remains unchanged; thus, what is gained in remanent magnetism is lost in temporary.—Dr. Dibbit observes that ammonium-sulphate, ammonium-oxalate, and ammonium-acetate, in boiling solution, are partly decomposed, on addition of equivalent quantities of the chloride or the nitrate of potassium, sodium, or barium; that decomposition is greater, the greater the quantity of chloride or nitrate added; and that in all cases the solution contains, at 100°, four salts. From other experiments he infers that the presence of salts in ammonia solution increases the quantity of evaporated ammonia in relation to the evaporated water (even where the salts are such as enter into known combinations with ammonia), and this both at the ordinary and at the boiling temperature.—M. Holtz calls attention to the polar electric attraction of fine particles suspended in liquids when under the influence of electric currents. There is always, along with the movements of translations, an attachment to one pole or the other; very well seen with lycopodium powder in sulphuric ether. Some substances seem indifferent, neither wandering nor clinging to the poles, but if the bottom of the vessel be clean and free from air moisture, they form into beautiful, regular, characteristic figures. These may be had, *e.g.*, with finely-powdered manganese, or iron oxide, or sawdust, in petroleum, oil of turpentine, benzine, or sulphuric ether. The figures are rarely long stable; they show various internal movements, not essentially altering the character of the figure; and there is sometimes rotation.—M. Sohncke advances a new theory of crystalline structure, based on unlimited regular point systems; and Dr. Exner gives an account of his recent researches on galvanic expansion of metallic wires; which are noticed elsewhere in our columns.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, Jan. 15.—Dr. Mohn contributes an article to this number on the causes of the greater depressions of the barometer in winter than in summer. His present views on this subject are different from those given in his work on meteorology. He explains that in order that a barometric minimum may attain a great depth, the ascending current must develop itself with ease and rapidity. Therefore, besides high temperature and a large amount of vapour, the air supplying the ascending current must possess qualities unlike those of the surrounding atmospheric region, so that the ascended air may flow off easily at great heights. The easier barometric maxima can be formed, the easier the development of minima. In winter the strong continuous radiation over the Continent tends to create maxima; the cooling of the air over the sea is moderated by the quantity of vapour always present and by the ocean temperature, so that minima are formed. In summer opposite conditions prevail, but no nightly radiation comparable to that of the land in winter can occur, and thus only small depressions are observed. In a similar way the low pressure of the antarctic zone between lat. 70° and lat. 75° may be understood to be caused by the position of this region between two districts with high pressure, the one northwards about the tropic of Capricorn, the other the great Frozen Antarctic Continent. Between these two maxima lies an unbroken sea developing conditions favourable to the existence of minima.—The next paper is by Dr. G. Hellmann, on the daily period of rainfall at Zechen.

Journal de Physique, January.—The substances used in thermometers are generally such as are not in the neighbourhood of their change of state; but (as M. Duclaux here shows) by using liquids that are near critical periods, very sensitive instruments may be had. Thus, if we mix 10 c.c. of crystallisable acetic acid with 5, 10, 15 c.c. of benzine at about 20° we have, in each case, a homogeneous mixture; and in cooling the three liquids we come, with each, to a point at which it is troubled, and at length divides into two layers. The upper layer is found nearly always to contain one-third of acetic acid for two-thirds of benzine; while the lower contains two-thirds of acetic acid and one-third of benzine. There are few combinations of *two* liquids that show small variations so distinctly as this one (acetic acid and petroleum is another). But a good mixture may be had by taking 10 c.c. of amylic alcohol, 25 c.c. of alcohol at 50°, and adding enough water to produce a slight opalescence. The least fall of temperature divides the mixture into two layers of nearly equal volume. Such a mixture will serve to show, *e.g.*, the cold produced by solution of marine salt in water. By varying the quantity of water the mixture may be so made as to become troubled at any temperature desired; and so a series of minimum thermometers may be constructed. A little carmine may be used to make the changes more apparent.—M. Deprez, in this number, gives some useful directions on the construction of electro-magnetic registers; and M. Branly describes the electrometer he uses for measuring electromotive force, resistance, and polarisation.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, April 28.—Prof. Andrews, F.R.S., delivered a most interesting lecture on certain methods of chemical research (see p. 12).

