of books used in France, should be introduced as soon as possible to supersede Euclid's elements. Text-books adapted to modern needs are in use in the United States of America, and their chief characteristics are:—(1) The more orderly arrangement of propositions; (2) the entire separation of theorems from problems of construction, hypothetical constructions being used in proving a theorem; (3) the closer association of a proposition and its converse when both were true; (4) the adoption of arithmetical notions and algebraic processes; (5) the early introduction of simple *loci*; (6) insistence on accurate figures drawn by accurate and practical processes; (7) practice in exercises from the very beginning. It had been suggested to Prof. Lodge that he should add, "Attention paid to the various phases of a theorem as the figure changes, and (as the student progresses) to the easier forms of generalisation." The greater part of these improvements could be adopted at once, provided that the sanction of the great examining bodies could be obtained. A committee of the Association is being formed to cooperate with the committee of the British Association in advancing the reforms advocated in mathematical teaching.

THE work of the Sir John Cass Technical Institute, London, was inaugurated on January 15, when an introductory address was given by Sir William Roberts-Austen, K.C.B., F.R.S. The institute has been founded by the governors of Sir John Cass's Foundation, and is one of the London polytechnics aided by the Technical Education Board of the London County Council and by the City Parochial Foundation. The institute is situated in Jewry Street, Aldgate, and is readily accessible. It is provided with good laboratories for chemistry, metallurgy and physics, and on the art side with workshops and drawing rooms for the department of arts and crafts. Dr. C. A. Kohn is the principal of the institute. Sir William Roberts-Austen in his introductory address dealt chiefly with the subject of metallurgy. It was, he said, an industrial art depending for its success on what were called the applications of science, but he heartily wished that the term "applied science" had never been devised. There was no essential difference between what was called pure science and what was called applied. In industrial life they simply applied the facts of science to a particular set of conditions or to the solution of definite problems. This view was illustrated by reference to the process of cupellation, the history of which was described and illustrated by suitable experiments. The diffusion of solids was then referred to, and a summary was given of the steps that had led Sir William to the investigation of the diffusion of metals.

THE importance of geography in education was the subject of an address delivered by Mr. James Bryce, M.P., at the annual meeting of the Geographical Association held last week, Mr. Douglas W. Freshfield, president, being in the chair. The Association aims at the improvement of the teaching of geography by spreading the knowledge of all such methods as call out the pupil's intelligence and reasoning powers and make geography a real educational discipline, instead of merely loading the memory with names and isolated facts. After expressing his hearty sympathy with the objects of the Association, Mr. Bryce considered the place of geography in education under three aspects, viz., as the gateway to the physical sciences, the key to history, and the basis of commerce. In this country, as in Germany for some time, it is thoroughly realised by all progressive teachers that geography must be made as much as possible an experimental science—that the pupil's mind must be brought into contact with facts and not alone with words. The pupil taught to observe has it suggested to him how things are connected with one another; he acquires the habit of looking at the country and asking himself what are the physical causes which make the district what it is, and what is the relation between those different causes. As to geography being regarded as the basis of commerce, Mr. Bryce said that the producer and merchant ought to know where each article could be best produced, where the raw material comes from, what are the conditions of labour, which are the best points of manufacture, where are the best markets, and what are the lines of communication and transport. Although the commercial man has to rely upon trained observers he would do better if he acquired geographical knowledge himself, because he could develop for himself certain lines of policy upon which he could conduct his operations; his wider knowledge of the world would enable him to take, not only a more intelligent, but a more practically serviceable view of the action which in each particular case was to be taken, and which, of course, would be constantly shifting. If the heads of great business houses were thoroughly trained to observe these things and to look at them in a scientific way, a great deal would be done to enable the country to hold its place in the great commercial world.

