the week of the Congress, to which geologists are invited to send maps, recent memoirs, rocks, fossils, &c. Foreign members of the Congress are invited by the Council of the British Association to attend the meeting of that Association at Bath. During the week when the Association meets, there will be short excursions in the neighbourhood of Bath, and longer excursions will be made after the meeting. At these excursions excellent sections of the Lower Secondary and Upper Palæozoic rocks will be visited. Excursions will take place in the week after the meeting of the Congress (September 24 to 30). The number of these will depend upon the number of members desirous of attending, and upon the districts which they most wish to visit. The excursions at present suggested are :—(1) The Isle of Wight (visiting the Ordnance Survey Office at Southampton on the way)—Cretaceous, Eocene, Oligocene. (2) North Wales—Pre-Cambrian and the older Palæozoic rocks; West Yorkshire (Ingleborough, &c.)—Silurian and Carboniferous Limestone. (3) East Yorkshire (Scarborough, Whitby, &c.)—Jurassic and Cretaceous. Should the number of members be so large as to make additional excursions necessary, they will probably be :—(4) Norfolk and Suffolk—Pliocene (Crag) and Glacial beds. (5) To the Jurassic rocks of Central England. The short excursions during the week of the Congress will probably be to Windsor and Eton, to St. Albans, to Watford, to Brighton, to the Royal Gardens at Kew, and to other places of interest. Brief descriptions of the districts to be visited in these excursions will be prepared (with illustrative sections, &c.), and will, if possible, be sent to members before the meeting. The full Report of the London meeting will be issued soon after the close of the session. It will contain, in addition to reports of the ordinary business of the Congress, the Report of the American Committee on Nomenclature (about 230 pp.); the Memoirs on the Crystalline Schists (about 150 pp.), and reports of discussion on the same; and probably a reprint, with additions, of the Report of the English Committee on Nomenclature (about 150 pp.).

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Burdett-Coutts Scholarship in Geology has been awarded to Mr. M. Hunter, B.A., Queen's College.

The degree of M.A. *honoris causâ* has been conferred on Dr. S. J. Hickson, the Deputy Linacre Professor, and on Mr. Wyndham R. Dunstan.

Scholarships in Natural Science are announced for competition, at Merton and Corpus jointly on June 26, at Magdalen on October 9, and at Balliol, Christ Church, and Trinity jointly on November 20. Information may be had from the science tutors of the various Colleges.

A statute is being discussed by Congregation, which will place the biological sciences on the same footing as the physical sciences so far as the examinations for pass degrees are concerned, and it is hoped that the changes to be introduced will increase the numbers of the biological and medical schools.

Mr. F. J. Smith, of the Millard Laboratory at Trinity, has been appointed University Lecturer in Mechanics and Experimental Physics.

CAMBRIDGE.—An amended report on the Natural Science Examinerships has just appeared, but the scheme proposed is very complex. It having been found difficult to get examiners to undertake the honours, and ordinary degree, and M.B. examinations combined, it is proposed to separate the elementary examination work, and appoint two examiners each in elementary chemistry, in elementary physics, and in elementary biology, while two examiners in each subject of the Natural Sciences Tripos are to be appointed as before, and two in pharmaceutical chemistry, for the second M.B. Thus there will be twenty-four examiners in all. The examiners are to be paid a minimum of fifteen, twenty, or thirty pounds each, with a payment of five shillings for each Tripos candidate in their subject, or one, two, and four shillings per candidate in other examinations. Moreover, it is required that all papers and all practical work in honours shall be examined by both examiners in a subject. Both examiners are to be present at all oral work in their subject; and all examiners must be present at the meeting for arranging the class-list for any examination. We prognosticate that the list of examiners, if at all worthy of the University, will not largely consist of non-residents, under the new scheme. The worst mistake perhaps that the University makes is in continuing the one-sided ordinary degree examinations in single subjects, such as geology, botany, and zoology; for all combined there were only four candidates in the last academical year; and for these there were six separate examinations provided, though two were not held. The chemistry "special" attracts a number of candidates, who might be much better employed in preparing for the First Part of the Natural Sciences Tripos. It would be far easier to work the Natural Science Examinations if these were abolished. It is absurd to keep up a machinery of examination which is tabooed even by candidates. The Tripos is a success, which the specials are not, and still more liberal payments and regulations ought to be made. It ought to be remembered that the graduates pay heavy degree fees in addition to examination fees.

The examiners for 1888 in the Second Part of the Mathematical Tripos were Edward John Routh, Sc.D., Peterhouse; James Whitbread Lee Glaisher, Sc.D., Trinity College; Joseph John Thomson, M.A., Trinity College; Andrew Russell Forsyth, M.A., Trinity College. The names, in each class and in each division, are arranged in alphabetical order, and not in order of merit. All the candidates passed the Mathematical Tripos, Part I., in June 1887.

Class I.—Division 1.—Baker, B.A., Joh.; Berry, B.A., Trin.; Flux, B.A., Joh.; Mitchell, B.A., Trin. Division 2.—Brown, B.A., Christ's; Clay, B.A., Trin.; Iles, B.A., Trin.