Anthropological Institute, April 25.—Col. A. Lane-Fox, president, in the chair.—Dr. Comrie, R.N., exhibited his collection of weapons and articles of domestic use from New Guinea, and added several particulars to his previous remarks.—Mr. A. Tylor, F.G.S., read a paper on the origin of numerals. He held that inventive thought had always an object origin, and mentioned measures of length, as pace, foot, hand, &c., as having such a source. Also in the Ptolemaic hieroglyphics, a minute or second was shown by an eye-winking, answering to "the twinkling of an eye." Illustrations of the Abacus and mode of calculating by it were exhibited, and shown to be in principle the origin of the modern calculating machine. The dream of a universal language has been realised, as far as numerals and arithmetical figures are concerned, and this is due to their origin.—A paper by Mr. A. L. Lewis was read on some apparent coincidences of custom and belief in Chaldæa and other countries. He alluded, amongst other points, to the marks of finger-nails upon the terra-cotta deeds that had been discovered at Nineveh. They appeared to him to answer to the practice of touching the seals of legal documents with the finger. As regards the belief of the Assyrians in immortality, souls were either united with the sun, or descended to "Bit-Edie." Annwn, the country of the dead, in like manner amongst the Kymry was situated in the lower regions, at the going down of the sun in the west. The children of Anu, or the Sky, in Assyria, may be compared with "Cum Annwn," spirits, believed in by the Kymry. Amongst the Assyrian gods, Hed answered to the Lycian deity "Hu." Civilisation appeared to originate with the Turanians, the Semitic race merely succeeding to it.—The President, Mr. A. Smee, Mr. Distant, and others, took part in the discussion.

Physical Society, April 29.—Prof. Gladstone, vice-president, in the chair.—The following gentlemen were elected members of the Society: Prof. F. Fuller and Capt. E. H. White.—The Secretary read a communication from Sir John Conroy, Bart., on a simple form of heliostat. The defect of Fahrenheit's heliostat, in which the beam of sunlight is deflected by a mirror moved by clock-work in a direction parallel to the axis of the earth, and then in the required direction by a fixed mirror, consists in the great loss of light. The author substitutes two silvered mirrors for the looking-glasses usually employed, and he has shown that the loss of light with this arrangement is less than when the light is once reflected from a looking-glass.—Mr. S. P. Thompson then made a second communication on the so-called "Etheric Force," and described some experiments which he has recently made in the Physical Laboratory at South Kensington on the subject. The name was given by Mr. Edison, the inventor of the motograph, to the sparks obtained when a conductor is presented to the core of an electro-magnet, the coils of which are traversed by an intermittent current. The results of the experiments conducted as originally described not proving satisfactory, various other arrangements were tried, and it was found that if the secondary current from an induction coil be used, instead of a current direct from the battery, the effects are much more marked. When the induced spark was diverted either wholly or partially into a short coil which was insulated very perfectly from the core inside, a spark about half an inch in length, which had a decided effect on the nerves could be drawn off from the core, and this was sufficient to illuminate a small vacuum tube; the spark, however, does not exhibit the usual signs of polarity. It was shown by observing the illumination thus produced with a rotating mirror, that the discharge is in reality a reciprocating one, each spark returning on its path after a minute interval of time. Under certain conditions it is also possible to charge an electroscope either positively or negatively by means of the spark, and Mr. Thompson has shown that the spark ignites a jet of gas but fails to deflagrate metallic wire or ignite gunpowder. From the above, and other

experiments which will be exhibited on a future occasion, the author concludes that the cause of the phenomena is obvious, and that the hypothesis of a new force is unnecessary.—Prof. McLeod referred to a paper on the same subject which appeared in the *Chemical News* of April 28, by Messrs. Houston and Thomson.—Mr. David Ross, B.A., inquired the tension of the Leyden jar arrangement used in the experiments, but Mr. Thompson pointed out that it would be very difficult of determination on account of the rapid change of the spark from positive to negative.

