SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, March 9.—Mr. A. B. Basset, F.R.S., Vice-President, in the chair.—Mr. T. J. Dewar exhibited, with the aid of a stereoscope, twenty stereographs of the regular solids. These were not photographs of a solid object from two points of view for binocular vision, but the same object was drawn twice over by Mr. Dewar in perspective with different station points. The relief was aided by making the lines in the foreground thick, and those behind thin.—Mr. Love read a note on the stability of a thin rod loaded vertically. Suppose a thin rod or column is held vertically at its lower extremity, and loaded at its upper extremity. It is well known that, unless the load exceeds a certain limit, the rod will be simply compressed longitudinally without being bent. If, however, the limit is exceeded there exists a curved form in which the rod can be held by the application of the given load. This form must belong to the *elastica* family of curves. Now when the length and the load are given the elastica is not entirely determinate. In fact for the same length and the same load (if sufficiently great) there exist forms having respectively 1, 2, 3. . . . inflexions. These are the curves figured in Thomson and Tait's "Nat. Phil.," part ii. p. 148, and for our present application the rod must be supposed held at the middle point of one of the bays, into which it is divided by the line of action of the load. Thus the part of the curve between the point of support and the nearest inflexion is half a bay, the rest of the curve up to the point of attachment of the load consists of an integral number of complete bays. Now although all these forms are possible there is only one which is stable, and that is the form with a single inflexion. To prove this we have to investigate the potential energy in the configuration with a single inflexion, in which the curve forms a single half bay, and in the configuration with $2n+1$ inflexions, in which the curve forms $n+\frac{1}{2}$ bays. It is not difficult to prove that in every case the latter potential energy is the greater. It follows that the figures given by Euler's "Theory of Struts" in which the rod forms a curve which is nearly a curve of sines of small amplitude crossing the line of action of the load more than once are all unstable forms. The stable form is a curve of finite curvature, which never crosses the line of action of the load. —Prof. Lloyd Tanner next made a communication on complex primes formed with the fifth roots of unity. The object of the paper is to explain a method of calculating the complex prime factors of real primes included in the form $10\mu+1$. The only published method which I have met with is due to Kummer. This is not restricted to the particular case here considered; but as it involves the determination of the G.C.M. of two complex numbers, it is probably more laborious than the method now communicated. The method adopted by Reuschle in the calculation of his tables does not appear to have been published. The process here is based on the indeterminate equation

$$X^2 - 5Y^2 = 4p.$$

A minimum solution of this equation gives the "simplest" prime factor according to Kummer's definition (*Berlin Monatsberichte*, 1870, p. 413) and solutions in which Y is a multiple of 5 give the "primary" prime factors which Kummer found it necessary to use in order to establish the general law of reciprocity. In solving the equation Lagrange's method turns out to be impracticable, and a short discussion—treated graphically—is introduced, which is sufficient to show the relations between the different solutions. These relations can be expressed in the form—

$$\begin{pmatrix} 2, & 0 \\ 0, & 2 \end{pmatrix}\begin{pmatrix} X, & Y \end{pmatrix} = \begin{pmatrix} a, & 5b \\ b, & a \end{pmatrix}\begin{pmatrix} X', & Y' \end{pmatrix}$$

and it is interesting to note the intimate connection between these matrices and the complex units. From any solution (X, Y) three numbers A_0, A_1, A_2, are found, A_0 being the integer next greater than $2X/5$, and these serve to determine the values and sequence of the co-ordinates a_0, a_1, &c., in the required prime factor

