SOCIETIES AND ACADEMIES

LONDON

Royal Society, June 19.—"Preliminary Note on a New Tide-predicter." By E. Roberts, F.R.A.S. (*Nautical Almanac Office.*) Communicated by Prof. G. G. Stokes, M.A., Sec. R.S., &c.

The Indian Survey Department having undertaken the superintendence of tide-registration around the whole sea-board of India and at the port of Aden, and also the reduction of the observations by the method of harmonic analysis, with the view to the prediction of the tides for the whole of the ports, it became a matter of necessity, in order to save the large outlay which the numerical operation of their prediction would have involved, that an instrument should be constructed to delineate the predictions.

Accordingly, on the recommendation of the Surveyor-General of India, I was desired to design, and to undertake the construction of, an instrument to include a sufficient number of tide-components to predict the Indian Ocean tides with all the accuracy necessary for practical purposes.

The present machine is the outcome of the recommendation.

The instrument combines the following twenty tide-components:—

The mean lunar semidiurnal;
The first and second overtides of the mean lunar semidiurnal;
Two *elliptic* lunar semidiurnal;
Two *evectional* lunar semidiurnal;
One *variational* lunar semidiurnal;
The mean solar diurnal;
The mean solar semidiurnal;
The lunisolar semidiurnal;
The lunisolar diurnal;
The lunar diurnal;
The solar diurnal;
One lunisolar elliptic diurnal;
One lunar elliptic diurnal;
One compound (Helmholtz) lunisolar semidiurnal;
One compound (Helmholtz) lunisolar quarter-diurnal;
The solar annual; and
The solar semiannual.

Strictly speaking, there is no sensible astronomical tide-component of twenty-four mean-solar hours' period, but for the purposes of prediction it is necessary to include such a term, a very regular and sensible result of this period being obtained in the analysis, due probably to wind or temperature. The same remark applies partially to the solar annual and the solar semiannual, the theoretical tides of these periods being very small; the analysed results, however, are of considerable value, being due probably to the effect of rainfall and the regularity of the monsoons. These three components should, therefore, be regarded more as meteorological than astronomical.

The stipulation that the scale for heights should be one inch per foot range for Bombay necessitated a recording barrel of some 18 inches at least; the actual length adopted for the instrument, however, is 22 inches. The delineation of the curves on such a large scale rendered necessary some modification of the system of excentric pulleys, as fitted on the tide-predicter of the British Association. It was at first contemplated to fit parallel slides only to the larger of the tidal components; the whole of them have, however, been so provided.

The chief difficulty in the construction of the machine is the finding, within reasonable limits, of proportions which shall represent with sufficient accuracy the periods of the several components, in order that the machine may be used for a considerable period of prediction—say, for twelve months. Very great success has been attained in this respect in the present instrument. For instance, the error of the period of the chief component (the mean lunar semidiurnal) relatively to the mean solar semidurnal is inappreciable during a whole year's predictions, amounting to about $0°\cdot10$ only in a period of fifty years. The largest deviation from strict accuracy is $0°\cdot37$, after a run representing twelve months. This is, however, of one of the very small components, and insensible in its results. This part of the design may be therefore regarded as practically perfect.

Each component is provided for setting with a crank, in which a sliding piece is fitted, carrying a steel guiding-pin. The guiding-pin is thrown out by means of a fine-cut screw and micrometer head. An improved parallel slide, carrying a pulley, is also fitted to each component. The guiding-pin works between two parallel adjustable steel jaws at the back of the pulley frame. The pulley frame is fitted with a balance-weight, so that its centre of gravity is in a vertical line through the pulley's axis. The whole slide is counterpoised by a cord and weight, passing over pulleys, in order to relieve the guiding-pin of all strain and to prevent wear. The steel bar of the pulley slide moves freely in two guides drilled out nearly their entire length to reduce the touching parts to a minimum. The other side of the pulley slide is kept in position by a projecting fork or guide, travelling with freedom along a narrow flat brass bar. Both the brass bar guide and the steel rod guide are divided to millimetres; the brass bar for approximate, and the steel rod for the accurate, adjustment of the throw of the crank-pin, for which purpose the upper guide of the steel rod is furnished with a vernier. The milled head of the micrometer-screw is also divided and may be used with the divisions on the brass bar guide. The pulley frame is movable on its steel rod, for the purposes of the perfect adjustment of the pulley about the centre of motion of the axis of the crank.

