Journal of the Russian Chemical and Physical Society, vol. xxvi. parts 2 to 8.—Among many valuable papers inserted in these issues, the following are especially worthy of notice:—On the speed of formation of the amines, by N. Menschutkin.—On the nitration of saturated hydrocarbons by means of nitric acid, by M. Konovaloff.—On the solubility of anhydrous calcium sulphate, by A. Potilitsine.—On the isomerisation of aromatic hydrocarbons obtained by Fridel's method, by M. Konovaloff.—On the structure of terpenes and similar compounds, by G. Wagner.—On the nitration of unsaturated hydrocarbons, by means of nitric acid, by M. Konovaloff.—On the halogen compounds of nitrogen, by Th. Selivanoff.—In the physical part: On the electric resistance of bismuth to alternating currents, by A Sadovsky.—On the variation of electrostatic energy, by M. Schiller.—On the variation in length of iron wire during magnetisation, by M. Rosing.—Experiments with alternating currents of high frequency, by N. Slouginoff.

Part 2 of the *Journal* contains also, as a supplement, the first number of the Memoirs (*Vremennik*) of the Central Board of Measures and Weights, which was instituted in 1893, and is placed under Prof. Mendeléeff, who is also the editor of this publication. In this first part we find besides a preface by the editor, several papers of more than local interest, namely:—The measurements made to compare the iron *sajène* of the "Committee of the year 1833" with various units of length, accomplished in 1884, by MM. Glukhoff and Zawadski. The comparison was also made with the bronze and iron yards of Airy.—On the weight of a litre of air, a very elaborate paper by Prof. Mendeléeff, in which some remarks concerning the measurements of Leduc and Lord Rayleigh, and the corrections which should be introduced into their measurements, are especially valuable. The average value arrived at by Prof. Mendeléeff is, in grams,

$$e_0 = 0{\cdot}131844\,g \pm 0{\cdot}00010.$$

—First list of the standard measures of weight and length at the Central Board, by Th. Zawadski.—Data for the elaboration of an instruction for verifying the weights and measures in the trade establishments.—Preliminary researches into new scales for grain, as a means of determining the quality of the latter, by Th. Selivanoff.

SOCIETIES AND ACADEMIES.

LONDON

Royal Society, February 7.—"On the Application of the Kinetic Theory to Dense Gases." By S. H. Burbury, F.R.S.

February 14.—"An Instrument for Cutting, Grinding, and Polishing Section-plates and Prisms of Mineral or other Crystals accurately in the desired direction." By A. E. Tutton, Demonstrator of Chemistry at the Royal College of Science, South Kensington.

In a recent communication (*Phil. Trans.* 1894, Series A. p. 887) the author described an instrument for grinding accurately orientated section-plates and prisms of crystals of artificial preparations. The success of that instrument is so complete that another instrument has been devised and constructed, which enables equally accurately orientated plates or prisms to be prepared from the relatively harder crystals of natural minerals. The instrument is not intended to replace the one previously described, which is fully adapted for all the purposes of chemical crystallographers, and the cost of which is only two-thirds that of the one now described. It is intended especially for the use of mineralogists, but, naturally, will serve all the purposes of the smaller instrument. It is constructed upon a scale one-fifth larger than the former one as regards such parts as are fundamentally similar, to confer greater strength. The mode of supporting the outer fixed cone within which the movable axes rotate, the construction of the circle and its axis and fine adjustment, and of the gun-metal axis and its counterpoising levers designed for controlling the pressure between crystal and lap, as also of the inner steel axis from which are suspended the crystal and its centering and adjusting movements, are similar in principle to the corresponding arrangements in the smaller instrument, although many details are altered for the sake of greater rigidity. The same likewise applies to the goniometrical telescope and collimator and their mode of support. The main innovations are those of a cutting apparatus, and a larger grinding table capable of being readily furnished with any one of nine interchangeable grinding and polishing laps, suitable for use with crystals of every degree of hardness. Four metallic laps are provided, of iron, gun-metal, hard white metal, and pewter respectively, the first for rough grinding with coarse emery and brick oil or water, the second and third for fine grinding with flour emery, and the fourth for polishing with rottenstone and water. A polishing lap of hard felt, for use with putty powder and water, and a lap of box-wood, are supplied. Three glass laps, one coarsely ground, another finely ground, and the third of ordinary polished plate glass, are likewise provided for use with artificial crystals. The cutting apparatus is carried upon a horizontal arm pivoted about the back pillar of the instrument, in order to permit of its removal out of the way during grinding and polishing operations, and further supported when in use upon an adjunct of the right front pillar. It consists of a 4-inch disc of soft iron, supplied with diamond edge, and intended to be lubricated with brick oil, driven by an independent driving gear carried upon the arm. The supporting attachment to the front pillar is removable when not required, and includes a traversing apparatus for directing and controlling the cutting, and a safety back-spring to prevent the possibility of undue pressure being induced between the cutting disc and the crystal by injudiciously rapid rotation of the traversing screw. Instead of actuating the driving gear of the cutting or grinding apparatus by hand, a small electric, gas, or water motor may be employed.

