

medical and physical science, was approved at an influential meeting of members and friends of the University held in the Glasgow City Chambers last week. Addressing the meeting, Principal Story said that in the beginning of the present year an executive committee was formed to provide funds for carrying out the measures of extension and reform considered of primary importance, and already they had received a sum of more than 62,000*l.*, including 10,000*l.* given for a special lectureship. It was proposed to make good the defects by the erection of additional premises for the class rooms, departmental museums, and laboratories of physiology, materia medica and forensic medicine, and public health. The needs of the chemical department, which could be regarded as belonging both to the faculty of science and to that of medicine, might be met, but only partially and temporarily, by the transference of premises available when physiology was provided for. A set of thoroughly furnished chemical laboratories is one of the most immediate wants, and additional accommodation is needed by the department of physical science. The full realisation of these designs must necessarily be a work of time, and will cost in all probably not far short of 100,000*l.* But it is encouraging to know that within the last few months more than the half of this sum has been subscribed. For the other half the University must depend upon the generosity of its many friends.

SCIENTIFIC SERIALS.

American Journal of Science, October.—On galvanometers of high sensibility, by C. E. Mendenhall and C. W. Waidner. A description of the design and manufacture of a delicate galvanometer of the four-coil Thomson type. There is a detailed discussion of the methods for obtaining the highest sensibility and also of the causes of the changes of zero.—On a method of locating nodes and loops of sound in the open air, with applications, by Bergen Davis. A small mill-like arrangement, constructed by placing four hollow cylinders of gelatine at the end of cardboard arms in such a manner that the closed ends pointed in the same angular direction, was mounted in the mouth of a resonator with the plane of the system perpendicular to the mouth. The resonator was in unison with an organ pipe, and when the pipe was blown the mill was found to rotate with a high velocity, the position of the nodes and loops being readily determined with considerable accuracy. In the open air the effect could be observed up to about sixty feet from the pipe.—The anatomy of the fruit of *Cocos Nucifera*, by A. L. Winton.—Studies of Eocene mammalia in the Marsh collection, Peabody Museum, by J. L. Wortman.—A new crinoid from the Hamilton of Charlestown, Indiana, by E. Wood.—On the estimation of cesium and rubidium as the acid sulphates, and of potassium and sodium as the pyrosulphates, by P. E. Browning.—Time values of provincial carboniferous terranes, by C. E. Keyes.—The spectra of hydrogen and some of its compounds, by John Trowbridge. The vacuum tubes used in the experiments described were illuminated by a current derived from a large battery of storage cells and not from a Ruhmkorf coil. The conclusions drawn from these investigations, which are at variance with the views generally received, are that hydrogen is an insulator, the passage of electricity through hydrogen, oxygen, nitrogen and their gaseous compounds being conditioned by the water vapour present. Certain carbon bands are always present in glass tubes filled with hydrogen, nitrogen, oxygen and ammonia gas, notwithstanding the greatest care taken during filling. The X-rays excited by the application of a steady current are due to the radiations set up by the dissociation of highly rarefied water vapour.

Bulletin of the American Mathematical Society, October.—Prof. F. N. Cole gives an account of the proceedings at the eighth summer meeting of the Society, held at Cornell University, Ithaca, New York, August 19–24. It was a largely attended meeting, and various circumstances made an adequate provision of time for the reading and discussion of the thirty-two papers presented practically impossible. The titles and abstracts occupy more than twenty pages. The third colloquium of the same Society was also held on the same date. Dr. Kasner gives an abstract of the proceedings at the two previous colloquia, as well as of this one. During the four days, two courses of four lectures each were delivered by Prof. Oskar Bolza, on the simplest type of problems in the calculus of variations, and by Prof. E. W. Brown, on modern methods of

