neighbourhood of Cambridge, Mr. Marr on Advanced Physical Geology, Mr. Roberts on the Crinoidea.

The above are only a selection out of a long list.

Mr. J. G. Adams, of Christ's College, has been appointed Demonstrator of Pathology on Mr. Rolleston's resignation.

SCIENTIFIC SERIALS.

American Journal of Science, April.—The absolute wave-length of light, by Louis Bell. The final results are here given of the research partially reported in the *Journal* for March 1886. Owing to the wide discrepancies in the value of this constant as determined by various observers and methods, the author gives a brief historical summary of the subject, with a critical discussion of the standards of length, methods, and apparatus employed in the present investigation. The details of the experimental work, together with some remarks on the final results, and some questions of theoretical and practical interest connected with the work of recent experimenters in this field, are reserved for a future number.—History of the changes in the Mount Loa craters; Part I, Kilauea (continued), by James D Dana. Here are discussed questions connected with the ascensive action in the conduit lavas, the effects of heat, the hydrostatic and other gravitational pressure.—The electromotive force of magnetization, by Edward L. Nichols and William S. Franklin. At the Ann Arbor meeting of the American Association for the Advancement of Science the authors described some singular modifications in the relation of iron to acids which occur when the reaction takes place within the magnetic field. In the present paper, which was read at the New York meeting of the Association in 1887, they deal with the behaviour of iron when that metal acts as one electrode in a voltaic circuit, and is at the same time subjected to magnetization.—Notes on certain rare copper minerals from Utah, by W. F. Hillebrand. A series of rare copper ores, including olivenite, erinite, tyrolite (?), chalcophyllite, clinoclasite, mixite (?), and bronchantite, are here subjected to careful chemical and physical examination.—The Taconic system of Emmons, and the use of the name Taconic in geological nomenclature (continued), by Chas. D. Walcott. The main subject of this paper is the geology of the Taconic area as known to Dr. Emmous, with a comparison of its area as now known. As a result of this comparative study, the author finds that the Lower Taconic is essentially a repetition of the Lower Silurian (Ordovician) of the Champlain Valley, while the Upper Taconic appears to be conformably subjacent to the Stockbridge Limestone of the Lower Taconic, and to include the Potsdam horizon at or near its upper portion.—Three formations of the Middle Atlantic Slope (continued), by W. J. McGee. This paper is occupied with the Appomattox formation, its character, and distribution.—W. Le Conte Stevens describes a new lecture apparatus of an extremely simple character for the demonstration of reflection and refraction phenomena.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 8.—"Further Observations on the Electromotive Properties of the Electrical Organ of *Torpedo marmorata*." By Francis Gotch, Hon. M.A. Oxon., B.A., B.Sc. London, M.R.C.S. Communicated by Prof. J. Burdon Sanderson, F.R.S.

In the present treatise the author details the results of further observations as to the electromotive properties of the electrical organ of Torpedo, the experiments being carried out in October, 1887, at the laboratory of the Société Scientifique d'Arcachon.

I. The first part of the work deals entirely with the phenomena of "irreciprocal conduction" in the organ of Torpedo, as described by du Bois-Reymond.

From du Bois-Reymond's experiments it would appear that the organ possesses the remarkable property of conducting an intense current of short duration, led lengthwise through its columns, better when the current is directed from its ventral to its dorsal surface than when directed the reverse way. The former direction coincides with that of the current of the shock of the organ, and is therefore termed by him "homodromous," the latter, being opposite in direction, is termed "heterodromous." The evidence rests upon the value of the galvanometric deflections obtained when both currents are allowed to traverse a strip of organ and a galvanometric circuit. The deflections are markedly unequal, particularly when induced currents are used, the homodromous effect being always much greater than the heterodromous. The homodromous current must therefore either encounter less resistance than the heterodromous, or its electromotive force must be suddenly strengthened, and that of the heterodromous current weakened, by the sudden establishment in the tissue of a new source of electromotive energy. The first is the view taken by Prof. du Bois-Reymond.

(1) The present rheotome experiments reveal (*a*) the new fact that the passage of such intense currents of short duration is always followed by an excitatory response (shock) in the tissue; (*b*) that if the intense current due to this response is allowed to affect the galvanometer as well as the induced or other exciting current, then by obvious algebraic summation the homodromous deflection must be much larger than the heterodromous; (*c*) and that when by means of a fast-moving rheotome the induction shock only is allowed to affect the instrument, no irreciprocity is found.

The author therefore assumes that the phenomena of irreciprocal conduction are in reality excitatory phenomena, the nature of which, from the methods of investigation used, have not been recognized.

(2) The time relations of this response of the isolated strip of the organ to direct stimulation by the traversing induction shock are now for the first time investigated, by means of the rheotome, and the influence of temperature and other conditions upon these is shown by experimental evidence.