"On the Ratio of the Specific Heats of some Compound Gases." By Dr. J. W. Capstick, Fellow of Trinity College, Cambridge.

The experiments described are a continuation of those of which an account is given in the *Phil. Trans.* vol. clxxxv. p. 1, Kundt's dust-figure method being used, and the ratio of the specific heats corrected for deviation of the gas from Boyle's law. The results are as follows:—

Name.	Formula.	γ
Methylene chloride.....	CH_2Cl_2	1·219
Chloroform	$CHCl_3$	1·154
Carbon tetrachloride ...	CCl_4	1·130
Ethylene chloride	$C_2H_4Cl_2$	1·137
Ethylidene chloride.....	$C_2H_4Cl_2$	1·134
Ethylene	C_2H_4	1·264
Vinyl bromide.....	C_2H_3Br	1·198
Allyl chloride	C_3H_5Cl	1·137
Allyl bromide	C_3H_5Br	1·145
Ethyl formate	$HCOOC_2H_5$	1·124
Methyl acetate.....	CH_3COOCH_3	1·137
Sulphuretted hydrogen	SH_2	1·340
Carbon dioxide	CO_2	1·308
Carbon disulphide	CS_2	1·239
Silicon tetrachloride ...	CCl_4	1·129

From these, and the results given in the former paper, it follows that

(1) Replacement of one halogen by another in a compound has no effect on γ.

(2) One H in a paraffin molecule may in some cases (*e.g.* ethane and propane) be replaced by Cl without altering γ, but a second replacement always causes a fall.

(3) Carbon and silicon can be interchanged without effect on γ.

(4) Isomeric compounds have the same γ.

(5) Using γ to calculate β, the ratio of the rates of increase of intramolecular and translational energy of the molecule on a rise of temperature, we find $\frac{\beta+1}{n}$ is constant for the paraffins and their monohalogen derivatives, whence it follows that for these the ratio of the increase of mean total energy to the increase of kinetic energy of translation of the molecule is proportional to the number of atoms in the molecule.

"On some Considerations showing that Maxwell's Theorem of the Equal Partition of Energy among the Degrees of

Freedom of Atoms is not inconsistent with the various Internal Movements exhibited by the Spectra of Gases." By Prof. G. F. Fitzgerald, F.R.S.

It has been generally held that a sufficient freedom of internal motion in an atom to explain the spectra of gases proved that the theorem as to equal partition of energy among all degrees of freedom could not hold, and various suggestions have been made as to why the *proof*, as given by Maxwell, Boltzmann, and others, fails in this case. Prof Schuster has suggested that the numerous lines need not involve the same number of degrees of freedom, as it is possible that there may be connections between them such that one or two coordinates would define a motion which when analysed into its Fourier components, as is done by a grating or prism, would produce a very complex system of lines. However, even one degree of internal freedom would interfere very seriously with the observed value of the ratio of specific heats, and the object of this note is to explain how this difficulty may be surmounted without supposing that the theorem as to equal partition of energy is untrue, for it is not by any means disproved because a certain form of proof fails in certain cases.

It has been long held that the motion of the electrons on neighbouring atoms is very much controlled by the ether between them. The wave-length of light is generally many times as great as the molecular distances, so that the ether is a practically rigid connector between neighbouring electrons. Suppose now, as a particular example, that 10^6 atoms are in this sense, and so far as the motion of electrons is concerned, within one another's control. In this case the motion of these 10^6 electrons might be defined by means of, say, three coordinates. Hence, if the atoms were spheres, there would be 3×10^6 degrees of freedom plus these three degrees defining the motions of all the electrons. Now, if the total energy be equally distributed among all these degrees of freedom, each atom will only have its share of the electromotions, and its energy of external motion will only be diminished by 3×10^{-6}th part owing to the existence of the internal motion of its electrons. I need hardly say that our methods of calorimetry are by no means sufficiently delicate to detect anything of this kind. There might be a thousand such internal degrees of freedom, and yet the ratio of specific heats would agree with observation.

There is some analogy between this suggestion and the case of a sphere moving in a liquid. The presence of the liquid, although apparently endowed with an infinite number of degrees of freedom, does not really increase the degrees of freedom at all, because its motion is entirely defined by the motion of the sphere. In a somewhat similar manner, I would suggest that the presence of the million electrons does not sensibly increase the degrees of freedom of motion of the million atoms, as all their motions may be defined in terms of the motion of a few of them. That the ether would so control the motions of electrons seems almost certain from what we know of the rapidity with which electromagnetic actions are transmitted by it, showing how completely it behaves in respect of them as a system of rigid connections.