Class II.—Little, B.A., Trin.; Norris, B.A., Joh.; Peace, B.A., Emman.; Soper, B.A., Trin.

Class III.—None.

The faint hope that there was till lately that a Geological Museum might soon be begun has been dissipated by the Financial Board having reported that the University has no funds available at present, although the Sedgwick Fund has £19,000 in hand to supplement the University contribution.

The late Sir Charles Bunbury's valuable herbaria have been presented to the University by Lady Bunbury.

At the Annual Scholarship Election at St. John's College, on June 18, the following awards in Natural Science were made:—Foundation Scholarships continued or augmented—Seward, Rolleston, Rendle. Turpin, Groom, d'Albuquerque; Foundation Scholarships awarded—Hankin, Horton-Smith, Locke, Baily, Simpson; Exhibitions awarded—d'Albuquerque, Hankin, Horton-Smith, Blackman, Schmitz. In Mathematics, the following awards were made:—Foundation Scholarships continued or augmented—Baker, Flux, Norris, Orr, Sampson, Harris, Rudd, Bennett; Foundation Scholarships awarded—Palmer, Carlisle, Burstall, Monro, Cooke, Lawrenson; Exhibitions awarded—Sampson, Harris, Monro, Dobbs, Reeves, Bennett, Burstall, Cooke, Lawrenson, Brown, Finn, Kahn, Salisbury, Schmitz, Shawcross; Proper Sizarship awarded—Finn. Wright's Prizes to Simpson, Hankin, Blackman, for Science; and Orr, Burstall, Reeves, for Mathematics. The Herschel Prize to Salisbury, for Astronomy; the Hockin Prize for Electricity not awarded. The Hutchinson Studentship of £60 a year for two years is awarded to Mr. G. S. Turpin for research in Organic Chemistry; and the Hughes Prize to Orr (Senior Wrangler) and Brooks (Senior Classic).

SCIENTIFIC SERIALS.

American Journal of Science, June.—Note on earthquake-intensity in San Francisco, by Edward S. Holden. The object of this paper is to obtain an estimate of the absolute value of the earthquake-intensity developed at San Francisco during the American historic period, based on the very complete records collected by Thomas Tennant. The intensity of each separate shock (417 altogether) is assigned on the arbitrary scale of Rossi and Forel. The total average intensity during the 80 years from 1808 to 1888 is found to be nearly equal to the intensity of 28 separate shocks as severe as that of 1868, and the 417 shocks of known intensities correspond to 33,360 units of acceleration.—On the relations of the Laramie Group to earlier and later formations, by Charles A. White. The author's further studies of this group, by some geologists referred to the Tertiary, by others to the Cretaceous ages, lead to the conclusion that the upper strata form a gradual transition from the latter to the former, while there is strong presumptive evidence of the Cretaceous age of the greater part of it.—The gabbros and diorites of the "Cortlandt Series" on the Hudson River near Peekskill

New York, by George H. Williams. With this paper the author concludes for the present his elaborate petrographic studies of the extremely varied massive rocks of the "Cortlandt Series," as it has been designated by Prof. J. D. Dana. He treats in detail the gabbro, diorite, and mica-diorite varieties of norite occurring chiefly in the south-western portion of the area. —Three formations of the Middle Atlantic slope (continued), by W. J. McGee. In this concluding paper the whole subject of the Columbia formation is recapitulated, the general conclusion being that it is much older than the moraine-fringed drift-sheet of the North-Eastern States, and that while th evertebrates of its correlatives suggest a Pliocene origin, both stratigraphy and the invertebrate fossils prove that it is Quaternary. Thus the Columbia formation not only enlarges current conceptions of Quaternary time, and opens a hitherto sealed chapter in geology, but at the same time bridges over an important break in geological history, between the Tertiary and Quaternary epochs.—A comparison of the elastic and the electrical theories of light with respect to the law of double refraction and the dispersion of colours, by J. Willard Gibbs. The main object of this paper is to show the great superiority of the electric over the elastic theories of light as applied to the case of plane waves propagated in transparent and sensibly homogeneous media. The phenomena of dispersion here studied corroborate the conclusion which seemed to follow inevitably from the law of double refraction alone.—Mr. Henry J. Biddle contributes some valuable notes on the surface geology of Southern Oregon, visited by him during the summer of 1887.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 7.—"An Additional Contribution to the Placentation of the Lemurs." By Prof. Sir Wm. Turner, Knt., M.B., LL.D., F.R.S.

In 1876 the author contributed to the Royal Society a memoir "On the Placentation of the Lemurs," which was published in the Philosophical Transactions of that year (vol. clxvi. Part 2). The gravid uteri which he examined and described were from specimens of *Propithecus diadema*, *Lemur rufipes*, and *Indris brevicaudatus*.

In April of the present year he received from Mr. F. E. Beddard, Prosector to the Zoological Society of London, the gravid uterus of a Lemur, which was *Lemur xanthomystax*.