II. The second part deals with entirely novel phenomena—namely, the excitation of the organ by the current of its own excitatory state. It is shown that in vigorous summer fish every response of the whole or part of the organ to a single excitation of its nerves is followed by a second response, due to the passage through its own substance of the intense current of the first response. In other words, the shock of the organ excites its own nerve fibres and nerve endings, producing a feebler second shock, which in a similar manner evolves a feebler third shock; this a fourth, and so on.

The response of the isolated organ to nerve excitation is thus multiple; a primary, secondary, tertiary response following the application to the nerve of a single stimulus. Since all these responses produce currents similarly directed through the columns of the organ, each column during its activity must reinforce by its echoes the force of the primary explosion, both in its own substance and also in that of its neighbours.

Linnean Society, April 5.—Mr. W. Carruthers, F.R.S., President, in the chair.—Amongst the exhibitions of the evening Mr. D. Morris (Kew) showed a curious native bracelet from Martinique. Although formed apparently of seeds, or beads of wood, or bone, its real composition had puzzled both botanists and zoologists, and until microscopically examined could not be determined.—Mr. J. G. Baker, F.R.S., exhibited a series of specimens of *Adiantum Fergusoni* and *Capillis Veneris*, and offered some remarks upon their specific and varietal characters.—Mr. J. E. Harting exhibited a specimen of a rare British animal, the pine-marten, which had been trapped in Cumberland; and made some observations on the present distribution of the species in the British Islands.—Mr. Clement Reid exhibited a series of fruits and seeds obtained by Mr. J. Bennie from interglacial deposits near Edinburgh, affording evidence of a colder climate formerly than that now prevailing in the Lowlands of Scotland.—Mr. F. Crisp exhibited some fragmentary remains of a wild goose shot in Somersetshire, which had been reported as the lesser whitefronted goose (*Anser erythropus*, Linn.), but which was apparently an immature specimen of *Anser albifrons*, Scopoli.—In the absence of the author, a paper by Mr. A. W. Waters, on some ovicells of the Cyclostomatous Bryozoa, was read by the Zoological Secretary, Mr. W. Percy Sladen; and after an interesting discussion, the meeting adjourned.

Chemical Society, March 28.—Annual General Meeting.—Mr. W. Crookes, F.R.S., in the chair.—The President delivered an address on which we have already commented.—The following Officers and Council were elected for the ensuing session:—President: Mr. W. Crookes, F.R.S. Vice-Presidents who have filled the office of President: Sir F. A. Abel, F.R.S.; Dr. Warren de la Rue, F.R.S.; Dr. E. Frankland, F.R.S.; Dr. J. H. Gilbert, F.R.S.; Dr. J. H. Gladstone, F.R.S.; Dr. A. W. Hofmann, F.R.S.; Dr. H. Müller, F.R.S.; Prof. Odling, F.R.S.; Dr. W. H. Perkin, F.R.S.; Sir Lyon Playfair, F.R.S.; Sir H. E. Roscoe,

F.R.S., and Dr. A. W. Williamson, F.R.S. Vice-Presidents: Prof. G. Carey Foster, F.R.S.; Mr. David Howard; Prof. J. W. Mallet, F.R.S.; Prof. H. McLeod, F.R.S.; Mr. Ludwig Mond; and Prof. Schorlemmer, F.R.S. Secretaries: Prof. H. E. Armstrong, F.R.S., and Prof. J. M. Thomson. Foreign Secretary: Dr. F. R. Japp, F.R.S. Treasurer: Dr. W. J. Russell, F.R.S. Ordinary Members of Council: Prof. T. Carnelly, Mr. A. H. Church, Prof. Clowes, Prof. Dunstan, Dr. P. F. Frankland, Mr. R. J. Friswell, Mr. C. W. Heaton, Mr. E. Kinch, Dr. H. F. Morley, Dr. R. T. Plimpton, Prof. Purdie, and Prof. Ramsay.

April 5.—Mr. W. Crookes, F.R.S., in the chair.—The following papers were read:—Researches on the constitution of azo- and diazo-derivatives; part iii., compounds of the naphthalene β-series, by Prof. R. Meldola, F.R.S., and Mr. F. J. East.—The action of finely divided metals on solutions of ferric salts, and a rapid method for the titration of the latter, by Mr. D. J. Carnegie.

Anthropological Institute, April 10.—Francis Galton, F.R.S., President, in the chair.—Captain Strachan exhibited a young Papuan boy brought by him from the north-west coast of New Guinea.—Mr J. Allen Brown read a paper on some small highly specialized forms of stone implements, found in Asia, North Africa, and Europe.—A paper by MM. Henri and Louis Siret, on the early age of metal in the south-east of Spain, was read.

PARIS.

