on electric conductivity of gases (first part).—A. Oberbeck, on electric oscillations and on phenomena of polarisation caused thereby.—A. Toepler, on the estimation of horizontal magnetic intensity by use of the balance.—W. von Bezold, a simple experiment on the connection between the temperature of an incandescent wire and the composition of the light emitted by it. A platinum wire is stretched horizontally through the tip of a Bunsen burner and examined in a spectroscope with horizontal slit.—E. Ketteler, reply to Herr Voigt's criticisms.

No. 2, February.—S. Czapski, on the thermal variation of the electromotive force of galvanic batteries, and its relation to their free energy.—J. Kollert, on the properties of flame in their electrical relation. Confirms the previous measurements of Elster and Geitel.—F. Fuchs, on a compensation-method for estimation of the resistance of unpolarisable elements. A modification of Poggendorff's well-known method.—E. Budde, on the theory of thermo-electric forces.—H. Lorberg, on electrostriction. A discussion of Quincke's results.—B. Weinstein, on the calculation of the potential of coils. A mathematical paper.—A. von Waltenhofen, on an instructive experiment which may be made with asymmetrical thermopiles. On passing an independent current through the thermopile certain non-reversible phenomena of polarisation are observed arising from the asymmetry of the junctions that are heated.—C. Christiansen, on the emission of heat from uneven surfaces.—A. Tschirch, researches on chlorophyll and some of its derivatives.—W. Holtz, a lecture experiment in proof of the law that the velocity of rotation increases as the rotating masses approach the axis.

Journal de Physique, tome iii. No. 2, February.—G. Lippmann, physical definition and determination of absolute temperatures. This is the first part of a communication in which the author seeks to find stricter thermodynamic definitions of temperature. He attributes to Carnot the discovery of the scale of absolute temperature!—D. Gernez, researches on the duration of the solidification of sulphur, and on a new variety of sulphur. The crystallisation in octahedra takes from 25 to 100 times as long as the crystallisation in rhombic prisms. The new crystalline kind obtained by M. Gernez is in the form of very elongated prisms of a nacreous texture. They are produced by rubbing the side of the test-tube containing the surfused sulphur with the end of a platinum wire or glass rod. When these crystals are introduced into surfused sulphur, they determine a growth of similar crystals throughout the mass; and the formation is much more rapid than that of either of the previously known forms.—E. Mathieu, suspension of a liquid by a capillary vertical tube.—E. Mathieu, modification of the pressure of a liquid by capillary forces.

Rendiconti del R. Istituto Lombardo, Milan, January 24.—Biographical memoir of Emilio Cornalia (1824–1883), by Prof. Leopoldo Maggi.—Necrological notice of the late Camillo Hajech.—*Résumé* of the meteorological observations made at the Brera Observatory, Milan, during the year 1883, by E. Pini.—Some applications of Cournat's principle of least effort to the equilibrium of linked systems (theoretical mechanics), by Prof. G. Bardelli.—Meteorological observations made at the Brera Observatory during the month of January, 1884.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, March 13.—Prof. Henrici, F.R.S., president, and subsequently Mr. S. Roberts, F.R.S., vice-president, in the chair.—The Rev. A. C. E. Blomfield, Messrs. J. Chevallier, E. H. Hayes, R. S. Heath, and Prof. J. Larmor were elected Members.—Mr. Tucker read a paper by Prof. M. J. M. Hill on the closed funicular polygons belonging to a system of coplanar forces having a single resultant; and communicated a paper by Prof. J. Larmor, on the direct application of the principle of least action to dynamical analogues.—Mr. J. W. L. Glaisher, F.R.S., read a paper on the square of Euler's series.—Mr. J. J. Walker, F.R.S., communicated a note by Mr. J. Griffiths, further results from a theory of transformation of elliptic functions.—Mr. S. Roberts, F.R.S., read a note concerning the Pellian equation.