"Note on the Disease of Cabbages and allied Plants known as 'Finger and Toe,' &c." By George Massee, Royal Gardens, Kew.

The disease known in different parts of Britain as "finger and toe," "clubbing," or "anbury," attacks turnips, rape, cabbages of all varieties, radishes, and, in fact, most cultivated plants belonging to the order *Cruciferæ*. Several common weeds are also attacked, namely, charlock (*Brassica sinapistrum*, Boiss.); garlic-mustard (*Sisymbrium alliaria*, Scop.); treacle-mustard (*Erysimum cheiranthoides*, Linn.), and shepherd's purse (*Capsella bursa pastoris*, D.C.). The last-named is reported from the United States by Halsted (New Jersey Agric. Coll. Expt. Station; *Bulletin* 98, 1893), and has not been observed to be diseased in Britain, although one of our commonest weeds. The disease is characterised by the formation of numerous nodules on the root, which becomes much distorted and soon decays, forming a slimy, fœtid mass.

Berkeley (*Gard. Chron.*, p. 500, 1856) appears to have been the first to investigate the disease from a scientific standpoint, and although he did not succeed in determining the true cause, distinctly states that microscopic examination revealed the presence of a factor previously unknown in connection with plant diseases. Furthermore, Berkeley pointed out that wood ashes were a cure for the disease, and supposed this to be due to the presence of potash salts in the ash.

Owing to the serious amount of damage caused by "finger and toe" to the cabbage crop in Russia, the Government of that country offered a reward for the discovery of the cause of the disease. Woronin ("Pringsheim's Jahrb," vol. xi. p. 548, tabs. xxix.–xxxiv., 1878) undertook the investigation, and after years of patient study published an elaborate account, proving clearly that the disease was caused by a minute organism related to the fungi, to which he gave the name *Plasmodiophora brassicæ*.

In 1859, Voelcker (*Roy. Agric. Soc. Journ.*, vol. xx. p. 101, 1859) pointed out that the disease was influenced by the amount of lime present in the soil. Where little or no lime existed, as in light and sandy soils, the disease abounded, whereas in soil containing lime the disease was absent. This opinion is corroborated by the same author at a later date (*Op. cit.*, series iii. vol. v. p. 321, 1894).

A series of experiments have been carried out during four successive years at Kew, and they demonstrate the following points:—

(1) That in addition to cultivated plants, several common weeds belonging to the order *Cruciferæ* are attacked by the *Plasmodiophora*. Hence the necessity for preventing the growth of such weeds in fields and hedge-banks.

(2) That the germs of disease are present in soil that has produced a diseased crop, and retain their vitality for at least two years.

(3) That the development of *Plasmodiophora* is favoured by the presence of acids, and checked by the presence of alkalies, agreeing in this respect with the fungi rather than with bacteria.

(4) For the purpose of sterilising infected soil, experiments prove that either a dressing of lime or a manure containing potash salts is effective, the last being most valuable, as it not only destroys the germs in the soil but also arrests the disease in seedling plants, and at the same time supplies one of the ingredients necessary for the healthy growth of turnips.

February 21.—"Iron and Steel at Welding Temperatures." By T. Wrightson.

The object of this paper was to demonstrate that the phenomenon of welding in iron is identical with that of regelation in ice.

The author recapitulated experiments made by him in 1879–80, described in the *Proceedings* of the Iron and Steel Institute for those years. These experiments were upon cast iron, and proved that this form of iron possessed the property of expanding while passing from the liquid to the plastic state during a small range of temperature, and then contracted to the solid state, and that the expansion amounted to about 6 per cent. in volume. This property of iron resembles the similar property of water in freezing, which, within a range of about 4° C., expands about 9 per cent. of its liquid volume, and then contracts as the cooling proceeds.

This property of water was investigated by Prof. James Thomson and by Lord Kelvin. The former showed that from theoretical considerations there was reason to expect that in the case of a body exhibiting the anomalous property of expanding when cooled and contracting when heated, it should be cooled instead of heated by pressure or impact. Lord Kelvin investigated the problem experimentally as affecting freezing water, and completely demonstrated the truth of his brother's reasoning.

The experiments made by the author in 1879 and 1880 suggested the view that this property of ice was connected with the property of welding in iron, but this was only hypothetical, as the experiments had been made on cast iron, which probably, on account of the presence of carbon, does not possess the property of welding. Further, it was not practicable to experiment with wrought iron in the same way as with cast iron on account of the difficulty of dealing with that substance in its liquid form. Prof. Roberts-Austen has, however, given metallurgical research a recording pyrometer, and this has enabled the author to resume the investigation at the Mint. The method adopted was the heating of bars in an electric welder, and as soon as the junction of the bars was at a welding temperature, end pressure was applied by mechanical power, and the weld effected.

Observations show that a molecular lowering of temperature took place immediately the pressure was applied to the bar when in the welding condition.

The fall in temperature varied from 57° C. to 19° C., according to the circumstances of temperature and pressure.

