careful analysis of the contents is prefixed to the memoir. Dr. F. N. Cole (pp. 378–388) discusses the simple groups from order 201 to order 500, and arrives at the conclusion that "the possible orders of simple groups of compound order between 201 and 500 are reduced to 360 and 432." The volume closes with a note (p. 389) by M. M. D'Ocagne, correcting a slight mistake in a memoir by him in the 1888 volume, entitled "Sur certaines courbes," and the title page and index.

SOCIETIES AND ACADEMIES.

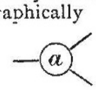
LONDON.

Royal Society, February 2.—"On a Meteoric Stone found at Makariwa, near Invercargill, New Zealand." By G. H. F. Ulrich, Professor of Mining and Mineralogy in the University of Dunedin, N.Z. Communicated by Prof. J. W. Judd, F.R.S.

The specimen described in this memoir was found in the year 1879 in a bed of clay, which was cut through in making a railway at Invercargill, near the southern end of the Middle Island of New Zealand. Originally, this meteorite appears to have been about the size of a man's fist, and to have weighed four or five pounds, but it was broken up, and only a few small fragments have been preserved. The stone evidently consisted originally of an intimate admixture of metallic matter (nickel-iron) and of stony material, but much of the metallic portion has undergone oxidation. Microscopic examination of thin sections shows that the stony portion, which is beautifully chondritic in structure, contains olivine, enstatite, a glass, and probably also magnetite; and through these stony materials the nickel-iron and troilite are distributed. The specific gravity of portions of the stone was found to vary between 3·31 and 3·54, owing to the unequal distribution of the metallic particles. A partial chemical examination of this meteorite was made by the author and Mr. James Allen, but the complete analysis has been undertaken by Mr. L. Fletcher, F.R.S., of the British Museum. The analysis, which when finished will be communicated to this Society, has gone so far as to show that the percentage mineral composition of the Makariwa meteorite may be expressed approximately by the following numbers: nickel-iron 1, oxides of nickel and iron 10, troilite 6, enstatite 39, olivine 44.