IN view of the recognition with which scientific training is now meeting, as part of our educational system, some of the suggestions made at the Conference of Public School Science Masters on January 18 are of interest. Those responsible for the framing of the regulations for Army examinations were unanimously recommended by scientific men from all the great public schools, and from many others, to lay more stress upon the practical side of the science work. It was, further, suggested to them that quantitative work should be introduced and that physics should be given the place it deserves in the compulsory science papers. Moreover, what is to be sought is not knowledge-worship, but training, not the old-fashioned theoretical questions with which examiners find it so easy to elicit facts, but the construction of problems which, when worked out practically under their own eyes, will truly tell them the capabilities of the candidates. Testimony was also forthcoming that there are examiners who will take the trouble to examine in the latter way, and the meeting was in favour of allowing that greater scope to assistant practical examiners which they must have if large numbers of persons are to be examined at one time. The pernicious specialisation which takes place in schools as a result of the examinations for science scholarships at the Universities of Oxford and Cambridge was made abundantly clear, and some system advocated which will prevent this and at the same time ensure all boys in the school—and not the "intellectual refuse" and Army classes alone—having a proper scientific training for several years, whether they be classical or modern, literary or mathematical. A committee, it has been arranged, is to take up the matter. A sidewind during the discussion, as to whether classical boys do better than others in scientific work elicited the fact that at Woolwich, for instance, no rule one way or the other could be laid down. The necessity of culture as well as scientific education was a point that was touched upon, and might well form the subject of a future discussion. Biology as a school subject was rather pooh-poohed by one representative from Cambridge University, while its importance was just as strongly urged by a public school master. It came as no surprise to those familiar with what occurred last year, that a definite association was formed as a result of the conference which will arrange for similar and possibly more frequent meetings in the future. Principal Rücker has consented to become the first president of the Association of Public School Science Masters—a body the constitution of which will be somewhat elastic, as it is difficult to define what is a public school science master, but the title is sufficiently rigid to specify the character of the Association.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 20, 1901.—"The Anomalous Dispersion of Sodium Vapour." By R. W. Wood, Professor of Experimental Physics, Johns Hopkins University, U.S.A.

The modern theories of dispersion show that the effect of an absorption band is to lower abnormally the refractive index of the medium on the side of the shorter wave-lengths and raise it on the side of the longer wave-lengths. In some cases even the refractive index may fall below one on the blue side of the band, which means that light of a certain wave-length travels through the medium at a higher velocity than in a vacuum. Substances showing this peculiarity are exceedingly opaque to light, a thickness of a few wave-lengths absorbing completely all of the light for which this peculiarity exists.

It is quite possible to conceive of a medium with a strong absorption band in the middle of the visible spectrum having a refractive index greater than unity for all waves longer than the absorbed waves, and a refractive index less than unity for all shorter waves. A prism made of such a substance would deviate half of the spectrum in one direction and half in another direction, something in the manner of the direct-vision prism, except that the arrangement of the colours would be anomalous. Such a medium has been found in metallic sodium vapour, which is most beautifully transparent in addition to having the peculiarity before mentioned. By means of prisms of sodium vapour it is possible to form a complete anomalous spectrum, in which all the colours between the extreme red and violet are present, with the exception of a very narrow range at the D lines. It has been found that the refractive index is one for the extreme violet, greater than one for all colours on the red side of the D lines, and less than one for all colours on the other side, the maximum and minimum values occurring, of course, close to absorptionbands (the D lines).

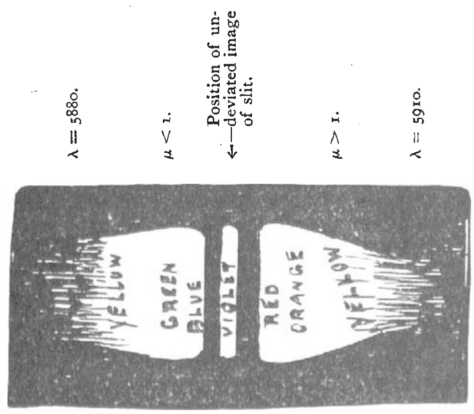

FIG. 1.

In the spectrum produced by a prism of sodium vapour the violet occupies the position of the undeviated image of the slit, the red and orange flaring off to one side, and the blue, green and yellow to the other, as is shown in Fig. 1.[1]

Inasmuch as sodium vapour appears to be the substance best adapted to class demonstration of anomalous dispersion, it is worth while to describe in some detail the apparatus by which the remarkable optical properties of the vapour can be exhibited, referring the reader to the original paper for a more complete discussion. (The paper is to appear also in the *Philosophical Magazine.*)

The first experiments were made with a large prism of cast iron, furnished with windows of mica or thin plate glass, in which the metal was heated in an atmosphere of hydrogen. Very beautiful results were at once obtained, but certain peculiarities of the vapour's action showed that the refraction was due chiefly to the action of a non-homogeneous medium, the planes of constant density being horizontal. Great trouble was caused by the windows, which soon became covered with a white deposit, which cut off most of the light. It being apparent, however, that the oblique faces played but a very small part, the effect being due almost wholly to the variable density of the vapour, it seemed best to make the most of this circumstance and dispense with the trouble entirely by removing the glass plates to such a distance from the heated vapour that no deposit took place. The arrangement finally adopted was simply a tube of glass about 30 cm. long, provided with plate-glass ends cemented on with sealing-wax. Hydrogen dried by passage over calcium chloride was conducted into and out of the tube by means of two fine glass tubes, arranged as shown in Fig. 2.