MANCHESTER

Literary and Philosophical Society, Jan. 25.—Mr. E. W. Binney, F.R.S., vice-president, in the chair.—On stannic arsenate, by Mr. William Carleton Williams, F.C.S., Demonstrator in the Chemical Laboratory of the Owens College.

Feb. 8.—Ordinary meeting.—Mr. Edward Schunck, F.R.S., president, in the chair.—Prof. C. Schorlemmer, F.R.S., read a communication from Prof. Sadtler, of the University of Pennsylvania, on some of the natural gases from the gas wells in Butler County, Pennsylvania, in the midst of the oil region.—Notice of a recent discovery of a prehistoric burial place near Colombier, in Switzerland, by Mr. William E. A. Axon, M.R.S.L.—Mr. Brockbank, F.G.S., exhibited a large collection of granites from the Ravenglass district, and from Criffel, which he had got together with a view to proving the origin of the large granite boulders recently found in the Glacial clay or till of this district.—On the formation of azurite from malachite, by Mr. Charles A. Burghardt, Ph.D.—On a direct-vision spectroscope of great dispersive power, by Mr. Arthur Schuster. This instrument is made by Mr. A. Hilger, of London. The following are its chief advantages:—1. The compound prism has a very great dispersive power. The nickel line between the two sodium lines is easily seen in the solar spectrum. 2. The cross wire is replaced by a very fine slit which can be illuminated from above to any degree of intensity. 3. The slit is moveable by means of a very fine micrometer screw; the position of the slit can be read off to within 0·0001 inch. The measurement is made by bringing the line to be measured against the bright slit which comes down from the top to the middle of the field. The position of the lines can be easily measured to within the fifth part of the distance between the sodium lines.—On a new absorptiometer, by Mr. Arthur Schuster. In some recent researches Prof. Vogel found that the relative intensity of the red and blue part of the solar spectrum was subject to great changes. While working with the spectroscope at considerable heights on the southern slope of the Western Himalayas, I was struck by the same fact. The instrument which I have now the honour to exhibit before the Society is constructed in order to measure the relative intensity of the red and blue light in the solar or any other spectrum, by comparing the intensity of each ray with that given out by a standard lamp. The photometric principle involved in the measurement is that first used by Prof. Zöllner. The intensity of a certain part of the spectrum is brought to the same intensity as that of the standard light by a system of Nicol's prisms. Prof. Zöllner only compared the whole intensity of two sources of light and did not investigate the relative intensity of the different colours. Mr. D. Glau constructed another apparatus by which he could measure the relative intensity of different colours, but his instrument was constructed for an entirely different object, and is not suitable for the purpose for which the present instrument is made. The instrument, which I have called absorptiometer, because it is intended chiefly for the determination of the absorption of light taking place in our atmosphere, consists of a table similar to that of a goniometer table, but being able to turn round on a horizontal axis so as to give it any inclination to a horizontal surface. The telescope of the goniometer is replaced by a direct-vision spectroscope. Opposite the spectroscope a tube is fixed to the table containing two Nicol's prisms. One of the prisms is fixed, the other can be turned, and its azimuth read off on a graduated circle. The standard light is placed behind its tube. The intensity of the light falling unto the slit of the spectroscope is $\frac{A}{2} \sin \alpha$, where α is the angle between two of the principal planes of the two Nicol prisms, and A the intensity of the light which would fall into the slit of the spectroscope if the Nicol's were removed. A plane parallel piece of glass, acting as a mirror, is fixed unto the small table, the centre of which coincides with the centre of the large goniometer table. The parallel sides can be adjusted by means of three screws until they are vertical. This mirror reaches to such a height that the horizontal plane laid through the top of the plate would bisect the tube containing the two Nicols. The light which is to be examined falls through a tube containing one Nicol, and is reflected by means of the plane parallel mirror into the lower half of the spectroscope. If the ray of light is reflected at the angle of polarisation the intensity of this light can be reduced to nothing by means of the rotation of the Nicol. On placing the standard light in front of the tube containing the two Nicols and allowing the light which is to be examined to be reflected into the spectroscope on the mirror through the tube containing one Nicol, the mirror being placed at the angle of polarisation, we observe in the spectroscope the two spectra one above the other, and by turning the Nicols we can reduce the intensity of the brighter light to that of the weaker for any colour we like. The positions of the Nicols will enable us to find the relative intensity of the two lights for the different colours.