Physical Society, March 8.—Prof. Guthrie, president, in the chair.—Lord Rayleigh read a paper on the electro-chemical equivalent of silver. The determination was made by a method described to the last meeting of the British Association at Southampton, which consists in using two fixed coils and a movable coil suspended between these from one end of a balanced beam. These coils are in circuit with the current and voltameter. The current is reversed in the fixed coils at intervals of five minutes, and the weight required to bring the balance even is noted. The calculation of the effect by this method is independent of the precise measurement of the coils. Two or more silver voltameters were in circuit, nitrate of silver being the solution used. Careful precautions of various kinds were taken, and the result was that unit C.G.S. current deposits $1{\cdot}118 \times 10^{-2}$. It follows that 1 ampere will deposit 4·025 grm. of silver per hour.—Lord Rayleigh also read a paper on the absolute electromotive force of Clark's cell. Experiments made at the Cavendish Laboratory gave the electromotive force of this cell as 1·453 volts. The accepted value is 1·457 volts. If the B.A. unit (as Lord Rayleigh believes) is about ·9867 of a true ohm, the result, 1·453, becomes 1·434 volts.—Lord Rayleigh also mentioned that he had been making experiments on the rotation of the plane of polarised light in bisulphide of carbon, and obtained a result agreeing more nearly with Gordon's than with Becquerel's.—Profs. Guthrie and Ayrton spoke on the papers, the former eliciting the reply that electro-corrosion was less satisfactory than electro-deposition for determining the equivalent; and the latter that silver was better than copper for accurate results in the voltameter.—Mr. Shelford Bidwell, M.A., read a paper on some experiments illustrating an explanation of Hall's phenomenon. By these experiments Mr. Bidwell sought to explain Hall's effect through a combination of mechanical stress and the well-known Peltier effect on the thin metal plate which is placed between the poles of the magnet. He repeated many of the experiments, and showed how he had obtained the same results as Hall, except in the case of aluminium, which he found to be + like iron, whereas Hall made it −. Mr. Bidwell reversed the effect by cutting two slits in the strip of metal, thereby altering the stress on it. Righi's effect was also explained on the same grounds. Mr. Walter Browne said that difference in the quality of the aluminium might explain the anomaly with this metal. Prof. Perry criticised the explanation of the slitted plate, and Prof. G. C. Foster suggested that results in absolute measure should be obtained.

EDINBURGH

Royal Society, February 18.—Sheriff Forbes Irvine, vice-president, in the chair.—Prof. Tait read a paper on radiation, in which he called attention to Stewart's papers of 1858 as containing, so far as it has yet been developed, the theory of exchanges. Yet, in the most recent authoritative treatise on the subject, the name of Stewart is not even once mentioned. The basis of the whole theory is Carnot's principle, and therefore no demonstration can be considered absolutely rigorous. Thus it is probable that as there are very hot particles in a gas at ordinary temperatures, so there may be feeble radiation of high wave-lengths from a black body at ordinary temperatures.—Mr. Saug read a paper on the need for decimal subdivisions in astronomy, trigonometry, and navigation, in which he pointed out the inconvenience of the sexagesimal system, and estimated it as doubling the labour of calculation. The decimal division of the second, used throughout the *Nautical Almanac*, was appealed to as evidence of the need for a change. The paper was accompanied by a number of tables suited to the decimal division of the quadrant, or useful therefor.—Prof. Ewing communicated a paper by A. Tanakadaté on an electromagnetic declinometer.—Prof. Tait showed that when one polygon has its corners at the middle points of the sides of another, the condition that the first, second, or nth derived polygon shall be similar to the original, involves a singular equation in quaternion differences.—Prof. Tait also made some remarks on the basis of the theory of vortex atoms, pointing out that there is not necessarily any direct action between vortices in a perfect fluid; the present theory, which indicates such action, being based upon the assumed continuity of motion throughout the fluid.

PARIS

Academy of Sciences, March 10.—M. Rolland in the chair.—The election of M. G. Darboux was announced, as successor to the late M. Puiseux in the Section of Geometry.—On the forms presented by the nucleus of the Pons-Brooks comet on January 13 and 19 (one illustration), by M. Faye. The author rejects the explanation of these remarkable forms proposed by Bessel, who attributed to the nucleus a polarity like that of the magnetic forces. In virtue of this polarity the nucleus and ante-

rior nuclear emission are supposed to oscillate in presence of the sun like the needle of a compass in presence of a magnet. But M. Faye sees in these changes nothing but the effect of a rotatory motion powerfully affected by solar attraction. Under these conditions the rotation may acquire irregular pendulant vibrations without having recourse to the intervention of polar forces. —Explosive gaseous mixtures; calculation of their temperatures and specific heat at the moment of explosion (continued), by MM. Berthelot and Vieille. Tables of the results of these experiments are appended for the oxyhydric and oxycarbonic mixtures, for cyanogen, and the carburets of hydrogen.—Note on a letter of the astronomer Méchain in connection with the completion of the triangulation of Spain and the extension of the meridian to the Balearic Isles, by M. J. Lefort.—On a differential equation of the third order, by M. E. Goursat.—On the decomposition of polynomes which admit only of primary divisors of a determined form, by M. Lefébure.—On the remarkable variation of the nucleus of the Pons-Brooks comet (one illustration, by M. Ch. Trépied.—On the barometric oscillations produced by the Krakatoa eruption, by M. P. Tacchini.—On the crepuscular and auroral lights observed at Morges, in Switzerland, during the winter of 1883-84, by M. Ch. Dufour.—On a method for measuring the coefficient of cubic expansion of solid substances in the form of minute particles, by M. J. Thoulet. To determine the coefficients of these bodies the author employs a solution of iodide of mercury in iodide of potassium. The extreme delicacy of the process is shown by its application to quartz, which yields a coefficient of 0·0000357 compared with M. Fizeau's 0·00003619. —On the action of two consecutive parts of the same electric current, by M. A. Buguet.—On the spectrum of absorption of water; preliminary studies connected with the spectral analysis of the rays transmitted through a more or less dense layer of water, by MM. J. L. Soret and Ed. Sarasin.—Action of electric effluvia on oxygen and nitrogen in the presence of chlorine, by MM. P. Hautefeuille and J. Chappuis.—Observations on the formula of some sal ammoniacs, by M. R. Engel.—Observation relative to a note of M. Calmels on the poison of Batrachians, by MM. A. Gautier and Etard.—On the Malpighian vessels of the Lepidoptera, by M. Cholodkovsky.—On an aberrant form of the phylum Sporozoa, by M. J. Kunstler.—On the presence of manganese in the white cipoline marbles of Carrara, Paros, and the Pyrenees; geological deductions, by M. Dieulafait.