$$a_0 + a_1\omega + a_2\omega^2 + a_3\omega^3 + a_4\omega^4.$$

The first condition is

$$A_0 = a_0^2 + a_1^2 + a_2^2 + a_3^2 + a_4^2.$$

The values of a have to satisfy other conditions, some of which are tested by mere inspection. To give some idea of the facility of the method from the calculator's point of view it may be stated that the determination of the prime factors of two primes selected at random in the second million (viz. 1,562,051 and 1,671,781) was completed in three hours. The only auxiliary table required is a table of squares: and if this extends to the square of 7000 it will suffice for the factorisation of all primes in the first nine millions. Tables are appended giving the simplest —and simplest primary—prime factors of all suitable primes less than 10,000. The reciprocal factors are also given after the first thousand. For the first thousand the reciprocal factors have already been published; and instead of giving these again, a comparison is indicated between the factors here given and those published in Reuschle's tables. The result of the comparison suggests that Reuschle's method of calculation was not the same as that now communicated.—The dioptrics of gratings, by Dr. J. Larmor, F.R.S. When a beam of light falls on a continuously ruled or striated surface, in addition to the principal portion that passes on and the portion that is scattered and lost by the roughnesses of the surface, there are formed a series of secondary diffracted beams that are propagated onward in oblique directions. Each of these beams is produced in the well-known manner by the union of the elements from the different striations (or homologous groups of striations), which arrive at its front in a common phase. The dioptrical discussion of such diffracted beams, that is so far as regards their geometrical properties, forms a rather simple case of the theory of the refraction of a general dioptrical pencil, which has been developed by Hamilton, Maxwell, and other writers. In the case of homogeneous wave-length λ, when the principal beam, coming from its focal lines, is refracted at the striated surface to two other focal lines, the nth diffracted beam is propagated as if it were simply refracted at a new surface formed by adding on at each point a thickness $(\mu - 1)nm\lambda$ of the refracting medium in front of the original surface; where m is the number of striations counting from any arbitrary origin on the surface up to the point. The case of reflexion is included by making $\mu = -1$. As a special example, it is well known that the positions of the primary and secondary foci for conical pencils in a spherical Rowland grating, are determined by the same formulæ as hold for reflexion in a curved mirror. The treatment of the aberration at the focal lines, or the discussion of the caustic surfaces of the diffracted beams, is reduced immediately to the Hamiltonian formulæ by noting that the characteristic function of the beam is increased by the quantity $(\mu - 1)nm\lambda$, exactly, in crossing the diffracting surface.—The secretary read a brief abstract of a note by Prof. L. J. Rogers on a three-fold symmetry in the elements of Heine's series.—Messrs. Greenhill, Walker, Cunningham, and the Chairman joined in the discussions on the papers.

Royal Microscopical Society, March 15.—A. D. Michael, President, in the chair.—The president said that a series of thirty-six photomicrographs had been sent to the Society of Arts, in compliance with the request read at the last meeting, for exhibition at Chicago.—An electric turntable was exhibited on behalf of Mr. Payne, of Newcastle. It consisted of a brass turntable of ordinary pattern having an electric motor fitted beneath the plate; the whole was caused to revolve by the current from a bichromate battery cell.—Dr. W. H. Dallinger gave a brief description of Prof. Bütschli's experiments on the so-called artificial protoplasm; and said in conclusion, that he could not suppose that any one looking at these forms would regard them as in any way allied to living matter. The more intimately they became acquainted with them the more sure they would become that they were only forms, and that those which appeared under a low power to be so much like tissue were under a high power seen to be minute bubbles and nothing more. He believed the movements observed would be found to be due to the effect of differences of surface tension, and that the study of them would no doubt help them to understand some of the mechanical properties of protoplasm, but they did not leave an impression that they had caused an approximation in the least degree towards the artificial production of protoplasm.—Mr. R. T. Lewis exhibited and described a new species of Aleurodes (*A. asparagi*) which had been found upon the leaves of asparagus in Natal.—Mr. T. F. Smith read a note on the use of monochromatic yellow light in photomicrography. —Prof. F. Jeffrey Bell read a note from Dr. A. M. Edwards on

a simple mode of illumination for the microscope.—Surgeon V. Gunson Thorpe's paper on the rotifera of China was read by Prof. Bell.—Dr. G. M. Giles's paper on certain cystic worms which simulate the appearances of tuberculosis was also read by Prof. Bell.—Dr. R. G. Hebb said that he had never met with any of the worms described in England. He had found nodules in the lungs of sheep, and although unable to find the worm, he had supposed it to be the cause of what he had found. —Prof. Bell thought that what Dr. Giles stated in the beginning of his paper was of considerable importance, because if the large number of animals which were killed as being tuberculous were really not so, it might be possible to prevent their destruction. There was, he imagined, a general dislike amongst most persons—except such as were fond of high game—to eating meat which swarmed with parasites of any kind; for if it was correct that the cattle in India which were reputed to be highly tuberculous were not so, it was very important that the fact should be widely made known.—The president said that he fully agreed with Prof. Bell in his remarks.—Dr. A. C. Stokes's paper on new brackish water infusoria from the United States was taken as read.

