

on the development of Echinoderm larvæ, (2) the relation of the respiratory exchange of cold-blooded animals to temperature, (3) the respiratory exchange of the lower marine invertebrates.

CAMBRIDGE.—The Reade Lecture will be given on Wednesday, June 10, in the Anatomy Theatre, by Prof. J. J. Thomson. The subject for this year is "Röntgen Rays."

Prof. Lewis announces a course of lectures and demonstrations in Crystallography, to be given daily during the Long Vacation, beginning on July 8.

A new syndicate, to take the place of that rejected by the Senate last term, has been nominated to consider the question of degrees for women. It consists of the Vice-Chancellor, Dr. C. Taylor, Mr. W. Chawner, Dr. V. Stanton, Dr. F. W. Maitland, Dr. L. E. Shore, Dr. M. James, Prof. Robinson, Mr. J. W. Cartmell, Mr. R. D. Roberts, Mr. W. N. Shaw, F.R.S., Mr. A. W. W. Dale, Mr. A. N. Whitehead, and Mr. A. Berry. This list includes only three members of the Council, and is said to be younger and less partisan than the rejected syndicate.

Meanwhile Dr. Hobson, F.R.S. of Christ's College, has issued a fly-sheet proposing that, as the balance of opinion in the Senate is against the admission of women to full membership, it might suffice to confer on them the "title" of B.A. by diploma. The title, he thinks, should be open to women who have studied at recognised colleges other than Newnham and Girton, provided they pass one of the Tripos examinations. It remains to be seen what reception will be given by Newnham and Girton to this proposal for an encroachment on their monopoly.

The Statute authorising the University to make provision for Advanced Students has received the approval of the Queen in Council. A guide to the courses of advanced study and research at present arranged for, has been prepared by Dr. Donald MacAlister, Tutor of St. John's College, and will be issued in June by the University Press.

A STRENUOUS and persistent effort to endow Barnard College (for women) has just been successfully made. The college some months ago purchased a site adjoining the new site of Columbia University, paying 160,000 dols., of which sum 100,000 dols. remained on mortgage. An unknown benefactor offered to pay the amount of this mortgage, provided others would contribute an equal amount by May 10. It is now known that this benefactor is Mrs. Van Wyck Brinkerhoff. Another unknown donor, who turns out to be Mr. John D. Rockefeller, offered 25,000 dols.; others contributed smaller amounts, but on the morning of Saturday, May 9, there was still a deficit of 23,000 dols. By strenuous efforts, however, this was secured during the day. Among the contributors were Mr. Seth Low, Mrs. F. E. Hockley, and an anonymous friend, who each paid 10,000 dols., and Mr. Jacob H. Schiff, who paid 8000 dols.

WE notice that at the last meeting of the Oxfordshire County Council, held at Oxford on the 12th inst., a proposition was made to devote the sum of £2000 out of a total of £4080, arising from the Customs and Excise Duties, to the relief of the rates; but it was defeated by a large majority. At a meeting of the East Sussex County Council, held on the same day, a resolution was carried that the whole of the funds available for the purposes of technical education be in future devoted to this object, instead of £5000 as heretofore. A similar motion was proposed at the meeting of the County Council for the North Riding of Yorkshire, held on the 6th inst. at Northallerton, and gave rise to a considerable amount of discussion, during which one councillor, a prominent member of Parliament, described the Technical Instruction Committee as the "horse-leech of the Council." Eventually an amendment, "that the County Council devote £6000 of the Local Taxation (Customs and Excise) grant for 1896-7 to technical education," was carried unanimously. By referring we find that during the financial year 1893-4 the total amount available was £6928.

THE last number of the *London Technical Education Gazette* gives some very interesting information concerning the number of scholarships and exhibitions which have been awarded by the Technical Education Board of the London County Council. The total number of the Board's scholars and exhibitors is 1752, of whom 1154 are junior, 118 are intermediate, and 10 senior county scholars. The reports, which the Board receives at regular intervals, show that in the majority of cases the conduct and progress of the scholars are satisfactory. Some scholars have done remarkably well, especially in the case of

the intermediate and senior students. In the case of a few of the junior scholars it has been found necessary to give a caution and to renew their scholarships for a short time on probation. This has in most cases been quite enough, though one or two scholarships have had to be taken away entirely. The scholarship winners are left free to choose any school that appears on the Board's published list. The result is, that at present 913 junior county scholars are in attendance at secondary schools, and 241 at upper standard public elementary schools. The secondary schools most commonly chosen are Roan School, Owen's School, Alleyn's School, and Aske's School, Hatcham, at all of which there are over fifty scholars and exhibitors. The intermediate county scholars are now attending all the principal secondary schools of London, and some are in attendance at institutions of university rank, after having been for a year at a secondary school. The senior county scholars have joined some of the principal universities of the country, two being at Cambridge, at Clare and Sidney Sussex Colleges, and two at Newcastle in connection with the University of Durham.