The experiments appears to prove that wrought iron at a welding temperature possesses the same property of cooling under pressure which was proved by Lord Kelvin to exist in freezing water, and on which demonstration the generally received theory of regelation depends.

The author distinguishes the process of melting together of metals from that of welding. Either process forms a junction, but the latter takes place at a temperature considerably below the melting point.

The well-known and useful property of welding in iron appears, therefore, to depend, as in the case of regelation in ice, upon this critical condition, which exists over a limited range of temperature between the molten and the plastic state.

"Note on the Spectrum of Argon." By H. F. Newall.

In the course of a spectroscopic investigation in which the author has been for some time past engaged, a line spectrum, which so far as he was able to make out was unknown, had frequently presented itself upon his photographs. It appeared in May and June, 1894, under conditions which led him to call it, for the sake of convenience, "the low-pressure spectrum." It now appears that the lines are argon lines.

The argon of which the spectrum was observed was obtained from air, from which nitrogen was eliminated by passing electric discharge through it in presence of hydrogen or moisture and acid. Seventy-two lines in the author's "low-pressure spectrum" had their wave-lengths given in the paper, and side by side were given the measurements of the wave-lengths determined by Mr. Crookes for the argon lines.

The agreement of the measurements shows conclusively that the same spectrum was observed. The agreement of grouping and intensity, also, leaves no doubt as to the identity of the two spectra.

The experiments were repeated, with slight variations, several times with results which, so far as the spectrum of argon is concerned, were constant. But it was noted that continued passage of the discharge appears to result in the attaining of a certain minimum pressure, after which there is slight and slow rise to a tolerably-fixed pressure.

It is interesting to find argon asserting itself, unsolicited, in quite new circumstances, and under conditions which practically constitute one more mode of separating argon from nitrogen—namely, the getting rid of nitrogen by passing electric discharge through it in the presence of hydrogen or moisture and acid.

February 28.—"The Effect of Environment on the Development of Echinoderm Larvæ: an Experimental Inquiry into the Causes of Variation." By H. M. Vernon (from the Zoological Station, Naples).

The conditions of environment under which an organism develops are known to be of considerable influence in the production of variations. It was thought to be of interest to determine by exact measurement the effects which such slight changes in the environmental conditions as might occur naturally would produce in the growth of some organisms. The animal chosen was the larva or pluteus of the sea-urchin *Strongylocentrotus lividus*. These larvæ develop readily from artificial fertilisations, and they can, moreover, be obtained at all times of the year, irrespective of season. In all 10,000 larvæ were measured.

The effects of temperature on development were first studied. It was found that if the ova were placed in water at about 8° or 25° C. for an hour, or even for a minute, at the time of impregnation, the resulting larvæ after eight days development were, on an average, 4·6 per cent. smaller than those impregnated at from 17° to 22°, though all the subsequent conditions of development were identical. If kept at the abnormal temperature for only ten seconds during impregnation, the resulting larvæ were only 1·7 per cent. smaller.

The time of the year when the artificial fertilisations are prepared has a very marked influence on the size of the larvæ. Thus, those obtained in the middle of August are about 20 per cent. smaller than those obtained in April, May, and October, whilst those obtained in June and July are intermediate in size.

The salinity of the water has also a great influence on the development.

The effects which the various colours of the spectrum have upon the development were also determined, though these are not conditions of environment which occur in nature. The development of the larvæ seems to be but little affected if it is carried out in absolute darkness, the size only being diminished by 1·3 per cent. Larvæ grown in semi darkness are apparently 2·5 per cent. larger than the normal.

The body-length of the larvæ appears to be uninfluenced by the number of larvæ developing together in a given volume of water, if it be kept below 30,000 per litre. The arm-lengths are, on the other hand, considerably affected.

Certain products of metabolism exert a favourable influence on the developments of the larvæ, and not, as would be naturally expected, a harmful one.

As the number of measurements made was so large, it was thought to be of interest to subject them to statistical examination. It was found that with the body-length and oral arm-length measurements the deviations from the average occurred with a frequency indicated by the theoretical law of error. The measurements of the aboral arm-length did not agree so well, possibly owing to dimorphism.