Physical Society, January 27.—Walter Baily, Vice-President, in the chair.—Prof. S. P. Thompson, F.R.S., made a communication on Japanese magic mirrors, and exhibited numerous specimens showing the magic properties. Referring to the theory of the subject, he said the one now generally accepted was that proved by Profs. Ayrton and Perry in 1878, who showed that the patterns seen on the screen were due to differences in curvature of the surface. The experiments he now brought forward fully confirmed their views. Brewster had maintained that the effects were due to differences of texture in the surfaces causing differences in absorption or polarisation, but the fact that the character of the reflected image depended on the convergency or divergency of the light, and on the position of the screen, showed this view to be untenable. Another proof of the differing curvature theory was then given by covering a Japanese mirror with a card having a small hole in it. On moving the card about, the disc of light reflected from the exposed portion varied in size, showing that the curvatures of portions of the surfaces were not the same. The same fact was proved by a small spherometer, and also by reflecting the light passing through a coarse grating from the mirror, the lines being shown distorted. To put the matter to a test demanded by Brewster, he had a cast taken from a mirror by his assistant, Mr. Rousseau; this had been metallised, silvered, and polished, and now gave unmistakable evidence of the pattern reflected from the original. The true explanation of how the inequalities of curvature were brought about during manufacture had also been given by Profs. Ayrton and Perry, but there were some questions of detail on which difference of opinion might exist. The late Prof. Govi had noticed that warming a mirror altered its possibilities. A thick mirror which gave no pattern whilst cold developed one on being heated, was shown to the meeting. Prof. Thompson also showed that a glass mirror having a pattern cut on the back developed magic properties when the mirror was bent. When made convex the reflected pattern was dark on a light ground, and when made concave, light on a dark ground. Warming ordinary mirror-glass by a heater whose surface was cut to a pattern gave similar effects. Very thick glasses could be affected in this way. On passing a spirit lamp behind a strip of mirror, a dark band could be caused to pass along the screen illuminated by light reflected from the mirror. By writing on lead foil and pressing the foil against a glass mirror by a heater, the writing was caused to appear on the screen. Prof. Thompson had also found that Japanese mirrors which are not "magic" when imported, could be made so by bending them mechanically so as to make them more convex. In conclusion, he showed a large mirror 15″ × 11″, the reflection from which showed the prominent parts of the pattern on its back with the exception of two conspicuous knobs; these knobs gave no indication of their existence. Prof. Ayrton said the simple mechanical production of the magic property described by Prof. Thompson led him to think that some experiments on "seeing by electricity" by the aid of selenium cells which Prof. Perry and himself made some years ago, might lead to some result if repeated with thinner reflectors. Speaking of the effect of scratching the back of a Japanese mirror, he pointed out that if metal be removed by pressure a bright image was seen, whilst if removed chemically a dark image resulted. Since the original paper on the subject was written he had been led to modify his views as to the effect of amalgamation, for some time ago he showed the society how brass bars were bent if one edge be amalgamated, thus proving that enormous forces were developed. He now regarded amalgamation as an important part of the manufacture. Mr. Trotter inquired if it had been proved that there was no difference in the metal in the thick and thin parts? One would expect the thin parts to be harder and polished away less. After some remarks by Mr. J. W. Kearton and Major Rawson, Prof. Thompson said the magic effects produced by heating the back of a glass mirror remained for a short time after the heater was removed. The question of whether differences in hardness of the thick and thin parts of a mirror were of consequence in the production of the magic property had been tested by using sheets of brass thickened by pieces soldered to the back as mirrors, and found to be unimportant. Prof. Ayrton also described an experiment pointing to the same conclusion.—Mr. W. F. Stanley read a paper on the functions of the retina—(i.) The Perception of Colour. Referring to Young's three-nerve theory of colour-sensation, the author said Prof. Rutherford had pointed out that there was no necessity to assume that different nerves conveyed different colour-sensations, for as a telephone wire would transmit almost an infinite variety of sound vibrations, so the nerves of the retina were probably equally capable of conveying all kinds of light vibrations. Prof. Rutherford had further pointed out that the image of a star could not possibly cover three nerve-terminals at once, and therefore could not be seen as white if Young's theory was correct. The author then described Helmholtz's experiments with a small hole in a screen illuminated by spectrum colours. For red illumination the greatest distance at which the hole could be seen sharply defined was 8 feet, and for violet 1½ feet. When the hole was covered with purple glass, or with red and violet glasses superposed, and a bright light placed behind, the eye, when accommodated for red light, saw a red spot with a violet halo round it, and when focussed for violet light, saw a violet spot with circle of red. These experiments the author thinks show that the chromatic sense in distinct vision under critical conditions (*i.e.* where a single nerve or a small group of nerves is concerned) depends on the colours being brought to foci at different distances behind the crystalline lens. He also infers that the same focal position in the eye cannot convey simultaneously the compound impression of widely separated colours. Helmholtz's observations are further examined in the paper, and a series of zoetrope and colour disc experiments described which tend to show that the eye cannot follow rapid changes of colour. Changes from red to violet could be followed much more quickly than from violet to red. The red impressions were, however, more permanent. The observed effects were found to depend on the intensity of the light, and also on the distance of the eye from the coloured surface. Summing up his observations, the author infers that by systems of accommodation of the eye, the colours of the spectrum are brought to focus on special parts or points of the rods or cones of the retina, such focal points being equivalent, by equal depths or distances from the crystalline lens, to a focal plane formed across the whole series of nerve-terminals. That all the rays of light from an object, or part of an object, of very small area and of any spectrum colour, will converge to a point upon a nerve terminal, and that this terminal will be most excited by the light. At the end of the paper Dr. Stanley Hall's views of nerve structure are examined. Captain Abney thought the results of the zoetrope experiments were what one would have expected when pigmentary colours were used. To be conclusive, such experiments must be conducted with pure spectrum colours. The statement about the size of star images being less than that of a nerve terminal would probably need revision. Speaking of colour vision, he said the modern view was to regard light as producing chemical action in the retina, which action gave rise to the sensation of colour. On the author's theory he could not see how colour-blindness could be explained. Mr. Trotter said he understood Helmholtz to have proved that nerves could distinguish quantity, but not the quality of a stimulus. Since the speed at which stimuli travelled to the brain was about 30 metres a second, the wave length of a light vibration, if transmitted in this way, would be very small. Taking Lord Kelvin's estimate of the minimum size of molecules of matter, it followed that there must be many wave lengths in the length of a single molecule. This, he thought, hardly seemed possible. Mr. Lovibond pointed out that the observations referred to by the author could be equally well explained on the supposition that six colour sensations existed. The confusion of colours he had mentioned arose from lack of light. Mr. Stanley replied to some of the points raised by Captain Abney. In proposing a vote of thanks to Mr. Stanley, the chairman said it had been shown that light could be resolved into three sensations, but it was not known how this resolution occurred. Prof. S. P. Thompson said the gist of Mr. Stanley's paper seemed to be that lights of different colours were concentrated at points situated at different depths in the retina, the violet falling on the part nearest the crystalline lens, and the red furthest away. Another view of the action was that the different sensations might be due to the vibrations of longer wave length having to travel greater distances along the nerve terminals before they were completely absorbed.