THE report of the Technical Instruction Committee, which was presented to the May meeting of the West Riding Council, supplies abundant evidence of the good work which has been done during the session which is being completed. As would be expected, a very important place is occupied by the Committee's consideration of the Education Bill, an excellent summary of which forms the opening part of the report. The conclusions to which the Committee have come are that it would be undesirable for the duties connected with the administration of elementary education to be placed upon County Councils and for any expenditure in reference to such instruction to be thrown upon the County rates. The proposals with reference to secondary education are very favourably regarded, but it is pointed out that already the expenditure exceeds the income provided under the Local Taxation (Customs and Excise) Act, 1890, and must necessarily increase; and hence, if the County Council is to utilise the extended powers and carry out the duties to be conferred by the Bill, it is essential that adequate moneys be provided by Parliament. They further recommend that the Education Department should not be endowed with additional powers of control over the County Council in respect of the expenditure of funds provided under the above-mentioned Act, or out of the County rate for purposes of secondary education. We would call especial attention to certain supplementary regulations which have been adopted by the Committee as to the award and tenure of technical exhibitions. In future the Committee will, in considering recommendations for exhibitions, have regard to the preparatory work already done by the student, and as a rule no technical exhibition will be awarded unless evidence can be given by the candidate that he possesses a satisfactory knowledge of the principles of those sciences on which such technological subject is based; for instance, an exhibition in electric lighting and power distribution would in no instance be awarded to a student possessing an inadequate knowledge of applied mechanics and electricity and magnetism. No exhibition will usually be granted for a study of a *technological* subject to an applicant under eighteen years of age. These are but examples of a number of really wise provisions.

#### SCIENTIFIC SERIALS.

*American Journal of Science*, May.—Carbon and oxygen in the sun, by J. Trowbridge. The peculiar bands of the arc spectrum of carbon can be detected in the sun's spectrum. They are, however, almost obliterated by the overlying absorption lines of other metals, especially by the lines due to iron. In order to form an idea of the amount of iron in the atmosphere of the sun which would be necessary to obliterate the banded spectra of carbon, the author compared the spectrum of carbon with that of carbon dust and a definite proportion of iron distributed uniformly through it. The carbon dust and iron reduced by hydrogen was formed into pencils suitable for forming the voltaic arc, and containing 28 per cent. of iron to 72 per cent. of carbon. Photographs were taken of the portion of the solar spectrum which contains traces of the peculiar carbon band lying at wave-length 3883.7. The pure carbon-banded spectrum was photographed on the same plate immediately below the solar spectrum, and the spectrum of the mixed iron and carbon immediately below this. It was found that the iron present almost completely obliterated the carbon, and this fact tells in favour of

the supposition that the traces of bands observed are true carbon bands. The author also investigated the spark spectrum of oxygen produced by a dynamo and transformer, and compared the bright lines found with the solar iron lines found in the same positions. The result showed that the oxygen lines, if present in the sun, are not sufficient to cover even the faintest iron absorption lines. Still, the author inclines to the view that the sun's light is due to carbon vapour in an atmosphere of oxygen.—On the determination of the division errors of a straight scale, by H. Jacoby. The author compares every division, and set of divisions, microscopically with every division on a duplicate scale. This is Gill's method. But he improves it by counting the "weight" of each observation according to its true value, instead of assigning the same weight to all readings without distinction.—Röntgen rays not present in sunlight, by M. Carey Lea. The author proved this by trying to obtain radiographs from the sun's light through one hundred leaves of a book, or through aluminium foil. No trace of Röntgen rays was found in sunlight, nor was any found in the light from a Welsbach incandescent gas burner.—On numerical relations existing between the atomic weights of the elements, by M. Carey Lea. It has already been shown that elements whose ions are always colourless can be arranged in vertical lines so that the horizontal lines contain each a natural group. Also that the elements whose ions are always coloured, form series with the atomic weights immediately following one another. If the atomic weights in the first vertical column are subtracted from those in the second, the second from the third, and so on, certain standard differences are found to recur. One of these is about 16, the other about 46, and the third about 88. The elements with ions always coloured are outside of this rule. Their behaviour is altogether anomalous. The colourless elements, beginning with hydrogen, fall into four series of nine each, interrupted by four coloured groups, and followed by an alternate series, Hg, Tl, Pb, Bi, Th and U.

