

study, since during the present period of organisation and development at the University of Birmingham it is of importance that those responsible for its new commercial department should be intimate with German experience. It is not sufficiently remembered, the writer of the article insists, that these German institutions are new and in an experimental stage, that they are characterised by great diversity of organisation, and are the outcome, not of Governmental initiative, but of the demands of the commercial classes; in most cases, indeed, their financial basis was provided by private generosity and municipal support, not by grants from the State. At Aachen, where the commercial "course" is simply a department of the technical college, the authorities abide by the general rule for admission to universities and technical colleges, and refuse to receive into full membership any who have not passed the leaving examination of the Gymnasia, Realgymnasia, or Ober-realschulen. In most cases the certificate is not secured until nineteen. The three other institutions admit men who have left school three years earlier (with the certificate shortening their military service to one year), on condition that they have spent the three following years in an apprenticeship or in some definite business experience. At present the Aachen plan is hardly practicable, and tends to restrict the numbers. "The German movement is," the article shows, "full of interest and instruction for foreign observers. Its ideals are rising; and the two years which form the present period of study are already beginning to seem inadequate. There are grave difficulties to be met; but an amount of ardour, of ability of a high order, and, what is not unimportant, of money also, is being devoted to the task, which ought to sting a reflective Englishman with a sense of shame."

SCIENTIFIC SERIAL.

Biometrika.—The last three numbers continue to record results of high biological interest. The excellence of Prof. Karl Pearson's elaborate studies in statistical theory is becoming widely recognised, and his comments and criticisms add much to the value of the work of other contributors. In vol. i. part iv. Mr. F. Galton states a new problem in the variation of a population with respect to a given character, which, generalised in a note appended by Prof. K. Pearson, is seen to be likely to have important results in statistical inquiry.—The same part contains an attempt by Dr. J. Y. Simpson, good as far as it goes, to demonstrate the inequality of results in the binary fission of the Protozoa. Dr. Simpson's conclusions so far recall those of Maupas, but the difficulties in the way of a successful investigation of this problem are extreme, and it cannot be said that he has met every possible objection. The inquiry is obviously of importance for the general theory of variation, and it is to be hoped that in spite of their difficulty the observations will be continued.—The thorough-going study of the Naqada crania carried out by Miss Fawcett with the help of Miss Alice Lee and other biometric students at University College occupies the bulk of the present issue, and the part concludes with a careful research, by C. Hengsen, on the variations of *Helix nemoralis*.—The subject of gasteropod shells (*Nassa obsoleta* and *N. trivittata*) also finds a place in the opening part of vol. ii., in which number will likewise be found Prof. Weldon's strictures on the ambiguity of some of Mendel's categories, e.g. "green" and "yellow" as applied to the cotyledons of peas.—The co-operative paper on inheritance in the Shirley poppy marks another long step towards the establishment of a working theory of heredity, the results reached being in general accordance with Galton's law.—Among the "Miscellanea" may be noted Mr. Whitehead's paper on variation in *Adoxa moschatellina*, and the first instalment of what promises to be a most important series of test experiments, by Mr. Darbishire, in the Mendelian theory of heredity. Japanese "waltzing mice," the colour of the coats of which is white with patches of pale fawn, were crossed with European albinos, the hybrids being crossed *inter se* and also with the albino parent stock. These experiments, some later results of which are recorded and discussed in vol. ii. part ii., have yielded data which are by no means easy of interpretation,

and their further outcome will be awaited with keen interest. One remarkable result is that every hybrid of the first generation was dark-eyed, though the eyes of all the parents were pink. In a certain proportion, however, of the progeny of the first hybrids the pink eyes reappeared, as did some other parental characters. A recent letter in *NATURE* shows that Mr. Bateson, at all events, is not disposed to admit that the facts so far obtained are discordant with Mendel's law, but it must be allowed that much of the evidence is *prima facie* in favour of ancestral inheritance.