treating dynamical problems, and in particular the problem of three bodies. Grateful acknowledgments were made of the hospitality of the University and for the numerous privileges which were afforded to the members present. Short notices are given of two of the papers: upon the non-isomorphism of two simple groups of order $8\frac{1}{2}$, by Miss Schottenfels, and concerning surfaces whose first and second fundamental forms are the second and first fundamental forms respectively of another surface, by Prof. A. Pell. Extensive notes of the mathematical courses for the session 1901–1902 at several Universities follow, with other matters of personal interest. Several pages are also devoted to new publications.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, October 2.—The Rev. Canon W. W. Fowler, president, in the chair.—Mr. G. C. Champion exhibited a long series of *Buprestis sanguinea*, Fabr., from Albarracin, Spain, showing the remarkable dimorphism of this species.—Mr. H. St. J. Donisthorpe exhibited on behalf of the Rev. H. S. Gorham, of Shirley Warren, a specimen of the scarce beetle, *Hister marginatus*. He also exhibited a number of rare Coleoptera from the New Forest, including *Velleius dilatatus*, F., from hornets' nests, *Anthaxia nitidula*, L., *Agrilus sinuatus*, Ol.—not taken for many years—*Agrilus viridis*, L., *Platydema violaceum*, F., a species also not recorded recently, and *Collydium elongatum*, F., one specimen taken in the burrows of *Melasis buprestoides* and another in the burrows of *Scolytus intricatus*. Mr. Champion said that Mr. George Lewis associated *Velleius* with *Cossus* and not with hornets.—Mr. C. P. Pickett exhibited varieties and aberrations of *Lycaena corydon* taken during August at Dover, and a series of *Angerona prunaria* (bred June and July), the results of four years' interbreeding, showing a wide range of coloration.—Prof. T. Hudson Beare exhibited a specimen of *Medon castaneus*, Grav., taken at the edge of a pond in Richmond Park.—Mr. A. Harrison exhibited a series of *Amphidasys betularia* bred from parents taken in the New Forest in 1900, including six gynandromorphous specimens.—Mr. C. J. Gahan exhibited a male specimen of *Thamnotrizon cinereus*, L., one of the long-horned grasshoppers taken by Mr. F. W. Terry at Morden, near Wimbledon, and called attention to a very interesting abnormality displayed by the specimen in possessing two pairs of auditory organs instead of a single pair, the second pair being situated on the tibiae of the middle legs in a position corresponding with that of the normal pair on the fore-legs.—Mr. F. Merrifield exhibited a series of *O. antiqua* much darker than the type, bred from pupæ placed in a refrigerator five weeks and then exposed to a mean temperature of 48° F.—Mr. R. South communicated a paper by the late Mr. J. H. Leech, entitled "Lepidoptera-heterocera from China, Japan and Corea (Pyralidæ)"; Mr. G. C. Champion contributed notes and observations upon the sexual dimorphism of *Buprestis sanguinea*.

October 16.—Mr. E. Saunders, vice-president, in the chair.—Mr. C. Morley exhibited for the Rev. E. N. Bloomfield leaves of hornbeam from Battle, and a photograph of leaves of sweet chestnut from Haslemere, rolled by *Atelabus circulionoides*.—Mr. R. Adkin exhibited a specimen of *Pteris daplidice* taken by him at Eastbourne on August 19 last. He said that the insect was flying strongly, and in that respect and indeed in general appearance resembled on the wing a pale female of *Colias hyale*.—Mr. C. P. Pickett exhibited series of *Melitaea cinxia* bred in June last from larvæ taken in the Isle of Wight, including light and dark varieties, and a series of *Choerocampa elpenor* bred in June last from larvæ taken at Broxbourne in July 1900, including a variety of the male with purplish lower wings and another with purple markings on the upper wings.—The Rev. F. D. Morice exhibited specimens of *Hedychrum rutilans*, Dhl., and *Salix propinqua*, Lep., taken at Lyndhurst by Miss Ethel Chawner, and both new to the British list. He also exhibited two monstrosities, viz. *Allanua arcuatus*; (sawfly) with two perfect wings, and two other imperfectly developed wings on the left side, and *Gorytes quinquevinctus* (fossor) with the abdominal segments extraordinarily twisted out of their proper shape and places.—Mr. Arthur M. Lea communicated a list of the Australian and Tasmanian Mordellidæ, with descriptions of new species; and Mr.