PARIS

Academy of Sciences, April 17.—Vice-Admiral Paris in the chair.—The following papers were read:—New researches on pyrogenous carburets and on the composition of coal gas, by M. Berthelot. Benzine is the most abundant carburet, after formène, in Parisian gas; it is about 3 per cent. of the volume, and is, *par excellence*, the illuminating carburet.—On the direction of trees thrown down by tornados or trombes, by M. Faye. An observer in the central trajectory of the meteor (which turns from right to left in our hemisphere), and looking in the direction of the motion of translation, will distinguish, in the ravaged band, a right and a left region, and in the trombe an anterior and a posterior half. Then, in the right region, the trombe can throw down well rooted trees by the mere attack of its anterior part, but in the left region it overthrows them by the successive actions of its anterior and its posterior parts. The effects of a cyclone or tornado at sea are analogous.—On the carpellary theory according to the Amaryllideæ (second part, *Clivia nobilis*), by M. Trécul.—Memoir on the existence, the optic and crystallographic properties, and the chemical composition of *microcline*, a new species of triclinic felspar with base of potassium, by M. Des Cloizeaux.—Observations made at the Observatory of Toulouse with the large Foucault telescope, by M. Tisserand. It has been in use since the beginning of February; the observations described are on the nebula of Orion and on the satellites of Uranus and Jupiter.—Researches on M. Winnerl's compensating balance for chronometers, by M. Caspari.—Conclusions from actinometric measurements made on the summit of Mont Blanc, by M. Violle. He obtains, for the effective temperature of the sun, the value of about 1,500° C., which gives, for the probable mean temperature of the surface, a number between 2,000° and 3,000°.—New researches on the effects of powder in arms, by M. Sarrau. He constructs new formulæ for the velocities and pressures, and deduces the laws according to which these quantities depend not only on the conditions of charging, but on the nature of the powder and the form of the grains.—On the ozone of atmospheric air, by M. Marié-Davy. Comparison by means of ozonoscopic papers are very uncertain. The author sought to associate the rapidity of action of iodide of potassium with the stability of arsenical action; mixing pure iodide with equally neutral and pure arsenite of potash. From observations at Montsouris, March 15 to 31, it appears that the average proportion of ozone in the air by night was 0·76 mg. (per 100 cubic metres), and thus considerably less than that by day, viz., 1·13 mg. The volume of air operated on each time varied from 2 to 3 cubic metres.—The elephants of Mont Dol; attempt at organogeny of the system of molar teeth of the mammoth (third communication), by M. Sirodot.—Note on the discovery of a human station, of the epoch of polished stone, near Belfort, by M. Ch. Grad.—Elements of the new planet Una, by M. Peters.—Elements and ephemerides of the planet (148) Gallia, by M. Bossert.—Generalisation of the theorem of Lamé on the impossibility of the equation $x^7 + y^7 + z^7 = 0$, by M. Genocchi.—Note on the foci of a plane curve, by MM. Gibert and Niewenglowski.—Researches on the elasticity of the air under small pressures, by M. Amagat. Under small pressure air still follows Mariotte's law. The opposite has been asserted by MM. Mendeleeff and Kirpitschoff, and that the departure from the law is in the same direction as that of hydrogen.—On the nerve terminations in the electric apparatus of the torpedo, by M. Rouget.—Undulations of the chalk in the north of France. Part III. Age of the undulations; by M. Hébert.—Daubrée (oxychloride of bismuth), a new mineral species, by M. Domeyko.—On chronic caseous