Physical Society, February 22.—Captain Abney, F.R.S., President, in the chair.—An abstract of Mr. G. H. Bryan's paper, on the mechanical analogue of thermal equilibrium between bodies in contact, was read by Mr. Elder. After commenting on the difficulty in applying the kinetic theory of gases to the case of two substances in contact which do not mix, the author goes on to describe a system by which the phenomena of thermal equilibrium unaccompanied by diffusion can be explained. The two substances are represented by two sets of molecules designated by P and Q. Two parallel planes A and B, at a small distance apart, are imagined to divide space in three parts. Plane A (to the left of B) is supposed to be permeable to the P molecules, but to repel the Q molecules, whilst B is permeable to the Q set of molecules, and repels the P set. The spaces to the left of A and to the right of B are thus entirely occupied by the P and Q molecules respectively. Between the planes both P and Q molecules exist, and therefore have opportunities of colliding with one another and transferring energy from one gas to the other. Using generalised coordinates, it is shown by Boltzmann's method that when equilibrium is attained the mean kinetic energies of translation of the two kinds of molecules are equal, just as in the case of molecules which mix. Instead of assuming the planes A and B to repel the Q and P molecules respectively, the P molecules may be assumed to be positively electrified, and the Q ones negatively electrified, whilst the planes A and B are maintained at a constant difference of potential. The difference of potential thus assumed is analogous to "contact E.M.F." whose existence is proved by experiment. The communication concludes with a development of Prof. Boltzmann's paper on the application of the determinantal relation to the kinetic theory of polyatomic gases, read before the British Association at Oxford. Dr. Stoney thought the arguments were based on actions depending on the distances of the molecules, and the supposition that they were rigid. In his opinion events occur in nature which are not represented by this simple theory, and great reservation should be shown in accepting dynamical problems which leave out of account actions occurring between matter and the ether. In nature nothing was large and nothing was small except relatively. Even molecules might possess infinite detail of structure. Their interaction with the ether must be considered in any complete theory.—Mr. G. U. Yule's paper on a new harmonic analyser, and one by Mr. H. N. Allen, on the electromagnetic field, were postponed.

Chemical Society, February 21.—Dr. Armstrong, President, in the chair.—The following papers were read:—The electromotive force of an iodine cell, by A. P. Laurie. The E.M.F. of a cell consisting of a zinc and platinum plate immersed in iodine dissolved in potassium iodide solution is constant, but is the smaller as the iodine solution is the more dilute; the effect of varying the constituents of the cell on the E.M.F. has been investigated.—Contributions to the chemistry of cellulose, by C. F. Cross, E. J. Bevan, and C. Beadle. The melting-points of mixtures, by H. Crompton and Miss M. A. Whiteley. When a solution deposits the pure solvent on cooling, the relation $\log s = \frac{\rho}{1{\cdot}98} \cdot \frac{T - T^1}{T T^1}$ holds; s is the number of molecules of solvent per molecule of solution, ρ is the molecular latent heat of fusion of the solvent, and T and T^1 the melting-points of the solvent and the solution respectively.—The volumetric determination of manganese, by J. Reddrop and H.

Ramage. Schneider's process for the determination of manganese may be rendered much more accurate by substituting sodium bismuthate for bismuth peroxide.—Bromocamphoric acid, an oxidation product of π-dibromocamphor, by F. S. Kipping. A bromocamphoric acid is obtained by oxidising π-dibromocamphor; its anhydride has been prepared together with a new hydroxy-acid and a nitrobromocamphor.—Note on the action of diastase on cold starch-paste, by H. T. Brown and G. H. Morris.—On the magnetic rotation of some unsaturated hydrocarbons, by W. H. Perkin. The magnetic rotations of a number of unsaturated open-chain hydrocarbons have been determined; a comparison of hexane, hexylene, diallyl, and dipropargyl shows that the differences between the latter pair are of a different order to those of the former pair.

Linnean Society, February 7.—Mr. C. B. Clarke, F.R.S., President, in the chair.—Mr. Thomas Christy exhibited a dried specimen of *Aplopappus Llaretæ* and samples of the so-called Gum Kino, *Pterocarpus erinaceus*, of which some account was given by Mr. E. M. Holmes. Mr. George Murray exhibited a number of lantern slides of floating *Algæ*, of which he gave brief descriptions referring to the localities in which they had been found and the literature relating to them.—By permission of the Director of the Royal Gardens, Kew, Mr. W. B. Hemsley exhibited dried specimens of a number of new plants from Eastern Asia. Conspicuous amongst these was a new genus of *Scitamineæ* from the mountains of Northern Siam, characterised by having minute unisexual flowers destitute of staminodia, a one-celled ovary with parietal placentation, and two filiform stylodia; a remarkably broad-leaved *Lysimachia* from the same region; new species of *Hypericum*, *Ventilago*, *Mesona*, and *Helicia* from Formosa; and a new genus of *Cyrtandreæ*. From a collection made in Yunan, Western China, by Mr. W. Hancock, of Hong Kong, came a new *Jasminum*, allied to *J. nudiflorum*, with primrose yellow flowers an inch and a half in diameter; an elegant species of *Petrocosmea* (Cyrtandreæ), and a showy *Brandisia* (Scrophularineæ) with long racemes of crimson flowers, which were much admired.—Mr. Thomas Hanbury exhibited a beautiful collection of fresh fruits of the *Aurantieæ* grown in his own garden at La Mortola, Mentone, and gave an account of some of the more remarkable varieties, their mode of growth, and the conditions under which they had been grown.—A paper was then read by Mr. H. M. Bernard, on the comparative morphology of the *Galeodidæ*. Having described a possible origin for the Crustacea from a chætopod annelid by an adaptation of the anterior segments to a method of feeding, whereby the parapodia would function as jaws, the author attempted the same for the Arachnida with a view to solve the question of their relationship with the Merostomata. The *Galeodidæ* were chosen for special study because, unlike other arachnids, they have retained some segments of the cephalothorax as free movable segments, and hence might be expected to throw light on the subject. The author believed that he had solved the question of the primitive specialisation of the arachnid phylum from their annelidan ancestors, and expressed the opinion that as arthropods they are not related either to the Crustacea (including *Limulus*) nor to the Hexapoda; but that all these are distinct derivations of the Annelida. In an interesting discussion which followed, the paper was criticised at some length by Mr. A. D. Michael, Prof. Howes, and Mr. R. I. Pocock.