Edward Meyrick, descriptions of new Lepidoptera from New Zealand.—Mr. E. Saunders then read a paper upon Hymenoptera aculeata collected in Algeria by the Rev. E. A. Eaton and the Rev. F. D. Morice, part i., Heterogynæ and Fossore to the end of Pompilidæ.

Royal Microscopical Society, October 16.—Mr. Wm. Carruthers, F.R.S., president, in the chair.—Messrs. C. Baker exhibited a portable microscope on the model of the "Diagnostic," originally designed for Major Ronald Ross's investigations of malaria. It is made of magnalium, an alloy of manganese and aluminium, and weighs but fourteen ounces. This firm also exhibited a microscope intended for the examination of fractures and etched surfaces of metals. The instrument is provided with vertical illuminator, and rack and pinion focussing adjustment and levelling screws to the mechanical stage, now usual in this class of instrument.—Messrs. R. and J. Beck exhibited a portable model of their "London" microscope, which, by the introduction of several ingenious devices, could be packed with the apparatus into a leather case $2\frac{1}{2}$ inches \times $4\frac{1}{2}$ inches \times $9\frac{1}{2}$ inches. Messrs. Beck also exhibited a centrifuge, made to run at a high speed by an electric current.—The president showed some specimens of the mycetozoa and gave a brief account of the life-history of this group of organisms. The specimens belonged to a recently described species and had been named *Badhamia foliicola*. He directed attention to the exhibits by Mr. C. L. Curties consisting of a number of mounted specimens of marine zoological objects, accompanied by very full and interesting descriptions.—The president gave a *résumé* of a paper, by Miss A. Lorrain Smith, on fungi found on germinating farm seeds. Miss Smith had been assisting him in his work for the Royal Agricultural Society in examining farm seeds in respect to their germinating power. In the course of their observations Miss Smith had found numerous species of fungi on the germinating seeds, fourteen species in all, of which five were new and one belonged to a new genus.—The secretary announced the receipt of part xiv. of Mr. Millett's report on the foraminifera of the Malay Archipelago, which was taken as read.

MANCHESTER.

Literary and Philosophical Society, October 15.—Mr. Charles Bailey, president, in the chair.—Mr. R. L. Taylor remarked that he had noticed that the Manchester water appeared to contain an unusual amount of dissolved chlorides at the present time, and, on roughly estimating the amount of dissolved solids, found that the total had, curiously enough, gone up from a normal amount of about $4\frac{1}{2}$ grains to about $9\frac{1}{2}$ grains per gallon, due, no doubt, to the recent scarcity of water and to the concentration by evaporation on the gathering grounds and in the reservoirs.—Mr. R. D. Darbishire exhibited a large collection of the Eolithic implements of the Kentish plateau, and illustrated with map and section the outline of the denudation of the valley of the Weald, leaving a drift deposit on the remaining chalk of the north and south encarpments. In the process many levels of river gravels had been fixed, and partly occupied by stone implements of successive ages, mostly much mixed up in the redposition of the gravels by succeeding movements. He described the general facies of the so-called Palæolithic implements from river deposits in France and England and their peculiar modes of manufacture by "chipping" or flaking, and shapes; and confessed inability to determine the uses of such tools or any characteristics of the men who made them. They were fossil indications of man with mind, skill, and purpose, and that was all.

October 29.—Mr. Charles Bailey, president, in the chair.—Dr. C. H. Lees was elected to the office of honorary secretary in succession to Prof. A. W. Flux.—Mr. C. E. Stromeyer read a paper on explosions of steam-pipes due to water-hammers, dealing with the subject both from a theoretical and practical point of view. He referred to the reports of the Commissioners of the Board of Trade, according to which about fifty steam-pipe explosions have occurred from the above causes during the last seventeen years, and said that the majority were brought about by the opening of drain-cocks of steam-pipes in which water had accumulated, while a few were clearly due to a plug of water having been shot from the boiler ends of the pipes to the engine-ends. Mr. Stromeyer first investigated the pressure which is set up when an elastic body suddenly comes to rest, the solution of which problem was correctly guessed at by Dr. A. Ritter in 1889, but