The axis of the crank carries behind the main plate a fine-toothed wheel, fitted on a slotted cone, with a milled nut for clamping the wheel on its axis. The toothed wheel is driven by an endless screw, carrying a bevelled wheel, which is itself driven by another bevelled wheel on one of the four main axes of the machine. The endless screws and main axes are fitted with counter pivots.

At the back of the machine are fitted the setting dials. Each dial is toothed round its outer edge and movable round its centre by a pinion for adjustment. The axis of the component projects through the setting dial, and carries a steel pointer for setting.

A fine flexible wire fixed to a large screw-head passes alternately under and over the pulleys of the lower and upper series of components, and carries an ink-bottle at its free end. The ink-bottle, fitted with a fine glass point, travels in a geometrical slide, and is suspended to give just sufficient pressure to ensure contact on the paper of the recording barrel.

The recording barrel is fitted with brass pins at equidistant intervals to form the time indications on the paper by perforation. An index for setting is fitted behind the machine at the top of the recording barrel.

The paper, which is continuous and supplied from a reel, passes round two grooved rollers at the back of the main barrel, and is held in position whilst the pins enter the paper, and after receiving the curves is wound round the haul-off drum. The haul-off drum rests on toothed driving-wheels, and by friction turns and slips to accommodate itself at a proper tension to receive the recorded paper. Motion is given to the whole system of wheelwork through the horizontal centre main shaft from a system of clockwork driving-gear at the bottom of the machine, the whole being driven by a weight calculated at about 4 cwt., and controlled by a fan. A warning bell sounds when the weight is nearly run down. The length of the barrel round which the cord is wound is sufficient to give 15,000 turns of the main shaft. This corresponds to about three months' run of curves, and will occupy about one hour to run off. A year's tide-curves for any port will thus occupy about four hours.

The setting of the machine for the prediction of the tide-curves of any port for which the tide-components are known is as follows:—The dials are first turned so that the epoch or time of maximum is exactly under or above the highest or lowest point according as the component is situated on the upper or lower row of components. The cranks are set vertically (the slotted cone of the wheel on the axis having been first released) and the guide-pin thrown out to its proper range to represent the half-amplitude of the component. The proper positions of the hands having been previously determined by calculation for the time of starting, the hands are set and the slotted cones tightened up. The recording barrel is then set to the time and the wheelwork set in motion. The complete setting occupies only a few minutes.

The large dial in the centre is for showing the progress of the record, which can be marked occasionally to facilitate the entry of the dates on the record after its removal from the machine. A few supplementary pins are inserted in the barrel for the better distinction of the hours. Two speeds of travel can be given to the paper, viz., 1 inch and ½ inch per hour. A fixed rod near the recording pen carries ruling pens for the tracing of base lines, such as dock sills, river bars, or mean tide-levels, or if desired can rule the paper throughout its entire depth to represent feet, metres, &c.

To Sir William Thomson my thanks are due for the improved parallel slide and other details, and also to Mr. Légé (the maker of the instrument) for the design of the wheel-gearing.

"The Motion of Two Spheres in a Fluid." By W. M. Hicks, M.A., St. John's College, Cambridge. Communicated by Prof. J. Clerk Maxwell, F.R.S., Professor of Experimental Physics in the University of Cambridge.