[PARIS.]

Academy of Sciences, February 25.—M. Lœwy in the chair.—On the penetration of a projectile in semi-fluids and solids, by M. H. Resal.—On a class of equations of which the general integral is uniform, by M. Emile Picard.—On the measurement of time in astronomy by a method independent of personal equation, by M. G. Lippmann. The author employs a photographic method. A platinum wire is rendered incandescent for a very short time at the commencement of each second by mechanical means. The light from the wire is, by the aid of arrangements described, thrown on to a photographic plate in such a way that the image formed corresponds precisely with the meridian of the place of observation. By suitable exposure a photograph is obtained of a portion of the heavens on the same plate. The time of transit of a given star can then be easily deduced from the horary circles photographed as above. M. d'Abbadie remarked with reference to an alternative micrometric method proposed by M. Lippmann, that Breguet had used a moving wire grating for measurement of the same quantities fifty years previously.—On the mutual relations of potential determinants, by M. de Jonquières.—Ebullioscopic study of certain colouring matters from triphenylmethane, by MM. A. Haller and P. Th. Muller. The conclusion is drawn that, under the given experimental conditions, the hydrochlorides of the colouring substances of the triphenylmethane amido group are not dissociated, whereas the chlorides of ammonium bases and nitrosodimethylaniline hydrochloride are most clearly dissociated. Hence an argument may be drawn in favour of formulæ of the type of $ClC : (C_6H_4.NH_2)_3$ due to M. Rosenstiehl.—M. Sappey gave a short description of the "Atlas of Descriptive Anatomy," presented by M. Laskowski.—The Academy elected M. Weierstrass as foreign associate, the votes given being: M. Weierstrass 43, Prof. Frankland 1, Prof. Huxley 1.—A closed communication from M. E. Carvallo, accepted May 2, 1892, was opened. It gave the theory of the laws of crystalline absorption. For uniaxial crystals these are: (1) For the ordinary ray, the index of refraction and the coefficient of absorption are constant, whatever may be the angle between the luminous ray and the crystallographic axis. (2) The law of the index of the extraordinary ray is not altered sensibly by absorption. (3) The absorption of the extraordinary ray is represented by the formula

$$\frac{k}{n^3} = \frac{k_o}{n_o^3}\cos^2\Theta + \frac{k_e}{n_e^3}\sin^2\Theta,$$

where k, n, Θ represent the coefficient of absorption, the index of refraction, and the angle between the normal to the plane of the wave and the crystallographic axis. A memoir will shortly be brought out dealing with these results and their developments.—M. L. L. de Koninck claims priority for the properties of nickel and cobalt sulphides.—Spectrum researches on the rotation and movements of the planets, by M. H. Deslandres. (See "Our Astronomical Column.")—Observations on the subject of the preceding communication by M. Deslandres, by M. H. Poincaré. The theoretical views which have been confirmed by the foregoing results.—Determination of the position of the pole by photography, by M. C. Flammarion. By exposure of a fixed plate, circular traces of the circumpolar stars are obtained as shown in the figure given with the paper. Hence the position of the pole can be obtained with great accuracy.—On a surface of the sixth order which is connected with Kummer's surface, by M. G. Humbert.—On functional equations, by M. Lean.—On the exact invariants of an ordinary differential equation of the second order, by M. Tresse.—On some theorems of Arithmology, by M. N. Bougaief.—Lowering of the freezing point and relative diminution of vapour pressure in dilute solutions, by M. A. Ponsot. The author deduces formulæ differing somewhat from those given by Wüllner and Raoult, and agreeing with those of van t'Hoff and Duhem, with the exception that a different meaning is given to one of the terms.—On the lowering of the freezing point of very dilute solutions, by M. A. Leduc. The author proposes the substitution of the measurement of a considerable pressure for a small temperature difference. A theoretical demonstration.—On a sensitive pressometer, for the measurement of fluid pressures, by M. Paul Charpentier.—The measurement of the intensity of light by the chemical action produced; experiments with mixtures of ferric chloride and oxalic acid, by M. Georges Lemoine.—On some combinations of lead iodide with other metallic or organic iodides, by M. A. Mosnier. A number of new double salts have been obtained and their composition determined.—On some combinations of nitric oxide with the chlorides of iron, by M. V. Thomas. The substances: (1) $Fe_2Cl_6.NO$, (2) $2Fe_2Cl_6.NO$, (3) $FeCl_2.NO.2H_2O$, and (4) $FeCl_2.NO$, have been obtained and their composition determined by analysis.—Action of formaldehyde on hydroxylamine hydrochloride and on methylamine hydrochloride, by MM. A. Brochet and R. Cambier.—Active amyl ethereal salts, by MM. Ph. A. Guye and L. Chavanne. A paper on the product of asymmetry.—New researches on the correlative variations of the intensity of thermogenesis and respiratory changes, by M. Laulanié.—"*Autonarcose carbonico-acétonémique*," or winter sleep of the marmot, by M. Raphael Dubois.—On the *Rhinatrema bivittatum*, Cuvier, by M. Léon Vaillant.—Evolution of the nervous system and of the vibratile organ in the larvæ of compound ascidians, by M. Antoine Pizon.—On the rôle of Amæbocytes in the Annelids, by Émile G. Racovitza. Amæbocytes serve not only to deposit