Linnean Society, March 16.—Prof. Stewart, President, in the chair.—A curious freshwater alga, growing in a perfectly spherical mass without any visible point of attachment, and described as a condition of *Cladophora*, was exhibited by Mr. A. W. Bennett, who stated that specimens had been found in English and Welsh lakes, as well as in Sweden, and that the peculiar spherical form of growth was difficult to explain. Mr. G. R. Murray suggested that it might be due to the action of a current, which would cause a continuous revolution of the mass.—Mr. R. I. Pocock exhibited a singular nest, so called, of a myriopod received from Sierra Leone, and formed of a clayey earth, which had become hardened by exposure. It was suggested that it was not a nest in the proper sense of the word, formed by the creature itself, but rather a case fashioned by ants for the purpose of entombing their enemy.—Mr. G. F. Scott Elliot gave an interesting account of the botanical results of the Sierra Leone Boundary Commission, and of the collections made by him during five months travelling. His remarks were criticised by Messrs. J. G. Baker, C. B. Clarke, W. Carruthers, and Dr. Stapf, who was present as a visitor.—Mr. J. H. Venstone described some points in the anatomy of a mollusk (*Melongona*) from recent dissections made by him, and exhibited several preparations in support of his statements. Prof. G. B. Howes bore testimony to the originality and value of the observations which in some respects were at variance with the views of the most recent writers on the subject. Messrs. G. R. Murray and Horace Monckton offered some remarks on the similarity in certain respects of the fauna and flora of the West Coast of Africa and the East Coast of South America, with reference to the statements made by Mr. Pocock and Mr. Scott Elliot.—The meeting adjourned to April 6.

Anthropological Institute, March 21.—Prof. A. Macalister, F.R.S., President, in the chair.—Dr. Tylor exhibited a collection of the rude stone implements of the Tasmanians, showing them to belong to the palæolithic or unground stage of the implement-maker's art, below that found among prehistoric times in Europe, and being on the whole the lowest known in the world. Fragments or rough flakes of chert or mudstone, never edged by grinding, but only by chipping on one surface with another stone, and grasped in the hand without any handle, served the simple purposes of notching trees for climbing, cutting up game, and scraping spears and clubs. The Tasmanians appear to have kept up this rudimentary art in their remote corner of the world until the present century, and their state of civilisation thus becomes a guide by which to judge of that of the prehistoric drift and cave men, whose life in England and France depended on similar though better implements. The Tasmanians, though perhaps in arts the rudest of savages, were at most only a stage below other savages, and do not disclose any depths of brutality. The usual moral and social rules prevailed among them; their language was efficient and even copious; they had a well-marked religion in which the spirits of ancestors were looked to for help in trouble, and the echo was called the "talking shadow." Such facts make it clear that neither antiquity nor savagery reaches to really primitive stages of human life, which belongs to a remoter past.—A paper by Prof. Politis on burial customs in modern Greece was read; also a paper on the cave paintings of Australia, by the Rev. John Mathew.

EDINBURGH.

Royal Society, February 20.—The Hon. Lord Maclaren, vice-president, in the chair. Mr. Malcolm Laurie read a paper on the anatomy of the *Eurypteridæ*. Cheliceræ exist in front of the mouth in *Slimonia* and *Eurypterus*, thus making the number of cephalothoracic appendages in these forms agree with that of the arachnida in general. The presence of an epiconite on the basal joint of the walking limbs is also an arachnid character. The third to sixth free segments in *Slimonia* carry paired plate-like appendages, each of which appears to have borne one or more branchial lamellæ. There are sternites covering the whole ventral surface of each segment; *Slimonia* differing in this respect from *Eurypterus*, which, according to Schmidt, has no sternites on these segments. The suppression of the sternite of the second free segment and the reduction of its appendage to nothing but branchial lamellæ is due to the enormous development of the genital operculum which covers this region. This suppression of the second segment seems to point to a closer relation of these forms to the *Pedipalpi*, in which the same thing occurs, than to the scorpion, in which the second segment and its appendage are well developed.—The Rev. Prof. Duns discussed the early history of some Scottish mammals and birds.—Prof. Rutherford communicated a paper, by Dr. W. G. Aitchison Robertson, on the digestion of sugar in health.