The investigation is based on the lemma that the image of a source in an infinite fluid in presence of a sphere consists of a source at the inverse point of the former, and a line sink thence to the centre of the sphere. From this is deduced the image of a doublet whose axis passes through the centre of the sphere, and of one whose axis is perpendicular to this. Thence is found the kinetic energy of motion of two spheres and fluid in which they are immersed, and properties of the motion deduced by Lagrange's equations. Amongst other things is considered the action between vibrating spheres.

Physical Society, June 28.—Prof. W. G. Adams in the chair. New Members: Mr. J. F. Moulton, Mr. J. J. Eastwick.—Prof. W. G. Adams exhibited his new measuring polariscope. It consists of three principal parts. The lower section consists of a mirror, a lens, a Nicol's prism, and two other lenses. The upper section consists of lenses and Nicol's prisms arranged in the reverse order. Each lens and Nicol's prism is supported separately by screws, and its position can be altered independently of the others. These two parts form a complete polariscope. Besides these there is a middle piece consisting of two lenses (nearly hemispheres) forming a box to inclose the crystal immersed in oils, their curved surfaces being concentric. The whole middle piece is supported on the tubes of the upper and lower portions, and may be turned about the optical axis of the instrument. The vertical graduated circle carrying the central lenses and crystal may be turned through any angle about its horizontal axis. By means of an arc fastened perpendicularly on the graduated circle with the centre at the centre of curvature of the central lenses, the crystal may be turned about another horizontal axis at right angles to the former, so that the crystal and the central lenses can be turned about each of three axes which are mutually at right angles. By means of a system of toothed wheels in gear with the rims of the central lenses, the crystal and central lenses may be turned separately about the optic axes of the instrument, so as to bring the planes of the optic axes of a biaxial crystal parallel to the plane of the vertical graduated circle.—Sir John Conroy, Bart., read a paper on the distribution of heat in the spectrum. After referring to Dr. J. W. Draper's supposition that all the rays in the spectrum have the same heating effect, and to his statement that owing to the unequal dispersion of the prism for rays of different refrangibility, the method that has been usual for determining the calorific intensity of the various parts of the spectrum is an essentially defective one; the author described a graphical method for eliminating the effect of the unequal dispersion of the prisms, and showed that from MM. Fizeau and Foucault's measurements, and also from those of Lamansky and Prof. Tyndall, that the maximum intensity is about the middle of the visible spectrum, and not at the red end; and, further, that the curves given by various observers as representing the intensity of the heat in different portions of the spectrum, are in reality the "dispersion curves" for the particular prisms employed.—Capt. Abney, R.E., called attention to his published paper on the measurement of the so-called thermo-spectrum, wherein he shows that the distribution of heat in the spectrum is a misnomer, and that what was really measured by Lemansky and Tyndall was the energy absorbed by the lamp-black and the absorption due to the prisms used. He considered that there was no inherent heat in the spectrum. He found that Dr. Draper had not taken into account the amplitude. Prof. Guthrie said that Capt. Abney had expressed what many thought, namely, that heat was radiant energy.—Mr. Grant then described an investigation which he had made into the induction lines round two parallel coils of wire. In the primary coil an intermittent current of electricity from a Leclanché battery flowed; and in the secondary a telephone was connected up to detect the induction sounds. With this apparatus he found that with the coils kept parallel to each other, there were lines, or rather a surface of minimum induction surrounding the primary, and that if the secondary were placed in these lines hardly any induction noise could be detected. A diagram representing a medial section through the coils showed the lines to proceed from the wire of the coils in two curves resembling parabolas—one from each cross-section of the wire outwards.—Dr. Shettle then described his experiments proving the lines of force in a bar-magnet to run spirally round the bar between the equator and poles, the equator being decentred and oblique across the bar, as shown by diagrams.—Prof. Rowland, of Baltimore, made some observations on the new theory of terrestrial magnetism of Professors Ayrton and Perry. He said the experiments on which the theory was founded had been attributed to Helmholtz, but they were entirely his own, he having gone to Berlin to make them. The new theory had occurred to himself on making these experiments, but he had rejected it because he found that the potential which the earth's surface would require to have would not only cause violent planetary disturbances, but, by mutual repulsion, drive objects off the earth. He had made also an experiment to see if absolute motion of electricity would cause magnetisation, but failed to get any effect from it. Then he resorted to calculation to find the magnetic effect of relative motion by rotation of a charged sphere of perfect magnetic permeability that is more magnetic than iron. He found that when the sphere was uniformly charged and rotating there would be a magnetic field in its interior; but instead of the result of Messrs. Ayrton and Perry, that if the earth were charged to a potential of, he believed, 10^8 volts relatively to interplanetary space, the earth's magnetism would be what it is, he found the necessary charge to be 61×10^{15} volts. In the ordinary atmosphere this potential would produce a spark nine million miles long and discharge across to the moon. If the moon were electrified to the same degree the mutual repulsion would overcome the force of gravity between them. He therefore considered terrestrial magnetism to be still a mystery. He had also thought that the aurora borealis might be explained by supposing the upper regions of the earth's atmosphere electrified. The winds carrying the upper strata towards the poles, electricity would condense there. This hypothesis was still tenable. Prof. Ayrton said that whether or not the new theory of magnetism should be so rejected depended on whether or not Prof. Rowland's calculations, or those of himself and Prof. Perry were wrong. It had been found by Sir William Thomson, from experiments at Arran, that the earth was electrified with respect to the air, and that there is a difference of potential of 30 volts between earth and air for each foot of ascent. This gave 1360×10^{12} centimetre-gramme-second electrostatic units as the potential of the earth. The new theory required the potential to be 1011×10^{11}, supposing the earth to be of solid iron, or about fourteen times more—a wide margin. Prof. Rowland said he had not seen the calculations of Professors Ayrton and Perry yet, but he believed his results to be correct, as he had checked them in various ways.—Mr. Bailey exhibited a modification of Arago's experiment, in which a copper disk is caused to rotate continuously by changing the polarity of four electro-magnets underneath by a revolving commutator.—Mr. Conrad Cooke exhibited a single voltaic element showing the internal current. This is done by forming the glass vessel containing the element into a helical tube between the poles, and hanging a galvanometer needle in the interior of the helix; the internal current deflects the needle.