Mathematical Society, January 12.—Mr. A. B. Kempe, F.R.S., President, in the chair.—The President (Prof. Elliott, F.R.S., Vice-President, in the chair) read a paper on the application of Clifford's graphs to ordinary binary quantics (second part). In the first part it was pointed out that by some small modifications and a recognition of the fact that the covariants of $f(x, y)$ are invariants of the two quantics $f(X, Y)$ and $(Xy-Yx)$, the theory of graphs, which had been left in an unfinished state by the late Prof. Clifford, furnished a complete method of graphically representing the invariants (and therefore the covariants) of binary quantics. The method as modified depends essentially on the fact that any invariant, when multiplied by a suitable number of polar elements U, U′, V, V′, &c., can be expressed as a "pure compound form" (or sum of two or more such forms), the product of a number of "simple forms." Each of the latter has a "mark," viz. one of the letters $a, b, c, \ldots\ldots$ and has also a certain valence, 0, 1, 2, 3, &c. and these being given it is fully defined, *e.g.*, the simple form of mark a and valence 3 is graphically



having three radiating bonds, and is algebraically

$$a_0\,UVW + a_1\,(U'VW + UV'W + UVW') + a_2\,(UV'W' + U'VW' + U'V'W) + a_3\,U'V'W',$$

the pairs of polar elements U, U′; V, V′; and W, W′, corresponding to the three bonds of the graphical representation. A pure compound form is graphically represented by a number of simple forms having their bonds connected so that there are no free ends. If in the algebraical expression of a compound form two simple forms both contain the pair of polar elements U, U′, there will be a bond connecting their graphical representations; if the two simple forms both contain two pairs of such elements, viz. U, U′ and V, V′, there will be two bonds connecting their graphical representations and so on; if they contain no common pair their graphical representations will have bond connecting them. A pair of polar elements will appear in two simple forms only, so that each bond in the graphical representation of a compound form corresponds to a distinct pair of polar elements. If the algebraical expression corresponding to a graph be multiplied out, it will be found to consist of two distinct factors, viz.:—(1) the product of all the polar elements, and (2) a function of the letters $a_0, a_1, a_2 \ldots\ldots$; $b_0, b_1, b_2, \ldots\ldots$; &c., &c.; corresponding to the marks $a, b, \ldots\ldots$&c. of the simple forms contained in the compound form represented by the graph, the latter factor being an invariant of the quantics

$$(a_0, a_1, a_2, \ldots\ldots\ldots a_\alpha)(x, y)^\alpha$$
$$(b_0, b_1, b_2, \ldots\ldots\ldots b_\beta)(x, y)^\beta$$
&c., &c.

where α is the valence of the simple forms of mark a, which are here supposed to be all of the same valence, and similarly in the case of β, γ, &c.

In this second part a method of algebraically representing invariants is considered, which is directly derivable from the method of the first part, and was suggested by the graphs; but differs essentially from the earlier method in that it is independent of the use of polar elements. It shows, moreover, that the graphs may be regarded as absolutely equivalent to the invariants they represent, in lieu of being equivalent to those invariants multiplied by a number of polar elements. This second method deals in the first instance with "primary" invariants, *i.e.* invariants of two or more quantics linear in the coefficients of each. If these quantics are

$$(a_0, a_1, a_2, \ldots\ldots\ldots a_\alpha)(x, y)^\alpha$$
$$(b_0, b_1, b_2, \ldots\ldots\ldots b_\beta)(x, y)^\beta$$
&c., &c.,

and we take

$$a = a_1\frac{d}{da_0} + a_2\frac{d}{da_1} + a_3\frac{d}{da_2} + \text{\&c. } \textit{ad infinitum,}$$
$$b = b_1\frac{d}{db_0} + b_2\frac{d}{db_1} + b_3\frac{d}{db_2} + \text{\&c. } \textit{ad infinitum.}$$
&c., &c.