*Bulletin of the American Mathematical Society*, April.—A two-fold generalisation of Fermat's theorem, a paper presented to the Society at its February meeting, is stated by the author, Prof. E. H. Moore, to be one-fold generalisations of two known theorems, of which one may be looked at as a theorem in the ordinary Gauss-congruence theory, while its generalisation is a theorem in the Galois-field theory. It is naturally highly symbolical. Prof. J. Pierpont gives an interesting and valuable note on the Ruffini-Abelian theorem. Gauss, in 1799, rigorously established the fundamental theorem that every equation of degree  $n$  possesses  $n$  roots real or imaginary. When  $n$  is less than five, it had been long known that these roots could be expressed as explicit algebraic functions of the coefficients. Between the years 1799 and 1813 an Italian mathematician, Ruffini, made several attempts to establish the justice of the doubts that the roots of equations of degree greater than four possessed this property. His reasoning, however, has not been judged to be conclusive, and the question remained open until the publication of Abel's argument in 1826. Prof. Pierpont, in addition to the preceding statement, gives several other historical notes, and states that his object is to give a demonstration of the theorem which shall be as direct and self-contained as possible. In addition he gives demonstrations, one of which is a modification of Ruffini's form, and the other Kronecker's modification of Abel's form.—On certain subgroups of the general projective group, is a paper, read before the January meeting, by the author, Prof. Henry Taber. It is on the lines of recent previous papers by the author in the *Bulletin*, the *Proceedings* of the London Mathematical Society, and the *Mathematische Annalen*. The "Notes" give the courses for the summer semester at Berlin and Göttingen. A synopsis is also published of the first volume of a work of great originality, viz. the *Geometrie der Berührungstransformationen*, Dargestellt von Sophus Lie and G. Scheffers. A long list of new publications closes the number.

## SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 30.—"On some Palæolithic Implements found in Somaliland by Mr. H. W. Seton-Karr." By Sir John Evans, K.C.B., F.R.S.

In the course of more than one visit to Somaliland, Mr. Seton-Karr noticed, and brought home for examination, a number of worked flints, mostly of no great size, which he laid before

the Anthropological Section of the British Association, at the meeting last year at Ipswich.<sup>1</sup> Although many of these specimens were broad flat flakes trimmed along the edges so as to be of the "le Moustier type" of M. Gabriel de Mortillet, and although the general *facies* of the collection was suggestive of the implements being of Palæolithic age, they did not afford sufficient evidence to enable a satisfactory judgment to be formed whether they undoubtedly belonged to the Palæolithic period.

On returning to Somaliland, during the past winter, Mr. Seton-Karr was fortunate enough to meet with a large number of specimens in form absolutely identical with some from the valley of the Somme and other places.

Of this identity in form there can be no doubt, and though at present no fossil mammalian or other remains have been found with the implements, there need be no hesitation in claiming them as Palæolithic. Their great interest consists in the identity of their forms with those of the implements found in the Pleistocene deposits of North Western Europe and elsewhere.

The discovery aids in bridging over the interval between Palæolithic man in Britain and in India, and adds another link to the chain of evidence by which the original cradle of the human family may eventually be identified, and tends to prove the unity of race between the inhabitants of Asia, Africa, and Europe, in Palæolithic times.

May 7.—"The Electromotive Properties of the Electrical Organ of *Malapterurus electricus*." By Francis Gotch, F.R.S., and G. J. Burch.

The conclusions drawn by the authors from the experiments on the isolated organ and on the entire uninjured fish may be summarised as follows:—

(1) The isolated organ responds to electrical excitation of its nerves by monophasic electromotive changes, indicated by electrical currents which traverse the tissue from the head to the tail end; this response commences from 0.0035" at 30° C. to 0.009" at 5° C. after excitation, the period of delay for any given temperature being tolerably constant.

(2) The response occasionally consists of a single such monophasic electromotive change (shock) developed with great suddenness, and subsiding completely in from 0.002" to 0.005", according to the temperature; in the vast majority of cases the response is multiple, and consists of a series of such changes (shocks) recurring at perfectly regular intervals, from two to thirty times (peripheral organ rhythm); the interval between the successive changes varies from 0.004" at 30° C. to 0.01 at 5° C., but is perfectly uniform at any given temperature throughout the series.

(3) Such a single or multiple response (in the great majority of cases the latter) can also be evoked by the direct passage of an induced current through the organ and its contained nerves, in either direction heterodromous (*i.e.*, opposite in direction to the current of the response) or homodromous.

(4) The time relations of the response are almost identical whether this is evoked by nerve-trunk (indirect stimulation), or by the passage of the heterodromous induced current.

(5) There is no evidence that the electrical plate substance can be excited by the induced current apart from its nerves, *i.e.* it does not possess independent excitability.

(6) The organ and its contained nerves respond far more easily to the heterodromous than to the homodromous induced current, and the period of delay in the case of the latter response is appreciably lengthened.

(7) The peripheral organ rhythm (multiple response) varies from about 100 per second at 5° C. to about 280 per second at 35° C.

(8) One causative factor in the production of the peripheral rhythm is the susceptibility of the excitable tissue to respond to the current set up by its own activity (self-excitation).

The authors further conclude that, since each lateral half of the organ is innervated by the axis cylinder branches of one efferent nerve cell, and has no independent excitability, the specific characters of the reflex response of the organ express far more closely than those of muscle the changes in central nerve activity, and are presumably those of the activity of a single efferent nerve cell.

The single efferent nerve cell, the activity of which is thus for the first time ascertained, shows—

- (a) A minimum period of delay of 0.008" to 0.01".
- (b) A maximum rate of discharge of 12 per second.

<sup>1</sup> Report 1895 p. 824.