amygdalitis, by M. Bouchut.—M. Chapelas gave a *résumé* of observations of falling stars during March 1876.

April 24.—M. Peligot in the chair.—The following papers were read:—Discovery of two new planets, 162 and 163; note by M. Leverrier.—On coal-gas and pyrogenous carburets, by M. Berthelot.—On the pyrogenous decomposition of nitrate of ammonia, and on the volatility of ammoniacal salts, by M. Berthelot.—Reply to a part of the criticisms of M. Hildebrandsson (in letter of March 20), by M. Faye.—On the vegetation of plants without chlorophyll, by M. Boussingault. The author affirms that if solar radiation ceased, plants without chlorophyll, as well as plants with it, would disappear from the globe. M. Pasteur asserts that some lower plant forms might continue.—Researches on sugar beet (second year of experimentation), by MM. Fremy and Deherain. Similar saline solutions act quite differently on the roots, according as the latter are immersed in them, or in porous substances impregnated with them. An excess of nitrogenised manure diminishes the saccharine richness of all beets, but those of excellent race retain so much sugar that their cultivation is advantageous.—Experiments made to explain the round alveoli very frequently presented by the surface of meteorites, by M. Daubrée. These bodies, entering the air with high velocity, become incandescent and superficially fused. The part which, at a given moment, is in front, accumulates and compresses the air strongly, so that this is thrown into gyration, and bores a cavity. The mechanical action is generally accompanied by chemical action.—Note on cellular grainage for preparation of the grains of silkworms, by M. Pasteur.—On the triturators and crushers of the Anduze system, by M. Resal.—On the means of substitution of vines in countries where they have been destroyed by phylloxera, by M. Marés. He recommends the wider separation of the stocks.—M. de Baer was elected Foreign Associate in room of Sir Charles Wheatstone. The other candidates were Sir W. Thomson, M. Bunsen, and Mr. Stokes.—Note on an operation of gastrotomy performed in order to extract a solid body (fork) from the stomach, by M. Labbé. The young man (eighteen) retained the fork in his stomach for more than six months, suffering, at intervals, extreme pain. M. Labbé first tried caustics (for extraction), but at length resorted to the knife. He attributes his success (1) to carefully determining the points of operation; (2) fixing the stomach against the abdominal walls before opening it; (3) using a thick layer of collodion, which rendered motionless the abdominal walls and the digestive tube, producing strong compression. In about five days the man was almost in his normal health again.—On the exchanges of ammonia between natural waters and the atmosphere, by M. Schlœsing. Having previously studied the exchanges in rain, dew, fog, he here deals with snow and hoarfrost. The aqueous vapour and ammonia of the air, after having probably a common origin, the sea, are precipitated together, but in very different proportions, as the air is cooled to zero. Under zero the association is broken; water alone continues to be precipitated, and the ammonia remains in the atmosphere, which is then never entirely without it.—On various compounds of titanium, by MM. Friedel and Guérin.—On electric variations of the muscles, and the heart in particular, studied by means of Lippmann's electrometer, by M. Marey. The phases of electric variation of a muscle are similar to those of the work which it furnishes.—On electrical fuses, by M. Ris. He conceived the idea of rendering induction fuses conductive by incorporating with the detonating mixture (having a chlorate of potash base) a small quantity of pulverised spongy platinum. Such fuses are inflammable either by induction currents or by battery currents, and they can be tried without alteration of the elements composing them. If the quantity of platinum be small the resistance of the fuse is considerable, and may reach 50,000 ohms. By increasing the platinum, the fuse is brought towards the condition of those appropriated to currents of quantity.