we may express any primary invariant by an expression, or the sum of two or more expressions, consisting of the product of differences of the operators $a, b, \ldots\ldots$ operating upon the product of the corresponding leading terms, a_0, b_0, &c. Thus

$$(a-b)^2 a_0 b_0 \equiv a_2 b_0 - 2a_1 b_1 + a_0 b_2$$

is an invariant of the two quantics

$$a_0 x^2 + 2a_1 xy + a_2 y^2,$$
$$b_0 x^2 + 2b_1 xy + b_2 y^2,$$

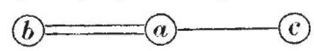
linear in the coefficients of each; and

$$(a-b)^2(a-c)a_0b_0c_0 \equiv a_3b_0c_0 - a_2b_0c_1 - 2a_2b_1c_0 + 2a_1b_1c_1 + a_1b_2c_0 - a_0b_2c_1$$

is a similar invariant of the three quantics

$$a_0x^3 + 3a_1x^2y + 3a_2xy^2 + a_3v_1^3$$
$$b_0x^2 + 2b_1xy + b_2y^2$$
$$c_0x + c_1y.$$

These two invariants are graphically represented by

 and 

respectively, where the relation between the algebraical and graphical expressions is obvious, viz. to every letter p in the algebraical representation there corresponds a nucleus including the mark p, and to every factor $(p-q)$ in the algebraical representation there corresponds a bond connecting the nuclei of marks p and q.

We can pass to invariants of higher degrees in the coefficients of the various quantics by substituting like coefficients for unlike. Thus, if we make $b_0 = a_0$, $b_1 = a_1$, $b_2 = a_2$, the primary invariant

$$a_2b_0 - 2a_1b_1 + a_0b_2$$

becomes the invariant of degree 2

$$2(a_0a_2 - a_1^2)$$

of the single quantic

$$a_0x^2 + 2a_1xy + a_2v^2.$$

This invariant will be graphically represented by substituting the mark a for the mark b in the graph representing the corresponding primary invariant.

If we proceed to deal in the same way with the invariant,

$$a_3b_0c_0 - a_2b_0c_1 - 2a_2b_1c_0 + 2a_1b_1c_1 + a_1b_2c_0 - a_0b_2c_1,$$

we get, as the invariant represented by substituting for the marks b and c the mark a, the expression of the third degree,

$$a_3a_0^2 - 3a_2a_1a_0 + 2a_1^3.$$

This is not an invariant of a single quantic, but of the three

$$a_0x^3 + 3a_1x^2y + 3a_2xy^2 + a_3y^3$$
$$a_0x^2 + 2a_1xy + a_2y^2$$
$$a_0x + a_1y.$$

It bears, however, a definite relation to the first of these three quantics, viz.: it is a *seminvariant* of that quantic, being in fact the source of its cubic-covariant J. The paper points out that all seminvariants are thus invariants of two or more quantics, and can therefore be represented by graphs; the difference between a graph representing an invariant of a quantic and one representing a seminvariant of the same quantic consisting merely in this, that the simple forms, *i.e.* the small circles or nuclei of the graphs in the former case are all of the same "valence," *i.e.* have the same number of bonds, while in the latter, though of like marks, they differ in valence. The classification of seminvariants, according to the valences of the simple forms composing them, or, in other words, according to the orders of the quantics of the systems of which they are respectively invariants, obviously throws considerable light upon their structure.

The paper also deals with the breaking up of graphs into simpler ones; and gives a theorem upon the subject which leads to some interesting results. It points out, moreover, how the graphs representing the sources of covariants can be instantaneously derived from those representing the covariants themselves.

On the evaluation of a certain surface-integral and its application to the expansion of the potential of ellipsoids in series, Dr. Hobson.