Geological Society, June 25.—Prof. P. Martin Duncan, F.R.S., vice-president, in the chair.—Edward Garlick was elected a Fellow of the Society.—The following communications were read:—On the evidence that certain species of *Ichthyosaurus* were viviparous, by Prof. H. G. Seeley, F.R.S., F.G.S.—On *Rhamphocephalus prestwichi*, Seeley, an Ornithosaurian from the Stonesfield Slate of Kineton, by Prof. H. G. Seeley, F.R.S.—A contribution to South American geology, by George Attwood, F.G.S. The paper describes a line of country in Spanish Guayana, Venezuela, S.A., commencing from a small town called "the Port of Las Tablas," on the Orinoco River, extending about 150 miles, and consisting of a series of crystalline and altered rocks. Syenite is the first rock met with, and then are found granite, quartz-diorite, hæmatite, and magnetic iron ores, gneiss, slaty rocks, gabbro, and diabase. In the diabase the quartz veins are found to contain large quantities of gold mixed with the vein matter; the alluvial soil in the neighbourhood of the quartz veins also contains gold nuggets and small grains of gold. Although quartz veins are found in great numbers from the river to the interior, none of them have so far been found to contain gold in any appreciable quantity until the diabase is met with. All the rocks analysed show a higher percentage of silica than is generally found in other localities. Three analyses made from one piece of diabase showing two distinct lines of alteration by weathering (on the original rock), prove that silica is readily dissolved under atmospheric influences, whilst alumina is not. Iron oxides contain more oxygen near the surface than below it. Lime and magnesia are both readily soluble, but lime much more so than magnesia. Soda is more sensitive to weathering than potash. The rocks contain *more combined as well as uncombined* water on their surface than when sheltered from atmospheric influences. The paper was accompanied by an appendix on the microscopical structure of some of the varieties of rocks by Prof. Bonney.—On the so-called Midford Sands, by James Buckman, F.L.S.—On the physical geography of the north-east of England in permian and triassic times, by E. Wilson, F.G.S. In this paper the author seeks to utilise the information he has acquired from the study of the permian and triassic rocks of the above district, towards solving some of the difficult and much debated questions as to their origin. One of the main objects of the paper is to establish the pre-permian origin of the Pennine Chain.—The formation of rock-basins, by J. D. Kendall, C.E., F.G.S.—On the diorites of the Warwickshire coal-field, by S. Allport, F.G.S.—On *Lepidodiscus lebouri*, a new species of *Agelacrinites*, from the carboniferous series of Northumberland, by W. Percy Sladen, F.G.S., F.L.S.—On the ancient river-deposit of the Amazon, by C. Barrington Brown, A.R.S.M., F.G.S. The author described a series of alluvial deposits, varying in thickness from 10 to 160 feet, which have been cut through by the river, and form a series of cliffs, giving rise to striking and characteristic scenery. The succession of beds exposed in these cliffs was illustrated by a number of sections, and it was shown that the strata in question must have been deposited by river action. It was then pointed out that the river is performing two classes of work, namely, cutting away the older sheets of alluvial matter, and depositing the materials derived from them at a much lower level. The interesting phenomena of the cutting of curves by the river, and the abandonment by the river of parts of these curves, giving rise to the formation of lakes, was fully explained; and in conclusion the author showed by a map what vast areas in South America have thus been covered by these alluvial deposits.