Academy of Sciences, April 16.—M. Janssen, President, in the chair.—On the spectra of oxygen, by M. J. Janssen. Attention is called to Olszewski's recent experiments with liquefied oxygen, which fully confirm the results of the author's researches on the phenomena of elective absorption in oxygen gas. The bands already determined by him have been observed by Olszewski with a thickness of 7 millimetres of liquid oxygen, while a thickness of from 4 to 5 millimetres would be required to detect the presence of the strongest band, which occurs in the neighbourhood of D. This is a remarkable confirmation of the law of the product of the thickness by the square of the density regulating one of the two systems of bands described by M. Janssen.—On the relations of atmospheric nitrogen to vegetable soil, by M. Th. Schlœsing. This is a reply to the objections recently urged by M. Berthelot against the character of the author's researches, and the general conclusions based on them. He denies the validity of M. Berthelot's criticisms, and insists that he does not deny the fixation of atmospheric nitrogen in vegetable soils. He maintains, however, that the phenomenon is neither determined by his own experiments nor demonstrated with sufficient accuracy by M. Berthelot's analyses.—On a source of algebraic equations whose roots are all real, by M. G. Fouret. An algebraic process is explained, by means of which equations, all of whose roots are real, may be combined in such a way as to obtain from them fresh equations possessing the same property. The following theorem is proposed and discussed: If the equation

$$F(x) \equiv a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_{n-1} x + a_n = 0$$

has all its roots real, then the equation

$$\phi(x) \equiv a_0 f(x) + a_1 f'(x) + a_2 f''(x) + \ldots + a_{n-1} f^{(n-1)}(x) + a_n f^{(n)}(x) = 0,$$

in which $f(x)$ represents an entire polynome of equal or higher degree to n, has at least as many real roots as the equation $f(x) = 0$; and if it has more, the excess is an even number.—On Foucault's gyroscope, by M. E. Guyou. An elementary solution is given of the problem connected with the rotation of a solid body suggested by the movement of this apparatus.—On a new method of measuring the heat of evaporation of liquefied gases, by M. E. Mathias. The calorimetric methods usually employed are either those of *variable* temperature or of the *fixed* temperature of melting ice. But for the purpose of his researches the author has had to employ one of *constant* temperature, the nature and advantages of which are here described. It is specially applicable in the case of gases which, like ethylene, carbonic acid, and the protoxide of nitrogen, have their critical point at the ordinary temperature.—On a class of electric currents set up by the ultra-violet rays, by M. A. Stoletow. Hertz, Wiedemann, and others having shown the influence of the ultra-violet rays on electric discharges at high tension, the author here inquires whether a similar effect may not be obtained with electricity of feeble potential.—On a regulator of electric light, by M. Charles Pollak. In the apparatus here described the movement required to be communicated to the carbons in order to supply and maintain the electric arc is obtained by the thermic expansion of the conducting wires. This appliance, which regulates the electric arc for a period of three hours consecutively, has the advantage of extreme simplicity, dispensing with all intricate mechanism, as well as with electro-magnets.—On a sodico-potassic carbonate, by MM. L. Hugounenq and J. Morel. The authors have obtained this substance by exposing to the open air at a temperature of 12° to 15° C. a solution of carbonate of soda containing carbonate of potassa in the presence of a great excess of iodide of potassium mixed with phosphate and chloride of sodium. It approaches the formula—

$$CO_3K_2,6H_2O + (CO_3Na_2,6H_2O).$$

These researches show generally that the carbonates of soda and of potassa may crystallize together, yielding isomorphous mixtures, which can scarcely be represented by definite formulas.—New experiments on inoculation against rabies, by M. G. Galtier. These experiments, made on sheep and goats, show that herbivorous animals may be successfully preserved from the bite of mad dogs by the usual processes of inoculation, whether applied before or immediately after the attack.—A communication was received from the Minister of Public Instruction announcing the results of the measures recently taken to determine the exact superficial area of France calculated by the planimetric method. This estimate gives 536,408 square kilometres, which is 8012 more than that indicated by the Bureau of Longitudes, and 2929 more than that of the Russian General Strelbitsky.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Outlines of Qualitative Analysis: G. W. Slatter (Murby).—Text-book of Biology: J. R. A. Davis (Griffin).—British Birds: Key List: Colonel L. H. Irby (Porter).—In Pursuit of a Shadow: A Lady Astronomer (Trübner).—A Treatise on Alcohol, 2nd edition: Dr. T. Stevenson (Gurney and Jackson).—Allgemeine Geologie: Dr. Karl von Fritsch (Engelhorn, Stuttgart).—Arithmetic for Beginners: Rev. J. B. Lock (Macmillan).—Nature Readers, Sea-Side and Way-Side, No. 1: J. W. Wright (Heath, Boston).—Mr. Tebbutt's Observatory, Windsor, New South Wales: J. Tebbutt (Sydney).—Bulletin du Musée Royal d'Histoire Naturelle de Belgique, Tome v. No. 1.

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