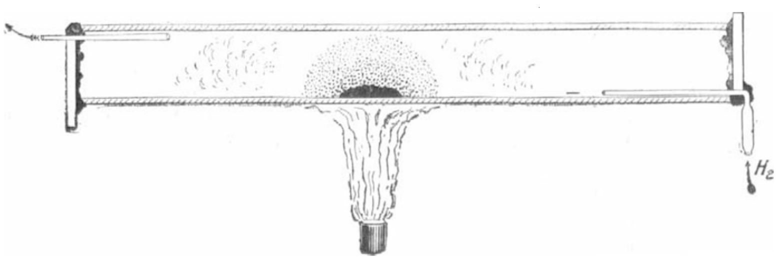

FIG. 2.

The diameter of the tubes should not be more than 2 mm., and they should lie close against the sides of the large tube in order not to cut off any of the light. The most suitable diameter for the large tube is 2 cm. The ends of the tube are first warmed and thickly coated with sealing-wax. One of the glass straws is placed in position, and a small piece of plate glass, previously warmed, applied to the end of the tube, any crevices around the straw being closed with wax. The leading-in tube is next placed in position and a piece of freshly cut sodium (about 5 mm. on a side) inserted. The other window is then cemented to the tube and the current of hydrogen started as soon as possible. Some experience is necessary to regulate properly the hydrogen stream during the experiment. When the tube is first heated much white smoke forms. If a stream corresponding to about one bubble per second is allowed to flow, the smoke will usually clear up in a few minutes and give little trouble. The tube should be heated by means of a Bunsen burner turned down low, the tip of the flame playing against the bottom of the tube. If a sodium flame is placed behind the tube the formation of the vapour can be watched, for it appears almost jet black against the flame, though quite colourless in white light. The behaviour of the vapour is somewhat peculiar. It grows out from the sodium globule as a dark atmosphere with a sharply defined surface, which clings to the globule with great tenacity. It resembles at first a thick growth of mould more than anything else, and a sudden gust of hydrogen scarcely moves it at all. A wire pushed up through it drags a certain amount above the free surface, in much the same manner as a stick pushed up through the surface of thick molasses would do. If the tube be inverted the black cloud clings to the upper surface, behaving, on the whole, like a very viscous mass. It is even possible to dip some of it up on a wire.

These peculiar physical properties of the metallic vapour have as yet only been studied in a very superficial manner, and they are mentioned now only because it appears that there is some connection between them and the optical behaviour of the medium.

The opinion is expressed that the apparent viscosity is an illusion; that the sharply defined surface is merely the boundary at which either condensation or chemical action (the hydrogen was not absolutely pure) is taking place. The process of dipping the vapour up on the wire might be explained by condensation on the wire followed by vaporisation. A more careful study of the physical behaviour of the vapour will be made some time in the future.

The apparatus employed in the study of the dispersion of the vapour was essentially identical with that used by Becquerel. The light of an arc lamp was focussed on the *horizontal* slit of a collimator, after traversing which the rays passed lengthwise through the dispersion tube. A second lens brought them to a focus on the slit of a spectroscope when the dispersion was to be studied by the method of crossed prisms, or in the focus of an eye-piece when the anomalous spectrum was to be viewed subjectively (Fig. 3).

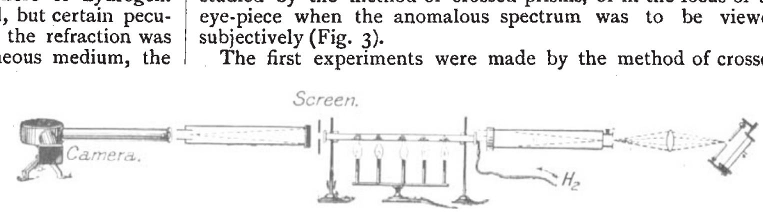

FIG. 3.

The first experiments were made by the method of crossed prisms, the spectrometer being furnished with a Rowland plane grating, which showed the sodium lines widely separated. It was at once apparent that far better results could be obtained with the dispersion tubes than had ever been observed with prismatic flames. The curved branches of the diffraction

[1] This spectrum is illustrated by a coloured plate in the original paper.

spectrum on each side of the D lines were perfectly sharp and steady, and the dispersion could be traced a considerable distance up and down the spectrum. On the slit of the spectrometer appeared, instead of the white image of the horizontal slit, a most beautiful anomalous spectrum of great brilliancy and purity. The spectrometer was at once removed and an eye-piece put in its place, when a most superb spectrum revealed itself (Fig. 1).