the excretory pigment in the epidermis, but when necessary, take up and digest for the benefit of the organism all the accumulated reserve substances.—Natural and artificial protophylline, by M. C. Timiriazeff.—On some applications of Oceanography to Geology, by M. J. Thoulet.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, MARCH 7.

ROYAL SOCIETY, at 4.30.—The Rubies of Burma and Associated Minerals: their Mode of Occurrence, Origin, and Metamorphoses. A Contribution to the History of Corundum C. Barrington Brown and Prof. Judd, F.R.S.—The Action of Heat upon Ethylene, Part II. Prof. V. B. Lewes.—On the Measurement of Pressures by the Crusher-Gauge: W. Kellner and W. H. Deering.

SOCIETY OF ANTIQUARIES, at 8.30.

LINNEAN SOCIETY, at 8.—On the Genus Cupressus: Dr. Maxwell T. Masters, F.R.S.—On the Insects, Arachnida, and Crustacea collected during Mr. T. Bent's Expedition to Hadramant, Arabia: W. F. Kirby, Chas. Gahan, and R. I. Pocock.

CHEMICAL SOCIETY, at 8.—Dimethylketohexamethylene: Dr. Kipping.—The Use of Barium Thiosulphate in Standardising Iodine: Dr. Plimpton and T. C. Chorley.—The Magnetic Rotation of the Plane of Polarisation of Light by Liquids: J. W. Rodger and W. Watson.—Trimethylsuccinic Acid: Prof. W. H. Perkin, F.R.S., and Dr. W. Bone.

FRIDAY, MARCH 8.

ROYAL INSTITUTION, at 9.—The Physical Work of Von Helmholtz: Prof. A. W. Rücker, F.R.S.

PHYSICAL SOCIETY, at 5.—Exhibition, by Mr. Naber, of a Voltameter.—(1) The Focal Heliostat; (2) An Improvement in Siderostats Dr. G. Johnstone Stoney, F.R.S. On a New Harmonic Analyser: G. U. Yule.—On the Electromagnetic Field: H. N. Allen.

ROYAL ASTRONOMICAL SOCIETY, at 8.—Micrometrical Measures of the Diameter of the Satellites of Jupiter; Micrometrical Measures of the Ball and Ring System of Saturn, and of the Diameter of Titan: E. E. Barnard.—Transit of Mercury, 1894 November 10: W. F. Gale; J. P. Thomson.—A List of Probably New Double Stars: R. T. A. Innes.—Double Star Measures: W. H. Maw and J. Tebbutt.—Notes on the Variable Stars X and W Sagittæ: Lieut.-Colonel Markwick.—Note on a Suggested Form of Equatorial Mounting for a Modified Newtonian Reflector: Rev. C. D. P. Davies.—On the Proper Motions of B.A.C. 793 and Cephei 24 (Hev.): W. T. Lynn.—The Wilsonian Theory and the Stonyhurst Drawings of Sun-spots: Rev. W. Sidgreaves.—Observations of Encke's Comet: Royal Observatory, Greenwich.—An Apparatus for Mechanically Calculating Star Corrections: W. E. Cooke.—Note on the above Paper: Prof. H. H. Turner.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Coordinate System of Surveying as employed in South Africa: A. Struben.

MALACOLOGICAL SOCIETY, at 8.

CLINICAL SOCIETY, at 8.30.

SATURDAY, MARCH 9.

ROYAL INSTITUTION, at 3.—Waves and Vibrations: Lord Rayleigh, F.R.S.

ROYAL BOTANIC SOCIETY, at 3.45.