March 6.—Mr. T. B. Sprague discussed a new algebra, by means of which permutations may be transformed in a variety of ways, and their properties investigated. In this algebra seven symbols of operation are used, the multiplication table being—

	r	i	p	s	t	l	m
r	1	ir	pi	$s^{-1}r$	tr	slr	mr
i	ri	1	pr	si	$t^{-1}i$	li	tmi
p	ip	rp	1	tp	sp	mp	lp
s	rs^{-1}	is	pt	s^2	ts	$s^{-1}ls$	ms
t	rt	it^{-1}	ps	st	t^2	lt	$t^{-1}mt$
l	$s^{-1}rl$	il	pm	s^2l	tl	l^2	ml
m	rm	$t^{-1}im$	pl	sm	t^2m	lm	m^2

Prof. Tait read a note on the compressibility of liquids in connection with their molecular pressure.

March 20.—Dr. D. Gill, H.M. Astronomer at the Cape of Good Hope, communicated a paper illustrated by photographs on recent progress in celestial photography. The method recently used for the determination of the sun's distance by observations of the planet Victoria was also described. A number of separate series of observations have been made—each series by itself being more trustworthy than observations made during a transit of Venus. The results indicate also that the present estimate of the mass of the moon is about one per cent. too large.—A paper was communicated by Dr. Robert Munro on a remarkable glacier lake, formed by a branch of the Hardanger-Jökul, near Eidfiörd, Norway.

PARIS.

Academy of Sciences, March 20.—M. Lœwy in the chair. —On the next solar eclipse, by M. J. Janssen.—On the preparation of a variety of swelling graphite, by M. Henri Moissan. M. Luzi has divided the varieties of graphite into two classes, according to their behaviour on treating with a little nitric acid and calcining. Those which swell up he calls graphites, and those which do not graphitites. The varieties produced ordinarily in the electric arc and by solution in iron do not swell. It can, however, be obtained in the first condition by suddenly cooling the casting in water, when the swelling graphite will be found in the more interior portions. The best way of preparing it is by means of molten platinum. About 200 gr. of platinum are fused in a carbon crucible placed in the elec-

