 100 feet from the entrance, veins of ice were also met with. It has been suggested that this ice has remained ever since the Glacial period. The mountain presents these two strange antagonistic phenomena in immediate proximity. On one side of the valley there is a mountain slope facing north-east, well grassed, totally devoid of shrubs and trees, where the rocky *débris* are underlain by a perpetual icy coat hundreds of feet in depth, supporting on its surface a growth of plants strictly Alpine and Arctic, and abounding with Ptarmigan, *Lagopus leucurus*, and the tail-less, earless marmot. A list of plants found bloom Oct. 2, 1875, is given. Less than half a mile distant on the opposite slope of the vale *Pinus aristata* of large size and a profuse growth of birches, willows, grasses, and arbutus abound.—On a new form of lantern galvanometer, by Francis E. Nipher, which possesses the advantages of being adaptable to any vertical lantern; the distance between the deflecting coils is readily varied and can be adjusted to currents of various intensity; the resistance of the galvanometer is quickly varied from one half to twice the resistance of the galvanometer coils.—On the occurrence of tartronic acid, with some remarks on the molecular structure of glyceric acid, by S. P. Sadtler. A comparison is made of two views taken of glyceric acid, and it is suggested that there are two isomeric acids, one of which is normal and the other an unsymmetrical acid.—On the "chloritic formation" on the western