On the vibrations of an elastic circular ring, by Mr. A. E. H. Love.—The ring is supposed to be of small circular section of radius c, and the elastic central-line a circle of radius a. There are four ways of displacing the ring. A point on the central-line may move along the radius of the circle which is its primitive form, or perpendicular to the plane of this circle, or along the tangent to this circle; and the circular sections may be displaced by rotation about the central-line. The modes of vibration fall into four classes, of which two are physically important:—Class I. Flexural vibrations in plane of ring.—These were investigated by Hoppe in 1871 (*Crelle*, bd. lxxiii.). The motion of a point on the elastic central-line is compounded of a displacement in and out along the radius and a displacement along the tangent to the circle, so proportioned that the central-line remains unstretched, and the nodes of the former displacement are the antinodes of the latter. There must be at least two wave-lengths to the circumference, and the frequency ($p/2\pi$) of the mode in which there are n wave-lengths to the circumference is given by the equation

$$p^2 = \frac{1}{4}\frac{n^2(n^2-1)^2}{n^2+1}\frac{E}{\rho_0}\frac{c^2}{a^4}$$

in which E is the Young's modulus, and ρ_0 the density of the material. Except for the numerical coefficient this is precisely similar to the formula for the lateral vibrations of a straight bar of the same material and section and of length πa (for which the fundamental tone has the same wave-lengths). The sequence of component tones when n is very great is ultimately identical with that of the tones of a free-free bar of length πa, but the sequence for the low tones is quite different to that for a bar. Class II. Flexural vibrations perpendicular to the plane of the ring.—It is found to be impossible to make the ring vibrate freely so that each particle of the elastic central-line moves perpendicular to the plane of the ring, unless at the same time the sections turn about the central-line through a certain angle. The flexure perpendicular to the plane of the ring is always accompanied by *torsion*. As in Class I. there must be at least two wave-lengths to the circumference, and the frequency of the mode in which there are n wave-lengths to the circumference is given by the equation

$$p^2 = \frac{1}{4}\frac{n^2(n^2-1)^2}{1+\sigma+n^2}\frac{E}{\rho_0}\frac{c^2}{a^4}$$

where σ is the *Poisson's ratio* for the material and the other constants have the same meaning as before. (For most hard solids σ is about $\frac{1}{4}$.) Since n must be at least 2 the sequence of tones is very nearly the same as in the vibrations of Class I., but the pitch is slightly lower, the ratio of the frequencies for the gravest tones being $\sqrt{\frac{21}{20}}$, which is very little less than a *comma*. For the higher tones, as we should expect, there is no sensible difference. These two classes include all that have much physical importance. The remaining types can be classified as:—Class III. Extensional vibrations.—The motion may be purely radial or partly radial and partly tangential. In the second case there will be an integral number of wave-lengths, and when this number is n we have the formula for the frequency

$$p^2 = (1 + n^2)\frac{E}{\rho_0}\frac{1}{a^2}$$

Putting n = zero we find the frequency of the purely radial vibrations. The pitch of any mode of extensional vibration of the ring is of the same order of magnitude as the pitch of the corresponding longitudinal vibration of a bar of length equal to half the circumference, the formula for the latter being in fact derived by writing n^2 for $1 + n^2$. Class IV. Torsional vibrations.—The motion consists of an angular displacement of the sections about the elastic central-line accompanied by a relatively very small displacement of the points on this line perpendicular to the plane of the ring. When there are n wave-lengths to the circumference the frequency is given by the formula

$$p^2 = (1 + \sigma + n^2)\frac{\mu}{\rho_0}a^2,$$

in which μ is the *rigidity* of the material. There is one symmetrical mode for which n is zero, and since $2\mu(1+\sigma) = E$, the frequency of this mode is $\frac{1}{2}\sqrt{2}$ of that of the radial vibrations. The pitch of the torsional vibrations is comparable with that for a straight rod of length equal to half the circumference, the formula for the latter being in fact derived by writing n^2 in place of $1 + \sigma + n^2$. Formulæ equivalent to those given in connection with Classes II. and IV. have been obtained by Mr. Basset (Proc. Dec. 1891), but he has not interpreted his results.