The examination of this gravid uterus confirmed the conclusions to which both Alphonse Milne Edwards[1] and the author had arrived independently from previous investigations, that the placenta in this important group of animals is diffused and non-deciduate, and that the sac of the allantois is large and persistent up to the time of parturition. In these important respects, therefore, the Lemurs, are, in their placental characters, as far removed from man and apes as it is possible for them to be.

Although the author is not disposed to attach too much weight to the placenta as furnishing a dominant character for purposes of classification, yet he cannot but think that animals which are megallantoid, non-deciduate, and with the villi diffused generally over the surface of the chorion, ought no longer to be associated in the same order with animals in which, as in the apes, the sac of the allantois early disappears, and the villi are concentrated into a special placental area, in which the fœtal and maternal structures are so intermingled that the placenta is highly deciduate. Hence he is of opinion that the Lemurs ought to be grouped apart from the Apes in a special order, which may be named either with Alphonse Milne Edwards *Lemuria*, or with Victor Carus and others *Prosimii*.

The fœtus possessed an imperfect covering, external to the hairy coat, and quite independent of the amnion, composed of a cuticular membrane. It corresponded with the envelope named by Welcker *epitrichium*, and described both by him and by the author as present in *Bradypus* and *Cholopus*. But it occurred in the fœtus both of *Lemur xanthomystax* and *Propithecus diadema* in flakes and patches, and not as a continuous envelope as in the Sloths.

Physical Society, May 26.—Mr. Shelford Bidwell, F.R.S., Vice-President, in the chair.—The following communications were read:—Note on the governing of electromotors, by Profs. W. E. Ayrton and J. Perry. In a paper read before the Society of Telegraph-Engineers in 1882 the authors deduced the conditions of self-regulation of electromotors for varying load when supplied either at constant potential or with constant current. The conditions involved "differential winding," *i.e.* the use of a shunt motor with series demagnetizing coils. With this arrangement fairly good regulation has been obtained, but owing to want of economy the methods have not been developed further. Since then another arrangement, in which a simple shunt motor is used, and a few accumulators placed in series with the armature, has been devised for working in a constant current system. By means of a suitable switch, the accumulators can be charged when the motor is at rest. On the assumption that the E.M.F. of motors is given by $E = n(p + tZ)$, where n = speed, Z = number of turns on magnets, and p and t are constants, it is shown that the speed at which a motor will govern is given by

$$n = \frac{z + a + a'}{t},$$

and the constant current

$$C = \frac{e - np}{a + a'},$$

where z and a are the resistances of the shunt and armature respectively, and e and a' the E.M.F. and resistance of the accumulators. Since a and a' may be small and np not large, the value of e need not be great to give a considerable value for C, and thus only a small number of accumulators will be required. —On the formulæ of Bernoulli and Haecker for the lifting-power of magnets, by Prof. S. P. Thompson, read by Prof. Perry. The formulæ referred to are $P \propto \sqrt[3]{W^2}$ and $P = a\sqrt[3]{W^2}$ respectively, where P = lifting-power, W = mass of magnet, and a a constant depending on the material and shape of the magnet. These formulæ, the author shows, are equivalent to saying that the lifting-power of magnets in which the magnetic induction, B, has been carried to an equal degree, is proportional to the polar surface, and that Haecker's coefficient a is proportional to B^2 through the surface. Assuming the induction uniform over the surface, it is shown that

$$P = \frac{1}{8\pi} B^2 A,$$

where A = area of surface, and this gives a very convenient method of determining B from measurements made upon the pull exerted at a given polar surface. If P be measured in kilogrammes and A in square centimetres, the formula for B becomes

$$B = 5000 \sqrt{\frac{P}{A}};$$

and if the measurements be made in pounds and inches, the constant becomes 1317. It will be readily seen that the greater power of small magnets in proportion to weight does not require for its explanation the sometimes alleged fact that small pieces of steel can be more highly magnetized than large ones, for if B be the same, the lifting-power will be proportional to the polar surface, and not to weight, and hence must necessarily be greater relatively to weight in small magnets. In the case of electromagnets for inductions between 6000 and 16,000, between which the permeability, μ, is approximately given by

$$\mu = \frac{16{,}000 - B}{3{\cdot}2},$$

the lifting-power is shown to be

$$P = A\left(\frac{3{\cdot}2\,Si}{Si + 2{\cdot}56l}\right)^2,$$

where P is in kilogrammes, A in square centimetres, Si = ampere turns, and l = mean length of the magnetic circuit.—Experiments on Electrolysis; Part ii., Irreciprocal Conduction,[1] by Mr. W. W. Haldane Gee and Mr. H. Holden. An abstract was read by the Secretary. The authors have observed, when strong sulphuric acid is used as an electrolyte, the electrodes being of platinum, that the decomposition nearly ceases, if, by decreasing the resistance in circuit, it is attempted to increase the current beyond a certain maximum. When this condition (called the insulating condition) is arrived at, reversing the current immediately restores the conductivity. Experiment shows that the current density is an important factor, and that the composition,

[1] "Histoire Naturelle des Mammifères de Madagascar," forming vol. vi. chap. ix. of Grandidier's "Histoire de Madagascar."

[1] Irreciprocal conduction is said to occur if a reversal of the direction of a current causes any change in its magnitude.