—The glacial deposits of Cromer, by Clement Reid, F.G.S.—On a disturbance of the chalk at Trowse, near Norwich, by Horace R. Woodward, F.G.S.—The submerged forest of Barnstaple Bay, by Townshend M. Hall, F.G.S.—On a section of boulder clay and gravels at Ballygalley Head, and an inquiry as to the proper classification of the Irish drift, by T. Mellard Reade, C.E., F.G.S.—On the augitic rocks of the Canary Islands, by Prof. Salvador Calderon. Communicated by the President. As the result of a long investigation of the eruptive rocks of the Canaries, and especially of Las Palmas, the author has come to the conclusion that there are two groups of such rocks in those islands, an older one, characterised by the presence of hornblende, and a newer, containing augite. In the latter he finds the essential minerals to be plagioclase, augite, magnetite, olivine, sanidine, and nepheline; and he distinguishes among them the following kinds of rocks, all of which have their characteristic minerals imbedded in a paste of augite and plagioclase:—(1) *Augite-andesite*, with a small quantity of sanidine; (2) *Tephrine*, with no sanidine, but abundance of nepheline; (3) *Basanite*, with some peridote; (4) *Nepheline-basalt*, with abundance of peridote; (5) *Dolerite*, crystalline, characterised by the disappearance of nepheline, the abundance of peridote and porphyritically imbedded plagioclase, and with porphyritically imbedded individuals of augite and olivine; (6) *Felspathic basalt* (like 5), but semicrystalline; and (7) Essentially olivinic modern lavas.—On the Cambrian (Sedgw.) and Silurian beds of the Dee valley, as compared with those of the Lake-district, by J. E. Marr, B.A., F.G.S.—On some superficial deposits in the neighbourhood of Evesham, by the Rev. A. H. Winnington Ingram, M.A., F.G.S.—Descriptions of palæozoic corals from Northern Queensland, with observations on the genus *Stenopora*, by Prof. H. A. Nicholson, M.D., D.Sc., F.G.S., and R. Etheridge, jun., F.G.S. The corals described in this paper were in part collected by the late Mr. Daintree, chiefly from the limestone of the Broken River, regarded as of Devonian age, and in part by Mr. R. L. Jack, from various sources, namely, the Bowen River coal-field, in beds probably of permo-carboniferous age, the Fanning River limestone (Devonian), and the Arthur's Creek limestone (permo-carboniferous). Mr. Daintree's collection also contained corals in the chloritic rock of the Gympsie gold-field. From the Coral Creek, Bowen River coal-field, the authors record *Stenopora ovata*, Lonsd., and *S. jackii*, sp. n.; from the Fanning River limestone, *Heliolites porosus*, Goldf., and *Pachypora meridionalis*, sp. n.; from the Gympsie chloritic rock, *Stenopora ?* sp. ind.; from the Broken River limestone, *Favosites gothlandicus*, vars. Lam., *Heliolites porosus*, Goldf., *H. plasmoporoides*, sp. n., *H. Daintreei*, sp. n., *Heliolites*, sp. ind., and *Aræopora australis*, sp. n.; from the Arthur's Creek limestone, Burdekin Down, *Alveolites* (*Pachypora ?*), sp., near *A. robustus*, Rom., *Alveolites*, sp. (lobate form), *Aulopora repens*, M.-Edw. and H., *Heliolites porosus*, Goldf., and vars., *Lithostrotion*, sp. ind., *Pachypora meridionalis*, *Trachypora*, sp. ind., and species of *Cannopora* and *Stromatopora*. The genus *Aræopora* is proposed as a new group; the genus *Stenopora* is made the subject of a long discussion; and the geological characters of the deposits from which the fossils are derived are indicated and discussed.