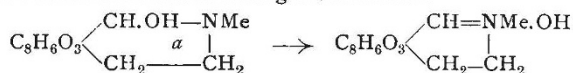
SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, March 27.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—On refraction at a cylindrical surface, by Mr. A. Whitwell. The object of the paper is to describe and illustrate the position and form of the focal areas produced by the refraction, at a cylindrical surface, of light diverging from or converging to a point. In general, if a plane can be drawn through the point to cut the surface symmetrically, then all the light passes really or virtually through an area in this plane. In the case of the cylinder there are two such planes. One contains the radiant point and the axis of the cylinder, the other contains the point, and is normal to the axis. The equation of the locus of intersections of symmetrical rays which intersect in the first plane, for small apertures, is obtained in terms of the distance of the radiant point from the axis of the cylinder a , the radius r , and the index of refraction μ . The loci of the intersections of symmetrical rays which intersect in the second plane, when the aperture is small, are shown to be circles described about the radiant point as centre and having radii equal to $(\mu-1)(a-r)$.—The evaluation of the absolute scale of temperature, by Dr. R. A. Lehfeldt. Formulæ are given for the constant-pressure and constant-volume thermometers. An attempt is made to work out the latter with the aid of existing data. It is found that $T_0 = 273.18$ from hydrogen and 273.2 from nitrogen. The deviation of the constant-volume scale from the absolute scale is indicated by curves. At 100° absolute the constant volume (hydrogen) thermometer reads 0.1 or 0.2 too low.—Prof. Callendar, in a communication sent subsequent to the meeting, said that in his paper on the thermodynamical correction of the gas thermometer (*Phil. Mag.*, January) he had incidentally mentioned that the correction for the constant-volume gas thermometer could not be directly deduced from the Joule-Thomson cooling-effect alone, without additional data, unless a formula were assumed for the variation of the cooling-effect with temperature; but that the value of the absolute zero could be deduced from the pressure coefficient if the Joule cooling-effect in free expansion were known. The experimental measurement of the latter was, however, impracticable.—Mr. Blakesley exhibited and described a lens possessing the following properties:—The two conjugate foci always move with the same relative rate along the axis. The size of the object always bears to the size of the image the same ratio, so that using the same object the image is always of the same size. The instrument is of one piece of glass, and constitutes a telescope the magnifying power of which is the ratio which the object bears to the image in size, linear. The relation of the rate of motion of the object to that of the image is the square of the magnifying power.

Chemical Society, March 18.—Prof. J. Emerson Reynolds F.R.S., president, in the chair.—The following papers were read:—Essential oil of hops, by Mr. A. C. Chapman. This oil consists principally of two terpenes, one being identical with that present in oil of bay, and named by its discoverers myrcene, and the second a sesquiterpene, which has been named humulene; there are present in addition to the foregoing small quantities of the odoriferous alcohols linalool and geraniol, the latter being present in the form of its isonoic ester.—A compound of dextrose with aluminium hydroxide, by Mr. A. C. Chapman. When dextrose dissolved in alcohol is treated with aluminium chloride there separates a white amorphous compound of the formula $3C_6H_{12}O_6 \cdot 5Al_2O_3 \cdot 11H_2O$.—Action of phosphorus haloids on dihydroresorcins. ii. Dihydroresorcin,

by Messrs. **Crossley** and **Haas**. A description of the derivatives obtained by the action of phosphorus tri- and pentachlorides on dihydroresorcinol.—The constitution of cotarnine, by Messrs. **Dobbie**, **Lauder** and **Tinkler**. The authors have examined the ultra-violet absorption spectra of solutions of this alkaloidal derivative in various solvents in order to ascertain which of the three formulæ assigned to the base most probably represents its constitution; the observations show that in the solid state cotarnine has the formula *a*, and that on solution in alcohol is converted into the coloured isomeride having the formula *b*.



—Decomposition of mercurous nitrite by heat, by Dr. P. C. **Rây** and Mr. J. N. **Sen**. The products of this reaction are mercuric nitrate, metallic mercury, nitric oxide and peroxide.—The action of nitrogen tetroxide on pyridine, by Mr. J. F. **Spencer**. The first product of this reaction is a molecular additive compound, but eventually there is formed a yellow substance of the composition $(\text{C}_5\text{H}_4\text{O}_2\text{N}_2)_4$, and a purple product of still more complex constitution.