BERLIN

Physical Society, February 22.—Prof. Landolt produced a cylinder of solid carbonic acid he had prepared about an hour *before the sitting, and described the mode of its formation.* From a Natterer compressing vessel a stream of liquid carbonic acid was made to penetrate into a conical cloth bag. The bag speedily got filled with a loose snow of carbonic acid, which was then, by means of a stamper, hammered together in a cylindrical vessel into a solid cylinder. Compact carbonic acid cylinders of this kind could be touched gently with the hand, and possessed the hardness of chalk, which, too, they resembled in appearance, and on account of their brittleness did not readily admit of being cut with a knife. The specific gravity of solid hammered carbonic acid was found to be 1·2.—Prof. Schwalbe showed on a beech twig the ice-swellings he had described at the last sitting. These were produced in a moderately freezing mixture, their formation failing in a strongly freezing mixture. A twig which by way of experiment had been completely dried entirely lost the capability it previously possessed in a high degree of forming ice protuberances.—Prof. Erdmann related an observation he had made some time ago, and had since very frequently repeated. In a perfectly dark room he was able only by indirect vision to perceive an object which reflected light very faintly, while, on endeavouring to look at it fixedly, the object completely disappeared. This phenomenon he observed only in the evening in going to bed, after he had been working for a considerable time in a brightly illuminated room. On the other hand, when he awoke in the night he perceived the faintly lucent object quite as well by direct as by indirect vision. He was of opinion that this phenomenon was connected with the lassitude of the middle parts of the retina, while Prof. von Helmholtz explained it by the inferior sensitiveness to light of the yellow spot in comparison with its surroundings.—Dr. Kœnig reported at length the experiments which in common with Dr. Dietrici he had instituted with a view to determining the colour-sensitiveness of normal eyes. Exhibiting the apparatus he had made use of, Dr. Kœnig explained its construction and the procedure he had followed in the experiment. Towards one angle of a prism was directed an observing telescope, which, instead of an eye-piece, had a diaphragm provided with a slit, on which the spectrum fell, so that it was possible to observe sections of any degree of minuteness whatsoever. Towards each of the two other angles of the prism was placed a collimator, which in the focus of its lens had a slit for the entrance of the light, which was polarised by means of a Nicol prism. Behind the slit was a double refracting prism, by varying the position of which in the collimator the slit-image could be doubled at pleasure. Through the slit of the objective were seen close beside each other the spectrum of the light which had passed through one collimator, and the spectrum of light which had passed through the other. While one collimator was now kept fixed, the other, by means of micrometers, was displaced till the point was reached at which the observer found the colours in both spectra alike. The wave-lengths in both spectral stripes were then measured, and their difference was the standard of colour-sensitiveness in the single regions. For each wave-length fifty readings were in this way made by each of the two observers, and the mean difference calculated of the wave-lengths in the two spectral ranges, which were perceived to be equal. These experiments extended from the wave-length of 640 millionths of a millimetre to the wave-length of 430, and were made from each 10 millionths of a millimetre, each particular spot being examined under two different intensities of light. From the results of these measurements it was established that the colour-sensitiveness of normal eyes ranged from more than 1 to about 0·2 millionths of a millimetre. The difference of the D-lines in the solar spectrum amounted to 0·6 millionths of a millimetre. Altogether three maxima of sensitiveness were found. The first maximum appeared with the wave-length of 570 near the D-line. A second greater maximum approached the F-line with a wave-length of about 490 to 470. Finally, a third smaller maximum was found with a wave-length of 450 to 440. The place of the maximum changed with the intensity in such a manner that, the greater the intensity was, the more the maximum shifted towards the more refrangible part of the spectrum. Beyond the wave-lengths of 640 and 430 these experiments could not be carried out, because, at the red end especially, no differences of colour, but only differences of brightness, were perceived. From the colour sensibility thus found, it was calculated that within the range of the normal spectrum the healthy eye was able to perceive about 300 differences of colour. Dr. Kœnig hoped to be able to set forth on a future occasion further experiments in conjunction with the measurements here communicated, and the consequences resulting therefrom in respect of the theory of the perception of colour.

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