Entomological Society, February 8.—Mr. Henry John Elwes, president, in the chair.—The President announced that he had nominated Mr. F. DuCane Godman, F.R.S., Mr. Frederic Merrifield, and Mr. George H. Verrall as Vice-Presidents during the Session 1893–1894.—Mr. S. Stevens exhibited a specimen of *Chœrocampa celerio*, in very fine condition, captured at light, in Hastings, on September 26 last, by Mr. Johnson.—Mr. A. J. Chitty exhibited specimens of *Gibbium scotias* and *Pentarthrum huttoni*, taken by Mr. Rye in a cellar in Shoe Lane. He stated that the *Gibbium scotias* lived in a mixture of beer and sawdust in the cellar, and that when this was cleaned out the beetles disappeared. The *Pentarthrum huttoni* lived in wood in the cellar.—Mr. McLachlan exhibited a large Noctuid moth, which had been placed in his hands by Mr. R. H. Scott, F.R.S., of the Meteorological Office. It was stated to have been taken at sea in the South Atlantic, in about lat. 28° S., long. 26° W. Colonel Swinhoe and the President made some remarks on the species, and on the migration of many species of Lepidoptera.—Mr. W. F. H. Blandford exhibited larvæ and pupæ of *Rhynchophorus palmarum*, L., the Gru-gru Worm of the West Indian Islands, which is eaten as a delicacy by the Negroes and by the French Creoles of Martinique. He stated that the existence of post-thoracic stigmata in the larva of a species of Rhynchophorus had been mentioned by Candèze, but denied by Leconte and Horn. They were certainly present in the larva of *R. palmarum*, but were very minute.—Mr. G. T. Porritt exhibited two varieties of *Arctia lubricipeda* from York; an olive-banded specimen of *Bombyx quercus* from Huddersfield; and a small melanic specimen of *Melanippe hastata* from Wharncliffe Wood, Yorkshire.—Mr. H. Goss exhibited species of Lepidoptera, Coleoptera, and Neuroptera, sent to him by Major G. H. Leathem, who had collected them, last June and July, whilst on a shooting expedition in Kashmi territory, Bengal. Some of the specimens were taken by Major Leathem at an elevation of from 10,000 to 11,000 feet, but the majority were stated to have been collected in the Krishnye Valley, which drains the glaciers on the western slopes of the Nun Kun range. Mr. Elwes remarked that some of the butterflies were of great interest.—Mr. G. F. Hampson exhibited a curious form of *Parnassius*, taken by Sir Henry Jenkyns, K.C.B., on June 29 last, in the Gasternthal, Kandersteg.—Mr. J. M. Adye exhibited a long series of remarkable varieties of *Boarmia repandata*, taken last July in the New Forest.—Mr. C. O. Waterhouse exhibited a photograph of the middle of the eye of a male *Tabanus*, showing square and other forms of facets, multiplied twenty-five times.—Mr. R. Trimen, F.R.S., communicated a paper entitled "On some new, or imperfectly known, species of South African

Butterflies," and the species described in this paper were exhibited.—Mr. T. D. A. Cockerell communicated a paper entitled "Two new species of *Pulvinaria* from Jamaica."—Mr. Martin Jacoby communicated a paper entitled "Descriptions of some new genera and new species of Halticidæ."

Linnean Society, February 2.—Prof. Stewart, President, in the chair.—On behalf of Mr. Thomas Scott, the Secretary read a report on the entomostraca from the Gulf of Guinea, collected by Mr. John Rattray.—Mr. H. Bernard gave an account of two new species of *Rhax*.—An important paper by Mr. Arthur Lister, on the division of nuclei in the mycetozoa, gave rise to an interesting discussion, in which Dr. D. H. Scott, Prof. Howes, and others took part.—This was followed by a paper on the structural differentiation of the protozoan body as studied in microscopic sections, by Mr. J. E. Moore. The meeting adjourned to February 16.

PARIS.

