

ing a space between two clouds, leaving behind it a fiery track of red.

A Worcester correspondent gives the time as 8.20. He describes the colour as brilliant blue and orange, and behind was a streaming trail of brilliant sparks, which remained visible for a few seconds after the brighter light had disappeared.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—At a Congregation on November 22, the University seal was ordered to be affixed to a letter of thanks to his Grace the Chancellor of the University for his munificent gift of a complete apparatus of scientific instruments for the Cavendish Laboratory.

A meeting of the members of the University to consider the propriety of securing a personal memorial of Dr. Darwin, was held on Monday in the combination room of Christ's College, the Rev. Dr. Cartmell, Master of the College, presiding. It was proposed by Prof. Humphry and seconded by Prof. Fawcett, "That it is desirable that the University should possess a personal memorial of Mr. Charles Darwin, LL.D." Proposed by Prof. Newton and seconded by Mr. Piele, of Christ's, "That the members of the University now present form themselves into a committee, with power to add to their number, for the purpose of collecting subscriptions from members of the University to carry out the foregoing resolution." Proposed by Prof. Liveing, seconded by Mr. J. W. Clark, "That Mr. A. G. Dew-Smith, of Trinity College, be treasurer and secretary to the committee, and be authorised to receive subscriptions." It was understood that the memorial should assume the form of a portrait, and about 75% was subscribed in the room.

EDINBURGH.—The subscriptions to the Edinburgh University Extension Fund now amount to 82,000*l.*, and Government has now promised to add 80,000*l.* to the amount on condition that 25,000*l.* is raised by public subscription, of which the sum of 10,000*l.* must be subscribed by December 31st next. The University Professors at Edinburgh have already contributed among themselves 5,360*l.* towards the additional 25,000*l.* required.

ST. ANDREWS.—Lord Selborne has been elected Lord Rector of this University. The students had much difficulty in getting any eminent man to allow himself to be nominated, and it was only on the day previous to the election that it was resolved to pit Lord Selborne against the Right Hon. Gathorne Hardy.

Prof. Alleyn Nicholson has been appointed Swiney Lecturer on Geology by the Trustees of the British Museum.

LEIPZIG.—Prof. Leuckhart, the newly-elected Rector of the University, was installed into the duties of the office on October 31, and delivered on the occasion an able address "On the Development of Zoology up to the Present Time, and its Importance." The students already number nearly 3,200, an attendance, as usual, far above that of any other German university.

AMSTERDAM.—The new University of Amsterdam has lately made a most flattering offer to Prof. Gegenbaur, of Heidelberg, which has, however, been declined.

BERGEN.—It is intended to establish a new university in the Norwegian town of Bergen. Eighty thousand crowns have already been subscribed towards this object.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, November 8.—Lord Rayleigh, F.R.S., president, in the chair.—The following were elected to form the Council during the session:—President: Lord Rayleigh, F.R.S. Vice-Presidents: Prof. J. Clerk Maxwell, F.R.S., Mr. C. W. Merrifield, F.R.S., Prof. H. J. S. Smith, F.R.S. Treasurer, Mr. S. Roberts. Hon. Secretaries: Messrs. M. Jenkins and R. Tucker. Other members, Prof. Cayley, F.R.S., Mr. T. Cotterill, Mr. J. W. L. Glaisher, F.R.S., Mr. H. Hart, Dr. Henrici, F.R.S., Dr. Hirst, F.R.S., Mr. Kempe, Dr. Spottiswoode, F.R.S., Mr. J. J. Walker.—Prof. Cayley made two communications, on the function $\phi(x) = \frac{ax+b}{cx+d}$ (a singularly neat expression was got for $\phi^n(x)$, the late Mr.