Entomological Society, March 18.—Prof. E. B. **Poulton**, F.R.S., president, in the chair.—The Rev. F. D. **Morice** exhibited with drawings a dissected gynandromorphous specimen of a bee (*Osmia fulviventris*, Panz.).—Mr. A. **Bacot** exhibited a number of specimens of *Malacosoma neustria* × *castrensis* in various stages, including a series of six ♂♂ and sixteen ♀♀ imagines reared during 1902 from one batch of ova laid by a ♀ *Castrensis*, which had been mated with a ♂ *Neustria*, and two ♀♀ reared from another batch of ova the result of a similar cross; also blown larvæ of hybrid parentage, and twigs showing attempts at ovipositing on the part of ♀♀ hybrids that had paired with hybrid ♂♂ of the same brood; also a series of *M. Neustria*, *M. Castrensis* and the hybrid moths reared during 1901 for comparison.—Mr. H. St. J. **Donisthorpe** exhibited specimens of *Trimium brevicorne*, Reich., from Chiddingfold, Surrey, an unusually southern locality for this species.—Mr. C. P. **Pickett** exhibited specimens of *Hybernia leucophaearia* and *Phigalia pedaria* taken at Chingford on February 14, and ova of *Endromis versicolora* on birch twigs, laid March 16.—Mr. G. C. **Champion** exhibited a long series of specimens of a species of *Cnoorrhinus* (? *pyriformis*) from Piedrahita, Spain, and called attention to the great dissimilarity between the sexes, and also to the possibility of the females being dimorphic, one form clothed with green scales, and the other with grey scales like the male. He also exhibited *Dorcadion dejeani*, Chev., from the Sierra de Bejar, a species peculiar to that district.—Mr. R. **McLachlan**, F.R.S., exhibited a dragonfly belonging to a small species of the genus *Orthetrum*, attacked by a fly almost as large as itself of the family *Asilidæ*, taken in Persia in June, 1902, by Mr. H. F. **Witherby**. The fly had inserted its proboscis at the junction of the head and prothorax, a vulnerable point. He also exhibited a female specimen of a large *Æschnid* dragonfly, *Hemianax ephippiger*, Burm., captured in a street at Devonport on February 24. The species occasionally visits Europe in migratory swarms or sporadically, but is especially African, and its presence at Devonport in February might probably be due to the example having flown on board a vessel off the African coast. Mr. F. **Merrifield** suggested that there might be some connection between the appearance of the insect in England and the reported showers of fine dust which are generally supposed to have come from the Sahara.—Prof. E. B. **Poulton**, F.R.S., exhibited seasonal forms of *Precis antilope*, parent and offspring, bred by Mr. G. A. K. **Marshall** in South Africa, and *Precis coelestina*, from the Victoria Nyanza region, with the dry-season form of that species, now taken probably for the first time.—Mr. W. J. **Lucas** exhibited with the lantern a slide showing the larva of *Cossus ligniperda* in its gallery in a tree trunk.—Dr. T. A. **Chapman** exhibited with the lantern a series of slides illustrating the life-history of *Liphya brassolis*, Westw., a Queensland species, the larva of which lives in ants' nests, and feeds upon the ant-larvæ. The imago on emergence from the pupa is clothed with scales highly distasteful to the ant, which protect it during emergence from attack, and until such time as it is able to

fly, when they drop off.—Mr. G. C. **Champion** read a paper on an Entomological Excursion to Bejar, Central Spain.—Dr. F. A. **Dixey** read a paper, illustrated by lantern slides, on Lepidoptera from the White Nile, collected by Mr. W. L. S. **Loat**; with further notes on seasonal dimorphism in butterflies.—Mr. E. **Saunders**, F.R.S., communicated a paper on Hymenoptera Aculeata collected by the Rev. A. E. **Eaton** in Madeira and Teneriffe, in the spring of 1902.

Royal Microscopical Society, March 18.—Dr. H. **Woodward**, F.R.S., in the chair.—Mr. J. W. **Gordon** gave an account of his paper on the Helmholtz theory of the microscope, which contained a rough sketch of the theory of diffraction, and considered this from a new point of view, expanding the Helmholtz theory from this position. The paper then dealt with the Helmholtz theory, starting with the proof of the sine law as given by Helmholtz. Having proved the sine law, Helmholtz made deductions from it, and drew the inference that the resolving power of the most perfect optical system must necessarily stop short at an object which was less than half a wave-length of the light by which its observation was attempted. Mr. Gordon then proceeded to set out the points of his own paper, including a description of some vibrating screens by the aid of which the definition of high powers was much improved, when the image was greatly super-amplified by eye-piece magnification.