he was unable to give a proof of the possibility of discontinuity of motion, which is part of the phenomena of an elastic blow. This point was illustrated by means of an unloaded helical spring. Having established this theory, it follows that when an elastic prismatic body is moving axially its front surface comes to rest instantaneously on contact with an unmovable obstacle, while the more distant parts of the bar come to rest also instantaneously when the wave of pressure or of change of velocity reaches them. This wave travels with the velocity of sound, and as the tail end of the bar has maintained its velocity, the axial pressure in the bar is the product of the elasticity of the material into the ratio of the velocity of the object to the velocity of sound. With the help of this theory it is easy to calculate the pressure which a plug of water of a given length travelling a given distance under the influence of a given pressure will exert if brought to a full stop.—A paper entitled "A Preliminary Note on the Preparation of Barium" was read by Mr. Edgar Stansfield. Results were given of a critical study of hitherto proposed methods of preparing metallic barium. The most promising results were obtained by the Goldschmidt process, by which alloys of barium and aluminium containing up to 60 per cent. of barium were produced, when the experiment was carried out *in vacuo* to avoid the formation of oxides and nitrides.

PARIS.

Academy of Sciences, October 28.—M. Bouquet de la Grye in the chair.—Experiments on some chemical reactions determined by radium, by M. Berthelot. A comparison of the action of light and of the radium rays in promoting certain chemical reactions. The reactions used were the decomposition of iodic acid, of anhydrous nitric acid, the oxidation of oxalic acid, and the polymerisation of acetylene. In the first two cases the action of the radium rays was exactly similar to that of light, except that the action was much feebler; in the two latter experiments no action was observed. It is suggested as possible that the glass vessels, in which the radium salts were necessarily enclosed, may have cut off that portion of the rays which is capable of the most energetic effects.—On the heat disengaged in the reaction between free oxygen and potassium pyrogallate, by M. Berthelot.—On a prehistoric lamp found in the cave of La Mouthe, by M. Berthelot. An examination of the carbonaceous substance scraped off a prehistoric lamp found by M. Em. Rivière showed that these residues are similar to those which would be left after combustion of a fatty material of animal origin, badly separated from its membranous envelopes.—The junction of a closed network of trigonometrical triangles, by M. P. Hatt. An application of the method of least squares to the method previously developed.—On the flagella of the undulating membrane of fishes (*Trypanosoma*), by MM. A. Laveran and F. Mesnil. The existence of organisms with undulating membrane and with two flagella would appear to be doubtful, and the authors regard the creation of a new genus for these organisms as necessary, and propose the name *Trypanoplasma*.—On Foucault's top, by M. A. S. Chassin.—On the stability of commutators, by M. Maurice Leblanc. A discussion of the cause of irregularity in the motion of a commutator in connection with a number of accumulators, and of the methods of overcoming this.—The minimum value of the total heat of combination, by M. de Forcrand. By an expansion of a formula given in a previous paper the minimum value of the total heat of combination can be calculated. This has been done for a considerable number of substances, and these compared with experimental data as far as available.—A contribution to the study of the copper-aluminium alloys, by M. Leon Guillet. The alloys were obtained by heating aluminium with pure oxide of copper. By the application of this method, which had previously given successful results with molybdenic and tungstic acids, three compounds could be isolated, Cu_2Al , CuAl and Al_2Cu . These had been already prepared by a different method by M. Chatelier.—On the separation of iron, by M. Paul Nicolardot. Ferric chloride, after being heated to 125°C . for some hours, forms an insoluble sulphate on adding ammonium sulphate to its aqueous solution. No other metals likely to be present in iron or steel are precipitated. The analysis of certain special alloys is rendered very simple by this method.—The qualitative and quantitative determination of traces of antimony in the presence of large proportions of arsenic, by M. G. Denigès. Two methods are suggested, the first depending upon the separation of the antimony by metallic