Babbage had considered the matter in 1813), and on the theta functions.—Mr. Tucker read a portion of a paper by Mr. Hugh MacColl (communicated by Prof. Crofton, F.R.S.) entitled the calculus of equivalent statements. A short account of this analytical method has been given in the July and November numbers (1877) of the *Educational Times*, under the name of Symbolical Language. The chief use at present made of it is to determine the new limits of integration when we change the order of integration or the variables in a multiple integral, and also to determine the limits of integration in questions relating to probability. This object, the writer asserts, it will accomplish with perfect certainty, and by a process almost as simple and mechanical as the ordinary operations of elementary algebra.—The president read a paper on progressive waves. It has often been remarked that when a group of waves advance into still water the velocity of the group is less than that of the individual waves of which it is composed; the waves appear to advance through the group, dying away as they approach its anterior limit. This phenomenon seems to have been first explained by Prof. Stokes, who regarded the group as formed by the superposition of two infinite trains of waves of equal amplitudes and of nearly equal wave-lengths advancing in the same direction. The writer's attention was called to the subject about two years since by Mr. Froude, and the same explanation then occurred to him independently. In his work on "The Theory of Sound" (§ 191), he has considered the question more generally. In a paper read at the Plymouth meeting of the British Association (afterwards printed in *NATURE*), Prof. Osborne Reynolds gave a dynamical explanation of the fact that a group of deep-water waves advances with only half the rapidity of the individual waves. Another phenomenon (also mentioned to the author by Mr. Froude) was also discussed as admitting of a similar explanation to that given in the present paper. A steam launch moving quickly through the water is accompanied by a peculiar system of diverging waves, of which the most striking feature is the obliquity of the line containing the greatest elevation of successive waves to the wave-fronts. This wave-pattern may be explained by the superposition of two (or more) infinite trains of waves, of slightly differing wave-lengths, whose direction and velocity of propagation are so related in each case that there is no change of position relatively to the boat. The mode of composition will be best understood by drawing on paper two sets of parallel and equidistant lines, subject to the above conditions, to represent the crests of the component trains. In the case of two trains of slightly different wave-lengths, it may be proved that the tangent of the angle between the line of maxima and the wave-fronts is half the tangent of the angle between the wave-fronts and the boat's course.—Prof. Clifford, F.R.S., communicated three notes. (1) On the triple generation of three-bar curves. *If one of the three-bar systems is a crossed rhomboid, the other two are kites.* This follows from the known fact that the path of the moving point in both these cases is the inverse of a conic. But it is also intuitively obvious as soon as the figure is drawn, and thus supplies an elementary proof that the path is the inverse of a conic in the case of a kite, which is not otherwise easy to get. (2) On the mass-centre of an octahedron. The construction was suggested by Dr. Sylvester's construction for the mass centre of a tetrahedral frustum. (3) On vortex-motion. The problem solved by Stokes as a general question of analysis, and subsequently by Helmholtz for the special case of fluid motion may be stated as follows: given the expansion and the rotation at every point of a moving substance, it is required to find the velocity at every point. The solution was exhibited in a very simple form.

Zoological Society, November 6.—Mr. A. Grote, vice-president, in the chair.—A letter was read from Mr. R. Trimen, containing remarks on the African species of *Sarcidiornis*.—A letter was read from Mr. A. O. Hume, containing some remarks on Mr. Howard Saunders' recent paper on the Sterninae.—The secretary exhibited, on the part of Mr. Geo. Dawson Rowley, an egg of *Pauxis galata*, laid by a black female.—Prof. W. H. Flower, F.R.S., read a paper entitled "A Further Contribution to the Knowledge of the existing Ziphioid Whales of the Genus *Mesoplodon*, containing a Description of a Skeleton and several Skulls of Cetaceans of that Genus from the Seas of New Zealand."—A communication was read from Lieut.-Col. R. H. Beddome, containing the descriptions of three new species of reptiles from the Madras Presidency. These were proposed to be called *Oligodon travancoricum*, *Gymnodactylus jeyaporensis*, and *Bufo travancoricus*.—A communication was read from the Marquis of Tweeddale, F.R.S., containing an account of a collection of