Linnean Society, March 19.—Prof. S. H. **Vines**, F.R.S., president, in the chair.—Mr. **Clement Reid** exhibited drawings by Mrs. **Reid** of fruits and seeds of British pre-Glacial and inter-Glacial plants (Thalamifloræ). In each case the specimens illustrated were the earliest known representatives of the species. Most of the plants are still living in Britain; but among the Thalamifloræ from the Cromer Forest-bed occur seeds of *Hypecoum*, a genus specially characteristic of the Mediterranean region, and no longer found living nearer than Southern France. The fossil seeds correspond closely with the living *Hypecoum pendulum* of Southern France, and either belong to that species or to a closely-allied extinct form. The seeds of all the species of *Hypecoum* are covered by a curious close mosaic of cubic crystals, apparently calcium oxalate, which fill square pits in the surface of the testa. Traces of these pits are still found on some of the fossil seeds.—Mr. G. **Claridge Druce** read a paper on *Poa laxa* and *Poa stricta* of our British floras. For some years past, doubts have been expressed by critical botanists as to the correct naming of these two plants. The author's conclusions are, that the plants named *Poa alpina*, var. *acutifolia*, and *P. laxa*, var. *scotica*, have been misunderstood and variously named; he therefore gives detailed descriptions of these two plants, with synonymy so far as British floras are concerned. The paper was illustrated by specimens from the author's herbarium, and the type-specimen of *Poa flexuosa* from Smith's herbarium.—The botany of the Ceylon patanas, part ii., by Messrs. J. **Parkin** and H. H. W. **Pearson**. In a former paper on the same subject (*Pearson, Journ. Linn. Soc. Bot.*, vol. xxxiv. 1899, pp. 300-365) the main features of these grassy uplands, locally known as "patanas," were given, the probable causes which have led to their development discussed, and the general biological characters of their flora described. An account of the anatomical examination of the plants collected was promised for a separate paper; this communication is the fulfilment of the promise.

PARIS.

Academy of Sciences, March 30.—M. Albert **Gaudry** in the chair.—On affinity at low temperatures; the reactions of liquid fluorine at -187°C ., by MM. H. **Moissan** and J. **Dewar** (see p. 544).—On the alkyl- and acyl-cyanocamphors and the alkylcamphocarbonic esters. The influence of the double linkage of the ring containing asymmetric carbon on the rotatory power of the molecule, by M. A. **Haller**. The enolic and ketonic forms are simultaneously produced in the formation of derivatives of cyanocamphor, which are distinguished by their behaviour on treatment with hydrochloric acid. Measurements of the rotatory power showed that higher values were always given by the enolic forms than with the ketonic forms.—Problems in biological energetics, raised by a note of Lord Kelvin on the regulation of the