tin in a platinum dish, and the second upon the formation of a double salt with caesium iodide, and examination under the microscope of the crystalline deposit.—Researches in plants on cane sugar with the aid of invertin and of glucosides with the aid of emulsin, by M. Ed. Bourquelot.—On the estimation of the alkalinity of the blood, by MM. August Lumière, Louis Lumière and Henri Barbier. After a comparison of the results obtained by various methods that have been suggested the authors adopt an iodometric method, the results given in this way being regarded as much more exact than those obtained in the usual way.—The liberoligneous bundles of ferns. The union and separation of the liberoligneous elements, and some consequences, by MM. C. Eg. Bertrand and F. Cornaille.—On two states of the living substance, by M. Felix Le Dantec.—Remarks concerning the formation and origin of fine pearls, by M. L. G. Seurat. A criticism of the theory put forward by M. R. Dubois.—The nematod of the beet-root (*Heterodera Schactii*), by M. Willot.—On the mode of production of divergent luminous rays at 180° from the sun, by M. G. Sagnac.

NEW SOUTH WALES.

Royal Society, September 4.—Mr. H. C. Russell, F.R.S., president, in the chair.—Recurrence of rain—the relation between the moon's motion in declination and the quantity of rain in New South Wales, by H. C. Russell, F.R.S. The paper was essentially a continuation of that on the periodicity of good and bad seasons, read June 3, 1896. The author stated that while coastal rains were irregular, those of the interior showed a 19-year periodicity. Regretting that observations did not extend over a more lengthy period, it was pointed out that some rain records of Horsham, Victoria, dating back to 1848 were valuable, our first record at Bathurst beginning in 1858. To minimise possible errors, the averages of neighbouring stations were taken. An illustrative diagram accompanied the paper, the author stating that between 1850 and 1851, 1869 and 1870, and 1888 and 1889, the thick vertical lines—nineteen years apart—divided the records in "natural spaces" in which the first six years had abundance of rain, and the remainder was a "dry period." The first bad year of the series we were stated to be now in was 1895, the loss of sheep from starvation between 1895 and 1900 being alleged to be 25,000,000, not including the loss of 20,000,000 natural increase. The diagram showed also the curve of extreme southerly declination of the moon for each year. The author, in conclusion, stated that rain is shown for three periods of nearly nineteen years each, "to come in times of abundance when the moon is in certain degrees of her motion south, and when the moon begins to go north, the droughty conditions prevail for seven or eight years," which he says is "either a marvellous coincidence, or it is a law connecting the two phenomena," and he is convinced that there is some connection between the two.—The theory of city design, by G. H. Knibbs. The subject was systematically treated under the following headings: (1) introductory; (2) general idea of a city; (3) radial street-system; (4) position of radial centres; (5) combination of radial and rectangular street-systems; (6) curved streets; (7) cardinal direction of rectangular streets; (8) width of streets; (9) localisation of the various types of street; (10) grade and cross-section of streets; (11) engineering features of streets; (12) size of blocks, between streets; (13) height of buildings; (14) theory of aspect; (15) the æsthetics of design; (16) sites for monumental buildings and monuments; (17) treatment of street; from the standpoint of æsthetics; (18) public parks and gardens; (19) hygienic elements of design; (20) the preliminaries of design; (21) conclusion.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 7.

LINNEAN SOCIETY, at 8.—On the Life-history of the Black-currant Mite (*Phytolius ribis*): Mr. Warburton and Miss Embleton.—Notes on the types of Species of *Carex* in Boott's Herbarium: C. B. Clarke, F.R.S.
RÖNTGEN SOCIETY, at 8.30.—Presidential Address: Herbert Jackson.
CHEMICAL SOCIETY, at 8.—Note on the Non-existence of a Higher Oxide of Hydrogen than the Di-oxide: Prof. W. Ramsay, F.R.S.—The Electrolytic Reduction of Nitrourea: G. W. F. Holroyd.—(1) The Constitution of Pilocarpine, III.; (2) A New Synthesis of α -Ethyl Tricarballic Acid: H. A. D. Jowett.—The Action of Nitric Acid on Methyl Dimethylacetacetate: Prof. W. H. Perkin, F.R.S.—(1) An Incrustation from the Stone Gallery of St. Paul's Cathedral; (2) Note on Asbestos: E. G. Clayton.—Liquid Nitrogen Peroxide as a Solvent: Prof. P. F. Frankland, F.R.S., and R. C. Farmer.