Academy of Sciences, February 6.—M. de Lacaze-Duthiers in the chair.—On the variations in the intensity of terrestrial gravitation, by M. d'Abbadie. Observations begun in 1837 at Olinda (Brazil), on the variations in the direction of gravitational force also made its constancy doubtful. Experiments on falling bodies revealed irregularities similar to those described (last number) by M. Mascart. The closed barometer employed by the latter may be termed a *brithometer*.—On the preparation of carbon under high pressure, by M. Henri Moissan (see article).—On the reproduction of the diamond, by M. C. Friedel. Remarks by M. Berthelot (see article).—On the pathogeny of diabetes; part played by the expenditure and the production of glycose in the deviations of the glycemic function, by MM. A. Chauveau and Kaufmann. The same inferiority of venous with respect to arterial blood, as regards the amount of sugar contained in it, occurs in all the deviations of the glycemic function produced by a lesion of the central nervous system. This inferiority is equally pronounced in the hyperglycemia resulting from the extirpation of the pancreas.—On the progress of the art of surveying with the aid of photography, in Europe and America, by M. A. Lausedat. Since 1888 a zone of twenty miles on each side of the Canadian Pacific Railway, in the neighbourhood of the Canadian National Park, has been surveyed with the aid of photography under the direction of Messrs. Deville, Drewry, and McArthur, at an average rate of 1040 square km. per annum for four men under great climatic disadvantages. The cost of the undertaking amounts to three dollars per square km.—Determination of the amount of carbonic oxide which can be contained in confined air, by means of a bird employed as physiological reagent, by M. N. Gréhant.—On the properties of faculæ; reply to a note by Mr. G. Hale, by M. H. Deslandres.—The probability of coincidence between solar and terrestrial phenomena, by M. G. E. Hale.—Note on an explicit expression of the algebraic integral of a hyperelliptic system of the most general form, by M. F. de Salvert.—On a generalisation of Bertrand's curves, by M. Alphonse Dumoulin.—On the surfaces which admit a system of lines of spherical curvature and which have the same spherical representation for their lines of curvature, by M. Blutel.—On semicircular interference fringes, by M. G. Meslin. Rectilinear interference fringes are sections of hyperboloids by planes parallel to their axis, the light being propagated in a direction at right angles to that axis. If the light proceeds along the axis, a screen perpendicular to it will cut circular sections, and the fringes will have the form of a circumference of which a greater or smaller arc will be seen accordingly as the two pencils overlap more or less. In practice these circular fringes were obtained by separating two of Bellet's half lenses and placing them one before the other in front of a very small hole illuminated by sunlight, such that the axis of the pencil passes through the optical centre of the two lenses. Under these conditions two pencils are formed from the same source of light, which may be made to show circular fringes by moving the lenses slightly in a direction perpendicular to their optical axes.—Study of the fluorides of chromium, by M. C. Poulenc.—On a new soldering process for aluminium and various other metals, by M. J. Novel. For aluminium the following solders are recommended: (1) Pure tin, fuses at 250°. (2) Pure tin 1000 gr.; lead 50 gr. (280° to 300°). (3) Pure tin 1000 gr.; pure zinc 50 gr. (280° to 320°). These solders do not stain or attack aluminium. A nickel soldering bit is preferable. (4) Pure tin 1000 gr.; red copper 10 to 15 gr. (350° to 450°). (5) Pure tin 1000 gr.; pure nickel 10 to 15 gr. (350° to 450°). These give a slightly yellowish tint, but are very durable. (6) Pure tin 900 gr.; copper 100 gr.; bismuth 2 to 3 gr. This is specially suitable for soldering aluminium bronze.—Action of acetic acid and formic acid upon terebenthine, by MM. Bouchardat and Oliviers.—On the mode of elimination of carbonic oxide, by M. L. de Saint-Martin. Experiment shows that animals partly intoxicated by carbonic oxide, when placed in conditions under which natural elimination is impossible, destroy slowly but regularly a certain quantity of the poisonous gas, this destruction being the more active the less the intoxication. It is probably converted into carbon dioxide. The toxic effect is entirely dependent upon the time during which the organism is exposed to the gas, and a very small quantity can be fatal on prolonged exposure.—Influence of pilocarpine and floridzine on the production of sugar in milk, by M. Cornevin.—On the seat of the colouring matter in the green oyster, by M. Joannes Chatin.—On pseudo-fertilisation in the *Uredinei*, by MM. P. A. Dangeard and Sapin-Trouffly.—On the substances formed by the nucleole in *Spirogyra setiformis*, and the directive force which it exerts upon them at the moment of the division of the cellular nucleus, by M. Ch. Decagny.—On a process for measuring the double refraction of crystalline plates, by M. Georges Friedel.—A horizontal section of the French Alps, by M. W. Kilian.—On the arrangement of the cretaceous beds in the interior of the Aquitaine basin, and their relations to tertiary formations, by M. Emmanuel Fallot.

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