ric furnace. When the metal fu ses it gets saturated with carbon, orming a carburet mixed with free carbon, which after solidification exists in the form of swelling or true graphite. It is separated by aqua regia. The residue consists of slate-grey hexagonal crystals of density 2·06 to 2·08, burning in a current of oxygen at 575°. From 400° upwards it swells like mercury sulpho-cyanide. It is not attacked by fused nitrate of potassium, chromic acid, or hot sulphuric acid, but is rapidly attacked by warm iodic acid and fused sodium carbonate. The swelling up is attributed to the sudden liberation of heated gas due to the decomposition of a very small quantity of graphitic oxide produced under the influence of nitric acid at the expense of a trace of amorphous graphite mixed with the crystallised variety, and more easily attacked than the latter.—Researches on samarium, by M. Lecoq de Boisbaudran.—The pancreas and the nerve centres regulating the glycemic function; experimental demonstrations derived from a comparison of the effects of a removal of the pancreas with those of bulbary section, by MM. A. Chauveau and M. Kaufmann. Medullary section, preceded or followed by bulbary section, produces exactly the same effects as medullary section preceded or followed by the removal of the pancreas. As regards, therefore, the physiological action exerted upon the sugar-forming apparatus, this last operation behaves exactly like the bulbary section. Now the latter determines the super-activity of the liver by suppressing the transmission of the influence of an inhibitory centre situated in the medulla oblongata. As a necessary result, the removal of the pancreas acts in an analogous way in producing hyperglycemia and glycosuria. This operation amounts to the annihilation of the centre controlling the glycogenic function. Hence the pancreas acts upon this function by exciting the activity of this inhibitory centre, and probably also by influencing the exciting centre, which is, on the other hand, checked in its activity by the products of internal pancreatic secretion poured into the blood. The results of the whole experimental investigation on the pathogeny of diabetes are embodied in sixteen propositions.—On the distribution in latitude of the solar phenomena observed at the Royal Observatory of the Roman College during the fourth quarter of 1892, by M. P. Tacchini.—Photography of the solar corona apart from total eclipses, by M. George E. Hale.—On electric waves along fine threads; calculation of the depression, by M. Birkeland.—On initial capacities of polarisation, by M. E. Bouty.—Influence of frequency upon the physiological effects of alternating currents, by M. d'Arsonval.—Measurement of large differences of phase in white light, by M. P. Joubin. A new method of rendering visible the fringes produced by two interfering systems of waves consists in placing an anisotropic compensator upon both the groups which have traversed the interference apparatus. This compensator then receives polarised light which, before being analysed, passes through a plate of quartz with its principal section at an angle of 45° to the plane of polarisation. Such an arrangement has been carried out in one of Fizeau's apparatus for measuring expansions. It reads direct to $\frac{1}{50}$ of a micron.—On spherical aberration of the human eye; measurement of senilism of the crystalline, by M. C. J. A. Leroy. The mean aberration is a function of the age which grows slowly in young people and very rapidly after mature age, tending towards a maximum in old age. The spherical aberration of the eye also depends principally upon the crystalline and notably upon the variability of its index of refraction. In young people this variability is rapid enough to sensibly correct the aberration. It decreases with age, and tends to a limiting value which it would have if the crystalline had a uniform index throughout.—Electrical crucible for the laboratory, with directing magnet, by MM. E. Ducretet and L. Lejeune.—On a phenomenon of dissociation of sodium chloride heated in presence of a wall of porous earth, by M. de Sanderval.—On hydurilic and desoxyamalic acids, by M. C. Matignon.—Action of cotton upon sublimate absorbed in dilute solutions, by M. Léo Vignon.—Influence of the alkalinity of blood upon the process of intra-organic oxidation provoked by spermine, by M. Alexandre Pœhl.—Production of sugar diabetes in the rabbit by the destruction of the pancreas, by M. E. Hédon.—Improvement of potato-culture for industrial and forage purposes in France, by M. Aimé Girard.—On the employment of ruthenium red in vegetable anatomy, by M. Louis Mangin.—Permian fish fauna in France, by M. H. E. Sauvage.—On the manifestation, for more than six hundred years, of sudden variations of temperature on fixed dates during the second fortnight of January, by M. Dom D. Démoulin.—Destruction of trees and public health, by M. J. Jeannel.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Laws and Properties of Matter: R. T. Glazebrook (K. Paul).—British Fungus Flora, vol. 2: G. Massey (Bell).—Text-book of Comparative Geology: Dr. E. Kayser, translated and edited by P. Lake (Sonnenschein). Beiträge zur Biologie und Anatomie der Lianen. Zweiter Theil:—Beiträge zur Anatomie der Lianen, Dr. H. Schenck (Jena, Fischer).—Œuvres Complètes de Christian Huygens, vol. 5 (La Haye, M. Nijhoff).—Statistics of the Colony of Tasmania, 1891 (Tasmania).—Meteorological Observations made at the Adelaide Observatory, &c., 1890 (Adelaide).—Lehrbuch der Entwicklungsgeschichte des Menschen und der Wirbelthiere, Dr. O. Hertwig (Jena, Fischer).—Topographische Anatomie des Pferdes. Erster Teil:—Die Gliedmassen: Drs. Ellenberger and Baum (Berlin, P. Parey).—Distribution de la Vapeur: A. Madamet (Paris, Gauthier-Villars).—Le Lait: P. Langlois (Paris, Gauthier-Villars).—Universal Atlas. Part 25 (Cassell).

PAMPHLETS.—Diagrams of Isothermal Lines of New South Wales.—Hail-storms: H. C. Russell.—Das Genetische System der Chemischen Elemente: W. Preyer (Berlin, Friedländer).—Further Studies of Yuccas and their Pollination: W. Trelease (St. Louis, Mo.).—Museums Association, Report of Proceedings, &c., at the Third Annual General Meeting.—The Negro in the District of Columbia: E. Ingle (Balt.).

SERIALS.—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, vol. 7, No. 1 (Manchester).—Journal of the College of Science, Imperial University, Japan, vol. v., part 3 (Tōkyō).

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