Meteorological Society, June 18.—Mr. C. Greaves, F.G.S., president, in the chair.—Lieut. A. Carpenter, H. Dodd, Capt. D. Galton, F.R.S., S. B. Goslin, A. Gray, Capt. Marshall Hall, W. L. MacGregor, and Rev. W. P. Robinson, D.D., were elected Fellows of the Society.—The following papers were read:—Report on the International Meteorological Congress held at Rome, April, 1879, by Robert H. Scott, F.R.S. —Thermometer exposure: Wall *versus* Stevenson screens, by William Marriott, F.M.S. It being the practice of some observers to expose their thermometers on walls facing north, it seemed a suitable object of inquiry whether instruments so placed gave results comparable with those obtained from thermometers in a Stevenson stand in the open. A pair of meteorological office wall screens were fixed to the brick wall of an outhouse with a northern aspect, so that the screens were in the shade, except in the morning and afternoon of the summer months. The Stevenson screen was on a grass plot 17 feet square, and about 50 feet north of the wall screen. The paper contains the results of the comparison of the maximum and minimum temperatures in the wall screen with those in the Stevenson screen for the twelve months ending March 31, 1879. The figures show that the mean daily maximum temperature on the wall is below that in the open, the monthly differences varying from 0°·0 to − 2°·1, that for the twelve months being − 1°·0. The minimum temperature on the wall was mostly higher than in the Stevenson stand, the differences varying from − 0°·1 to + 1°·3, the mean for the year being + 0°·5. The individual differences, however, are sometimes much greater, the maximum temperature on the wall being considerably lower than that in the stand. For instance, the difference exceeded 4°·0 five times in September, and four times in March, the greatest being 6°·7; these extremes occurred on fine calm days. The minimum temperature on the wall was more than 2°·0 higher than that in the Stevenson stand on five occasions in June, seven in July, and four in September. The mean daily range of temperature on the wall for the twelve months was 1°·4 less than in the stand in the open. The greatest difference was on March 9, when the range on the wall was 8°·5 less than in the stand. These results seem to show that, although the mean temperature may be roughly ascertained from thermometers shaded by a wall with a northern aspect, this method of exposure affords less sensitive indications than those obtained from instruments in a properly exposed Stevenson stand.—On the Hurricane at Mauritius, on March 20th—21st, 1879, by C. Meldrum, LL.D., F.R.S.—On a remarkable disturbance of Barometric Pressure, observed at the Royal Observatory, Greenwich, on May 18th, 1878, by W. Ellis, F.R.A.S.—Meteorology of Mozufferpore, Tirhoot, 1878, by C. N. Pearson, F.M.S.—Meteorological Observations made on the Peak of Teneriffe, by Dr. W. Marcet, F.R.S.—On the temperature of the Atlantic during December, 1877 and 1878, by Capt. H. Toynbee, F.R.A.S.