—Fauna and flora of the peat bogs of Champagne, by M. Fliche.—Note on a new process of titration of astringent matters, by M. Jean. Solutions of various astringent principles, with a carbonated alkali added, absorb a solution of iodine with an energy comparable to that of arsenite of soda. This absorption is in direct ratio of the quantity of astringent matter used, and one part by weight of dry tannic acid absorbs four parts of iodine. This is the principle of the method.—Hatching of the winter egg of phylloxera in the Gironde; characters of the insect, by M. Boiteau.—On the chemico-legal investigation of arsenic, by M. Brame.—On the temperature of ebullition of spirituous liquids by M. Salleron. Salts and solid substances dissolved (sugars, tartrates, gums, &c.) falsify considerably the indications of the ebullioscope.—General theorem on the symmetric functions of any number of variables, by M. Jung.—On the cyanide-cyanate of chloral, by M. Cech.—Sulphur in coal-gas, by M. Verigo. The gas in Odessa, he found, contained about 2 grammes of sulphur per 100 English cubic feet. He notes some of its effects, *e.g.*, a metallic part of a ball-shaped lamp, exposed some time in a gas-lit warehouse, had its surface corroded and covered with a greenish substance. The solution, from washing with distilled water, contained sulphuric acid, and gave, on evaporation, crystals of sulphate of zinc. The metallic alloy of the ball consisted of copper and zinc.—On the fructification of some silicified plants, from the beds of Autun and Saint Étienne, by M. Rénault.—New meteorological researches on the circulation of the lower layers of the atmosphere in the North Atlantic, by M. Brault.—In studying the map of the North Atlantic for July to September, one perceives four chief meteorological points that are, in some part, the keys of the situation. These are, on the one hand, the Gulf of Mexico and the Sahara; on the other, the Azores and the maximum region of calms. The two former are the more important, and they are points of convergence of winds. About the Azores turns an immense cyclone.—Process for taking impressions of plants, by M. Bertol.—Geological and anthropological note on Mount Vaudois and the Cravanche Cavern, by M. Voulot.—Experimental researches on pulmonary respiration in the large domestic mammalia, by M. Sanson. Equidæ eliminate more CO_2 per unit of time than Bovidæ, races of less weight more than those of great, males more than females, young more than old. Alimentation does not affect the respiratory function once it is sufficient to maintain the healthy state; nor does muscular work, after it is done. The quantity of CO_2 eliminated is directly proportional to rise of temperature, and inversely proportional to rise of pressure.

GÖTTINGEN

Royal Academy of Sciences, January 8.—The following, among other, papers, were read:—On the organs of vegetation of the Marattiaceæ, by Dr. Holle. By the bilateral arrangement of the vascular bundles Marattia and Argiopteris diverge from the typical ferns, and agree with Ophioglossæ and Osmundaceæ.—A new microscopical drawing apparatus, by Dr. Holle. The principle of this is to bring into view not the pencil itself or its reflected image, but the entire image thrown by lenses. The eyepiece of the microscope serves also as eyepiece of a telescope bent twice at right angles and having two mirrors. The first (transparent) is immediately under the eyepiece, the second under the object-glass of the telescope. The former is very thin (0·2 mm.) that the images of the drawing pencil, cast by the upper and under sides of the glass plate, may fall on each other. The other mirror is thicker; and between the two is a lens which again reverses the reversed image of the pencil. The microscopic image can thus be seen directly and without fatigue of the eyes. The drawing hand is immediately to the right, and so in the most convenient position. The image is unreversed.—Development of formulæ for Abel's theorem, by M. Goran Dillner.—Some remarks on the representation of mountain deities in classic art, by M. Wieseler.

CONTENTS