birds made by Mr. A. H. Everett in the Island of Luzon, Philippines. Three new species were named *Megalurus ruficeps*, *Dicaeum xanthopygium*, and *Oxyerca everetti*.—Mr. D. G. Elliott read some remarks on *Felis tigrina*, Erx., and its synonymy, showing that *F. mitis*, F. Cuv., and *F. macrura*, Pr. Max., are identical with that species.—Prof. Garrod, F.R.S., read a paper on some points in the visceral anatomy of the rhinoceros of the Sunderbunds (*Rh. sondaicus*).—A second communication from Prof. Garrod contained a note on an anatomical peculiarity in certain storks.—Mr. Edgar A. Smith read a paper in which he described some shells from Lake Nyassa, and a few marine species from the mouth of the Macusi River, near Quillimane, on the East Coast of Africa.—A communication from Dr. O. Finsch contained the description of a new species of petrel from the Feejee Islands, which it was proposed to name *Procellaria albigularis*.—A second communication from Dr. Finsch contained a report on the collections of birds made during the voyage of H.M.S. *Challenger* at Tongatabu, the Fiji Islands, Api, New Hebrides, and Tahiti.—Mr. Edward R. Alston read a supplementary note on rodents and marsupials from Duke of York Island and New Ireland. *Macropus lugens*, Alst., was shown to be a synonym of *Helmaturus brownii*, Ramsay, while Mr. Ramsay's *Mus. echinoides* and *M. musavora* were respectively identical with *Mus. brownii* and *Uromys rufescens* of Alston.—A communication from Mr. L. Taczanowski contained a supplementary list of birds collected in North-Western Peru by Messrs. Jelski and Stolzmann. Two species were new, and proposed to be called *Rallus cypereti* and *Penelope albipennis*.

CAMBRIDGE

Philosophical Society, October 22.—A communication was read by Mr. Balfour, on the development of the vertebrate ovum. The points dealt with in this paper were (1) the nature of the stroma of the ovary, and (2) the relation of the permanent ova to the large cells of the germinal epithelium, named primitive ova by Waldeyer.

October 29.—Mr. Bonney read a paper on the rocks of the Lizard District (Cornwall). The author brought forward evidence to prove that the serpentine of this district was clearly intrusive among the hornblende schists.

November 5.—Prof. Clerk Maxwell communicated to the society an account of the unpublished papers of the Hon. Henry Cavendish, which contain his experiments in electricity.

MANCHESTER

Literary and Philosophical Society, October 2.—Rev. William Gaskell, M.A., in the chair.—A case of flowering of *Chamerops fortunei* (Hook) at Alderley, by Arthur W. Waters, F.G.S. The fact of *Chamerops fortunei* (Hook) flowering so far north as near Manchester seemed to the author to be of sufficient interest to be worth mentioning to the Society.—Table of effect of movement of the surface of the globe on the shifting of the axis of the earth, by Arthur W. Waters, F.G.S.

PARIS

Academy of Sciences, November 19.—M. Peligot in the chair.—The following papers were read:—Meridian observations of small planets at the Greenwich and Paris Observatories during the third quarter of 1877, communicated by M. Villarceau.—New remarks on the quantities of heat liberated by mixture of water with sulphuric acid, by M. Berthelot. He affirms that sulphuric acid always liberates the same quantities of heat whether it have been recently heated or kept a considerable time.—*Résumé* of a history of matter (fifth article), by M. Chevreul.—On the theory and the various manoeuvres of the economising apparatus constructed at the dam of Au Bois, by M. de Caligny.—On the use of refined neutral oils for lubrication of pistons in engines with surface condensers, by M. Allaire. Lime causes decomposition of neutral fatty matters and unites with their acids, the result being a greater deposit than if lime had not been used. Doubtless the deposit is oleate of lime instead of oleate of iron, and the boiler is preserved from attack; but the inconveniences in condensing engines are aggravated, for the condenser ceases to act as the tubes get covered. M. Allaire commends the use of refined neutral fatty matters which are undecomposable under the ordinary pressure of boilers.—Various observations on phylloxera, by M. Boiteau. The winter egg is deposited exclusively on the exterior of the stock.—Discovery of a small planet at