Entomological Society, July 2.—Sir Jno. Lubbock, Bart., V.P.R.S., president, in the chair.—Mr. Vincent Robert Perkins, of South Belgravia, was elected as an Ordinary Member.—Mr. S. Stevens exhibited living specimens of *Tillus unifasciatus* taken at Norwood.—Mr. McLachlan contributed some further remarks respecting the sculptured pebbles from Lac Léman referred to at the last meeting of the Society.—A number of the perfect insects forwarded by Prof. Forel proved to be *Tinodes lurida*, Curt., a common insect generally on the margins of lakes and rivers.—Mr. W. L. Distant exhibited a specimen of *Papilio hystaspes*, Feld., taken at sea during a calm thirty miles from Singapore and nine miles from the nearest land.—Mr. W. Cole exhibited a remarkable variety of *Pyrameis cardui*, Linn., taken in Essex.—The Secretary exhibited, on the part of Lord Walsingham, some specimens of a remarkable species of *Tipulidæ* (*Bittacomorpha clavipes*, Fab.) possessing greatly enlarged tarsal joints, captured at Pitt River, California.—Sir Sydney Saunders communicated some additional explanations received from M. Jules Lichtenstein respecting the rearing of the blister beetle, *Cantharis versicatoria*.

Statistical Society, June 30.—Anniversary meeting.—Mr. G. J. Shaw-Lefevre, M.P., in the chair.—The report of the council, the financial statements of the treasurer, and the report of the auditors having been read, the chairman, in moving the adoption of the documents referred to, observed that the Fellows of the Society now numbered 746, and that the increase during the past year over the previous years, and as compared with the average of the last decade (509), indicated the steady progress of the Society. This was confirmed again by the increasing receipts from the sale of the Society's *Journal*. He congratulated the meeting on the satisfactory progress of the Society, financially and otherwise, during the past year. Thomas Brassey, M.P., was elected president. The chairman announced the subject selected for the essays in competition for the Howard Medal of 1880 (with 20*l*.), to be "The Oriental Plague, in its Social, Economical, Political, and International Relations; Special Reference being made to the Labours of Howard on the Subject."

Rome

R. Accademia dei Lincei, June 1.—Prof. Blaserna and MM. Casorati and Brioschi read a report on a memoir by M. Ascoli, on the representability of a function of two variants by double trigonometrical series.—Prof. Blaserna and MM. Felici and Betti read a report on a memoir by Prof. Galileo Ferraris on theorems on the distribution of constant electric currents.—Prof. Blaserna presented a memoir by M. Keller on the secular variation of the magnetic declination at Rome.—The following papers were read:—Contributions to etiology, by M. C. Emery.—Locomotion in the air, by M. Cordenous.—The application of photography to topographical operations, by M. Chizzoni.—President Sella spoke on a paper by M. Valle, a crystallographic study of some bodies of the aromatic series, prepared by Prof. Körner.—M. Lanciani made some demonstrations on malaria and on the subterranean roads in Rome and the Roman Campagna.—On the nature of the specific agent which produces fevers by malaria, by Profs. Tommaso-Crudelis and Klebs.—On the thermic and galvanometric laws of electric sparks produced by complete and incomplete discharges of condensers, by Prof. Villari.