temperature of warm blooded animals. The permanence of the processes producing heat of combustion, by M. A. **Chauveau**. In searching for a means of explanation of the constancy of temperature of an animal when placed in a medium at a higher temperature than the normal, the suggestions of Lord Kelvin are subjected to an experimental examination; it was found that under the experimental conditions of Crawford, venous blood is neither poorer in carbonic acid nor richer in oxygen; the expired air under the same conditions contains practically the normal amounts of oxygen and carbonic acid. There is thus no reason to suppose the existence of endothermic reactions in animals placed in a medium warmer than their normal temperature.—Remarks by M. Edmond **Perrier** on a work on embryonic acceleration.—Prof. Ray **Lankester** communicated to the Academy two drawings of the head of a gigantic mammal recently discovered in the Upper Eocene Sands at Fayum, Egypt.—M. de Forcrand was nominated a correspondent in the section of chemistry in the place of the late M. Reboul.—On an eruption of the volcano at St. Vincent, by M. A. **Lacroix**.—On a mechanical calculator called the arithmograph, by M. **Troncet**.—On the absolute temperature deduced from the normal thermometer, by M. H. **Pellat**. As a first approximation, it is shown that the usual formula for the absolute temperature gives results about 0.11° C. too low.—The action of hydrogen on the sulphides of arsenic in presence of antimony, and on the trisulphide of antimony in the presence of arsenic, by M. H. **Pelabon**. Antimony completely displaces arsenic in its sulphides if the two bodies are in the liquid state. Hydrogen gas, heated in presence of sulphide of antimony and a mixture of arsenic and antimony, forms hydrogen sulphide, the proportion of which increases with that of the arsenic in the mixture.—On pyrophosphorous acid, by M. V. **Auger**. Crystals of pyrophosphorous acid can be obtained by shaking together for some time a mixture of phosphorous acid with an excess of phosphorus trichloride.—On the action of phosgene on the organo-magnesium compounds, by M. V. **Grignard**. Either a symmetrical ketone or a tertiary alcohol can be obtained, according to the experimental conditions.—New researches on the decomposition of organic acids, by MM. **Oechsner de Coninck** and **Raynaud**. Various organic acids have been heated with strong sulphuric acid and with glycerol, and the conditions under which carbon monoxide and dioxide are given off have been determined.—The constitution of the nitrocelluloses, by M. Léo **Vignon**. The nitrocelluloses, reduced in acid solution by ferrous chloride, give oxycellulose. This reaction clearly differentiates cellulose from mannite and other polyatomic alcohols which have been previously studied from the point of view of nitration.—On the nitrogen compounds contained in arable earth, by M. G. **André**.—Remarks on the general morphology of the muscles, by M. J. **Chaine**.—On the fishes of the family of Atherina in Western Europe, and on the connection between their species, by M. Louis **Roule**.—The structure of the rootlets in *Trapa natans*, by M. C. **Queva**.—On the problematic bodies and the Algæ of the Trias in Lorraine, by M. P. **Fliche**.—The defence of the organism in the newly-born, by MM. A. **Charrin** and G. **Delamare**.—On the influence of the chemical state under which an element is presented to an organism on the rapidity of the passage of this element through the blood, by M. A. **Mouneyrat**.—On a law of decrease of effort as given by the ergograph, by M. Charles **Henry** and Mlle. J. **Joteyko**.—Biot's hypothesis on the height of the atmosphere, by W. **de Fonvielle**. From the consideration of the fall of temperature as the distance from the surface of the earth is increased, there would appear to be a sharp limit to the possible height of the truly gaseous atmosphere.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* (physico-mathematical section), No. 6 for 1902, and No. 1 for 1903, contain the following memoirs communicated to the Society:—

November 29, 1902.—C. **Jacobj**: On the pharmacological action of the cyclic isoximes.

July 26.—V. **Cuomo**: Measurements of electric dissipation in the open air at Capri (March–September).

January 24, 1903.—E. **Riecke**: Contributions to the

theory of atmospheric electricity. (1) On the dissipation of electricity in enclosed spaces.

January 10.—W. **Voigt**: On the magnetic induction of regular crystals.—A. **Schönflies**: On the proof of a fundamental theorem in the theory of point-aggregates.

February 6.—E. **Riecke**: Contributions to the theory of atmospheric electricity. (2) On the dissipation of electricity in uniformly moving air.

DIARY OF SOCIETIES.

WEDNESDAY, APRIL 15.

ROYAL MICROSCOPICAL SOCIETY, at 8.—On a New Method of Using the Electric Arc in Photomicrography: E. B. Stringer.—An Exhibition of Mounted Rotifers of the genus *Brachionus*: C. F. Rousselet.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Prevalence of Gales on the Coasts of the British Islands, 1871–1900: F. J. Brodie.—The Duration of Rainfall: J. Baxendell.

THURSDAY, APRIL 16.

MATHEMATICAL SOCIETY, at 5.30.—Exhibition of the Logo-Logarithmic Slide-rule: C. S. Jackson.—On the Deduction of Schlömilch's Series from a Fourier Series, and its Development into a Definite Integral: R. F. Gwyther.—On those Functions which are Defined by Definite Integrals with not more than Two Singularities: E. T. Whittaker.—Note on Exact Solutions of the Problem of the Bending of an Elastic Plate under Pressure: Prof. A. E. H. Love.

LINNEAN SOCIETY, at 8.—On some Points in Connection with the Ordinary Development of *Vaucheria* Resting Spores: Dr. H. Charlton Bastian, F.R.S.—The Labial and Maxillary Palpi in Diptera: W. Wesché.—On Freshwater Rhizopods and their Classification: Prof. G. S. West.

SATURDAY, APRIL 18

GEOLOGISTS' ASSOCIATION.—Excursion in Conjunction with the Geological Section of the Croydon Natural History Society. Directors: N. F. Roberts and W. Whitaker, F.R.S. Members meet at New Cross Station (L. B. & S. C. R., down platform), at 3.21 p.m. Object: To see the Reopening of the Cutting S. of the Station, showing the Junction of the London Clay with the Beds below.

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