Ann Arbor, by Mr. Watson.—General map of the proper motions of stars, by M. Flammarion. One result of this comparison is contradictory of some common views as to the distance of stars relatively to their order of brightness; for the greatest proper motions do not belong to the most brilliant stars, but indifferently to all sizes. Again, the author cannot support Bessel's and Struve's view that double stars are carried through space more rapidly than simple stars.—On the equation with partial derivatives of the fourth order, expressing that the problem of geodesic lines, considered as a problem of mechanics, supposes an algebraic integral of the fourth degree, by M. Levy.—New applications of a mode of plane representation of classes of ruled surfaces, by M. Mannheim.—On the laws which rule the order (or class) of plane algebraic curves, of which each point (or each tangent) depends at once on a variable point and tangent in a given curve, by M. Fouret.—Extract from a letter (mathematical) to M. Hermite, by M. Fuchs.—On the decomposition into first factors of the numbers $2^n \pm 1$, by M. de Longchamps.—Reproduction of orthose, by M. Hautefeuille. Orthose can be obtained by raising to from 900 to 1,000 deg. a mixture of tungstic acid and a very alkaline silico-aluminate of potash containing one equivalent of alumina to six of silica. The tungstic acid forms tungstate of potash, and the silico-aluminate is thus brought to the composition of orthose.—On the composition and industrial use of gases from metallurgical furnaces, by M. Cailletet. These gases, if suddenly cooled, are found to contain an important quantity of combustible principles which can easily be lit again and burnt by passing, e.g., through a grate with burning fuel, and having their velocity diminished.—Formation of iodous acid by the action of ozone on iodine, by M. Ogier.—On the solubility of sugar in water, by M. Courtonne. A saturated solution of sugar at 12.5° contains 66.5 gr. per cent. of sugar; one at 45° contains 71 gr. per cent.—On the products of oxidation of camphor, by M. Montgolfier.—Note on the accessory discs of the thin discs in striated muscles, by M. Renault. Muscular striation is formed of a succession of thick discs alone contractile, and of clear bands traversed each by a thin disc and two accessory discs similar to each other as regards form, and probably having similar functions.—A nalgesia obtained by the combined action of morphine and chloroform, by M. Guibert. A subcutaneous injection of chlorhydrate of morphine is made at least fifteen minutes before inhalation of chloroform.—On the causes of violet colour in oysters of the basin of Arcachon, by M. Descoust. The colour is found to be due to the presence of a small algal of the family of Rhodospiræ and Floridæ. This becomes more abundant in time of drought, and probably acts by absorbing moisture.—On the migrations and metamorphoses of the taenia of shrew mice, by M. Villot.—On certain monstrosities of *Asterocanthion rubens*, by M. Giard.—On the embryogeny of the cestoides, by M. Moniez.—On the bismuth ores of Bolivia, Peru, and Chili, by M. Domeyko.

CONTENTS

	PAGE
FLORA OF MAURITIUS AND SEYCHELLES. By W. R. McNAB	77
OUR BOOK SHELF:—	
Von Hauer's "Die Geologie".	78
LETTERS TO THE EDITOR:—	
Fritz Müller on Flowers and Insects.—CHARLES DARWIN, F.R.S.	78
The Radiometer and its Lessons.—G. JOHNSTONE STONEY; Prof. G. CAREY FOSTER, F.R.S.	79
Mr. Crookes and Eva Fay.—DR. WILLIAM B. CARPENTER, F.R.S.	81
Potential Energy.—Prof. H. W. LLOYD TANNER	81
Smell and Hearing in Moths.—GEORGE J. ROMANES; J. C.	82
Meteorological Phenomenon.—JOSEPH JOHN MURPHY	82
OUR ASTRONOMICAL COLUMN:—	
Stellar Systems	82
The Minor Planets	83
The Cordoba Observatory	83
CARL VON LITTROW	83
BACTERIA. By J. BURDON-SANDERSON, M.D., LL.D., F.R.S.	87
DIFFUSION FIGURES IN LIQUIDS. By Prof. TITO MARTINI (<i>With Illustrations</i>).	87
TRACES OF EARLY MAN IN JAPAN. By EDWARD S. MORSE	89
NOTES	89
THE LIBERTY OF SCIENCE IN THE MODERN STATE, II. By Prof. RUDOLF VIRCHOW	92
THE METEOR	94
UNIVERSITY AND EDUCATIONAL INTELLIGENCE	95
SOCIETIES AND ACADEMIES	95