FRIDAY NOVEMBER 8.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Recent Observations of the Position of Nova Aurigæ, made with the 40-inch Telescope of the Yerkes Observatory: Prof. E. E. Barnard.—The Determination of Selenographic Positions and the Measurement of Lunar Photographs, II.: S. A. Saunder.—Ephemeris for Physical Observations of the Moon for 1902: A. C. D. Crommelin.—A New Method of Interpolation: T. C. Hudson.—On Periodic Orbits in the Neighbourhood of Centres of Libration: H. C. Plummer.—The Spectrum of Nova Persei from February 28 to April 26, 1901: Rev. W. Sidgreaves.—Ephemeris for Physical Observations of Jupiter, 1902-3: A. C. D. Crommelin.—On the Variation of τ Centauri: A. W. Roberts.—Comparison of the Geocentric Places of Uranus, Neptune and the Sun, calculated from Newcomb's Tables, with their Places calculated from Le Verrier's Tables, for 1904: Dr. A. M. W. Downing.—On the Abnormal Photographic Image of Nova Persei: E. M. Antoniadi.—Probable Papers: Determination of Küstner's Magnitude Equation from Comparison of his Meridian Observations in Zones $+24'$ to $+27'$, with Measures of Photographic Plates taken at the University Observatory, Oxford: H. H. Turner.—On the Place of the Variable RU Herculis and Neighbouring Stars, from Photographic Measures: F. A. Bellamy.—First Reduction of Photographs of Eros made at Cambridge for the Determination of Solar Parallax: A. R. Hinks.
MALACOLOGICAL SOCIETY, at 8.—Note on the Type-specimen of *Belemnotus montefiorei*, J. Buckman: G. C. Crick.—Description of Two New Helicoid Landshells from British New Guinea: H. B. Preston.—On the Fate of the Type-specimen of *Voluta roadknightsae*: Mrs. A. F. Kenyon. Description of a New Species of *Helicina* from Guatemala: E. R. Sykes.

MONDAY, NOVEMBER 11.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Opening Address: The President.—The Uganda Protectorate, Ruwenzori and the Semliki Forest: Sir Harry Johnston, K.C.B.

TUESDAY, NOVEMBER 12.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Discharge of Sewage into a Tidal Estuary: W. Kaye Parry and Dr. W. E. Adeney.—Train Resistance: John A. F. Aspinall.
MINERALOGICAL SOCIETY, at 8.—Anniversary Meeting.—Papers: On Baumhauerite, a New Mineral, Dufrenôite and Hyalophane, from the Binnenthal: R. H. Solly.—Analyses of Marshite and Mierseite: G. T. Prior.—On the Hornsilvers: G. T. Prior and L. J. Spencer.—On Gibbsite from the Palni Hills in Southern India: Dr. H. Warth.—On the Occurrence of Gold in the Klondike; Results of a Visit in 1901: Prof. H. A. Miers, F.R.S.

THURSDAY, NOVEMBER 14.

MATHEMATICAL SOCIETY, at 5.30.—Linear Groups in an Infinite Field: Dr. L. E. Dickson.—Note on the Algebraic Properties of Pfaffians: J. Brill.—On Burmann's Theorem: Prof. A. C. Dixon.—The Puiseux Diagram and Differential Equations: R. W. H. T. Hudson.—Determination of all the Groups of Order 168: Dr. G. A. Miller.—An Outline of a Theory of Divergent Integrals: G. H. Hardy.—On the Representation of a Group of Finite Order as a Permutation Group; and on the Composition of Permutation Groups: Prof. W. Burnside, F.R.S.

FRIDAY, NOVEMBER 15.

EPIDEMIOLOGICAL SOCIETY, at 8.30.—The President, Dr. Patrick Manson, C.M.G., F.R.S., will deliver his Inaugural Address on the Ætiology of Beriberi.

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