ESSEX FIELD CLUB (at Stratford), at 6.30.—Notes on the Remains of Pleistocene Mammals found in the Neighbourhood of Chelmsford: E. T. Newton, F.R.S.—Note on the Section at Chelmsford in which the Mammoth and other Remains were discovered, November 1894: T. V. Holmes.

SUNDAY, MARCH 10.

SUNDAY LECTURE SOCIETY, at 4.—Perpetual Motion: Douglas Carnegie.

MONDAY, MARCH 11.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Three Years' Travelling and Fighting in the Congo Free State: Captain S. L. Hinde.

AFFILIATED PHOTOGRAPHIC SOCIETIES (Cordwainers' Hall, E.C.), at 8.—The Physics and Chemistry of Development: Thomas Bolas.

MEDICAL SOCIETY, at 8.30.

TUESDAY, MARCH 12.

ROYAL INSTITUTION, at 3.—Internal Framework of Plants and Animals: Prof C. Stewart.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Kidderpur Docks, Calcutta: William Duff Bruce.—Note on the Movement of the Walls of the Kidderpur Docks: James Henry Apjohn.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—The Changes in the Proportions of the Human Body during the Period of Growth Dr. Wingfield Hall.—Notes on the Language spoken in Madagascar J. T. Last.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—An Unconsidered Property of Photographic Lenses: T. R. Dallmeyer.

ROYAL VICTORIA HALL (Waterloo Bridge Road), at 8.—Photographic Astronomy: Mr. Knobel.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY, at 8.30.

ROYAL HORTICULTURAL SOCIETY, at 1.—The Diseases of Tomatoes and Vines.

WEDNESDAY, MARCH 13.

PHARMACEUTICAL SOCIETY, at 8.30.

SOCIETY OF ARTS, at 8.—The Meat Supply of the United Kingdom: E. Montague Nelson.

THURSDAY, MARCH 14.

ROYAL SOCIETY, at 4.30.

SOCIETY OF ANTIQUARIES, at 8.30

MATHEMATICAL SOCIETY, at 8.—The Invariants of the Binary Quantic of Unlimited Order: The President.—Certain π Functions: F. H. Jackson.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Electrolysis of Gold: N. S. Keith.

FRIDAY, MARCH 15.

ROYAL INSTITUTION, at 9.—The Rarer Metals and their Alloys: Prof. Roberts-Austen, C.B., F.R.S.

EPIDEMIOLOGICAL SOCIETY at 8.—The Value of Eucalyptus Oil as a Disinfectant in Scarlet Fever: Dr Joseph Priestley.

QUEKETT MICROSCOPIC CLUB, at 8.

SATURDAY, MARCH 16.

ROYAL INSTITUTION, at 3.—Waves and Vibrations: Lord Rayleigh, F.R.S.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Elements of Pathological Histology: Dr. A. Weichselbaum, translated by Dr. W R Dawson (Longmans).—Le Léman: F. A. Forel, tome second (Lausanne, Rouge).—Everybody's Pocket Lawyer (Saxon).—A Treatise on Elementary Trigonometry: Dr. J. Casey, new edition (Dublin, Hodges).—Appareils Accessoires des Chaudières a Vapeur: Dudebout and Cromeau (Paris, Gauthier-Villars).—Traité des Bicycles et Bicycletes: C. Bourlet (Paris, Gauthier-Villars).—Conic Sections: Dr. W. H. Besant, 9th edition (Bell).—Organic Chemistry—the Fatty Compounds: R. L. Whiteley (Longmans).—Smithsonian Geographical Tables: R. S. Woodward (Washington).—Les Aurores Polaires A. Angot (Paris, Alcan).—My Weather-wise Companion: B. T. (Blackwood).—The Fauna of British India, including Ceylon and Burma—Moths: G. F. Hampson, Vol. 3 (Taylor and Francis).

PAMPHLETS.—Index to the Literature of Didymium, 1842-1893 (Washington).—Report of S. P. Langley, Secretary of the Smithsonian Institution, for the Year ending June 30, 1894 (Washington).—Report on the Operations of the Department of Land Records and Agriculture, Madras Presidency, for the Official Year 1893-94 (Madras).—Zwei Neue Paradiesvögel: A. B. Meyer (Berlin, Friedländer).

SERIALS.—Natural Science, March (Rait).—Cassell's Magazine, March (Cassell).—Contemporary Review, March (Isbister).—Humanitarian, March (Hutchinson).—Bulletin de la Académie Royale des Sciences, &c., de Belgique, 65e Année 3e série, tome 29. No. 1 (Bruxelles).—Zeitschrift für Physikalische Chemie, xvi. Band, 2 Heft (Leipzig, Engelmann).—Scribner's Magazine, March (Low).—Zeitschrift für Naturwissenschaften, 66 Band, 5 and 6 Heft, 67 Band, 1 to 5 Heft (Leipzig, Pfeffer).—National Review, March (Arnold).

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