Paris

Academy of Sciences, July 7.—M. Daubrée in the chair.—The following papers were read:—Identity of *Bacillus amylobacter* and the butyric vibrion of M. Pasteur, by M. van Tieghem. The amylobacter, at a certain phase of development, produces a transitory reserve of starch, impregnating its protoplasm. That this occurs in solutions of dextrine or sugar, seems to have escaped the notice of M. Prazmowski and M. Pasteur.—On a new polygraph, an inscribing apparatus applicable to physiological and clinical researches, by M. Marey. He describes modifications by which his apparatus is rendered more portable, simple, and faithful in its indications. In his tambours, the elastic membrane is caught between two annular plates of metal; for transmission of sphygmograph movements he uses caoutchouc tubes rendered inextensible, &c.—On the origin of the excito-sudoral nerve-fibres of the face, by MM. Vulpian and Raymond. The cervical cord of the sympathetic probably contains few, if any, excito-sudoral fibres. The fibres in question come either from sympathetic nerve-fibres accompanying the vertebral artery in its ascending course through the transverse apophyses of the cervical vertebræ and (through these fibres) from the upper thoracic ganglion, or from the parts of the sympathetic coming from the rachidian bulb and the protuberance.—On the inundation of the town of Szegedin, in Hungary, by General Morin. A scientific account of the disaster. From data supplied by Prof. Krusper, of Buda-Pesth, it is shown that in less than fifty years, both as the natural effect of alluvia and that of embankment, the level of flood of the Tisza had risen two metres. General Morin points out the advantage of transferring the clayey and muddy deposits of the river from the lower to the upper parts of the valley, so turning marshes into cultivable land, and increasing the slope of the valley. With this view the dykes of the left bank might be gradually suppressed and replaced by submersible oblique dykes, furnishing successive basins for interception of material.—On the mean value of coefficients in the development of a skew or symmetrical determinant of an order infinitely great, and on doubly skew determinants, by Prof. Sylvester.—Application of sulphocarbonate of potassium to phylloxerised vines, by M. Mouillefert. He gives in a table particulars of the treatments effected by the General Society in the spring of this year. The sulphocarbonate is almost universally applicable for French vineyards, and can be used in any weather or any season without danger to the vine.—On the hypergeometric series and the polynomes of Jacobi, by M. Appell.—On the recent eruption of Etna, by M. Fouqué. The new eruption has produced, on the south-south-west, a fissure having only a few small crateriform apertures, and mouths of emission of lava slightly developed; but on the north-north-east side there are ten distinct craters, two of which are enormous (200 m. diameter, and 80 m. depth).—On the same subject, by M. de Saussure. He describes the phenomena in detail.—Evaporation of water under the influence of solar radiation through coloured glasses, by M. Baudrimont. Green and red, in general, favour the evaporation least, while yellow and red favour it most. M. Baudrimont considers there is probably a simple relation between the number and extent of the luminous waves and the number and extent of those which produce heat, in virtue of which they can be simultaneously propagated through a coloured glass and concur in the effect produced.—Thermo-chemical study of alkaline sulphides, by M. Sabatier.—On a new metal discovered by M. Tellef Dahll, by M. Hiortdahl. He has found it in a mineral composed of arseniuret of nickel (*kupfernickel*) and nickel glance at Oterö, a small island near the town of Krages. He calls it *Norvegium*. It is white, somewhat malleable, and hard like copper (Ng = 145·95).—On commercial trimethylamine, by MM. Duvillier and Buisine. It is not a simple product, as M. Vincent asserts; of trimethylamine there is only 5 to 10 per cent. in it. Dimethylamine dominates, being about 50 per cent. There are also monomethylamine, monopropylamine, and monoisobutylamine, in nearly equal quantities.—The charbon of ordinary onion (*Allium cepa*), a new disease, originating in America, and caused by an Ustilaginea (*Urocystis cepulæ*, Farlow), by M. Cornu.—Contribution to the physiology of local sweats; local action and antagonism of hypodermic injections of pilocarpine and atropine, by M. Straus.

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