Before discussing this spectrum in detail it will be better to take up the results of the experiments made by the method of crossed prisms. On first heating the tube the curvature of the

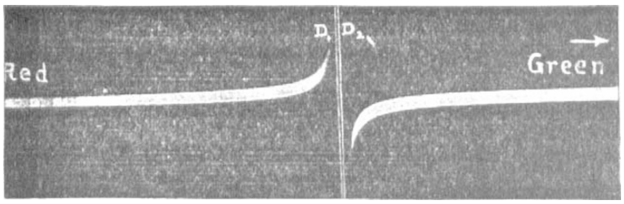

FIG. 4.

spectrum between the D lines as well as on each side is observed, the appearance being identical with that figured by Becquerel, but in a few seconds the vapour becomes so dense that total absorption of all the light between the lines occurs. The oppositely curved branches adjacent to the region of absorption extend rapidly up and down as the tube grows hotter, the ends finally passing out of the field of the instrument. A beautiful fluted absorption appears in the red and the greenish-blue, which finally blots out a region in the blue almost entirely. Meanwhile the curvature of the spectrum

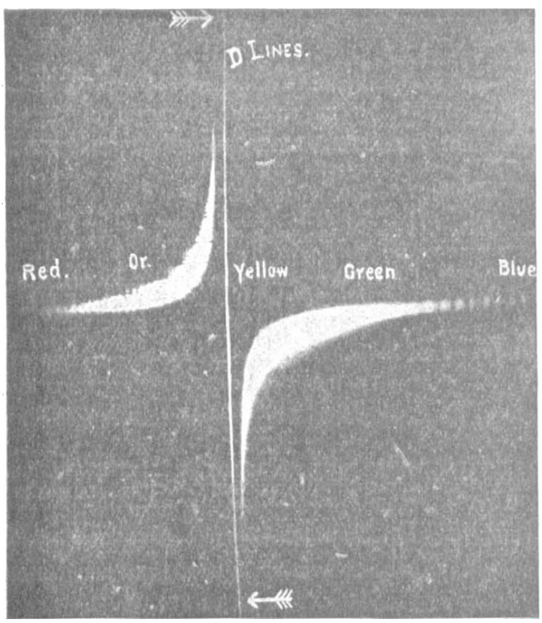

FIG. 5.

increases in a most remarkable manner, and the entire red end is lifted high above the green-blue end. As the density of the vapour increases the red gradually fades away, leaving only the yellow and green and the remote blue and violet, the curvature increasing all the while.

Figs. 4 and 5 are photographs of the continuous spectrum after dispersion by means of a prism of sodium vapour. They give a very good idea of what is seen with the apparatus arranged as shown in Fig. 3. The sodium lines were impressed on the plate by holding a sodium flame in front of the slit of the spectrometer after the exposure was over. In Fig. 5 the arrows indicate the points to which the curved branches could be traced in the original negative. Eye observations enable them to be traced much farther, for they are very feeble at the tips, and the light is not very actinic.

For the exhibition of the actual spectrum produced by a prism of sodium vapour a long dispersion tube with a battery of four or five prisms gives the best results. A small Bunsen burner should be used for each of the fragments of sodium, which should be at least 6 or 8 cm. apart. A coloured drawing of the spectrum, which has already been mentioned, was made when the spectrum was obtained in this manner. A single prism gives a very pretty anomalous spectrum, but the magnificent effect produced by the battery makes the slight amount of extra trouble well worth while. If the electric arc is employed as the source of light, the extreme violet will be found to occupy the position of the undeviated image of the slit (Fig. 1). Then comes the blue, sometimes in contact with the violet and sometimes slightly separated by a fine dark line, owing to the fact that the violet light comes from the fluted carbon band of the arc, which is separated from the blue by a comparatively dark region. Then comes a wide gap corresponding to light absorbed by the sodium vapour in the blue-green region (the channelled spectrum), and above this a beautiful flare of colour ranging from blue-green through grass-green to yellow. The red and orange portion of the spectrum is on the other side, or below the undeviated image, forming another brilliant flare of colour. It is separated from the violet by a wide dark band, due to the absorption in the vicinity of the D lines. If the density of the vapour is increased by heating the tube to a higher temperature, the red flare extends lower down, grows fainter, and finally fades away owing to the presence of the fluted absorption bands in the red. The green and blue persist, however, becoming more widely separated, but finally the green disappears almost entirely. It is best to arrange the gas cock so that the height of the flames can be controlled without leaving the eye-piece, for it is surprising how slight a change is necessary to completely alter the general appearance of the spectrum. The glass tube should not be allowed to cool until the experiment is at an end, otherwise it will immediately fly to pieces when the flame is again applied to it.

While glass answers very well if the experiment is to be of short duration, sheet iron is much more satisfactory. Suitable tubes can be made by any tinsmith. They should be made of thin sheet iron, and the turned-over seam should be hammered until a tight joint is formed. These tubes can be heated and cooled any number of times and can be kept in operation for an hour or two, at the end of which time the sodium is generally used up, a moss-like deposit of oxide gradually filling up the tube. The tubes can be used over and over again without deterioration, and are most satisfactory in every respect. Their only fault lies in their conductivity, the sealing-wax softening and the glass plates falling off; but this can be prevented by wrapping a strip of cloth around each end and wetting it from time to time. One tube was made with water jackets at each end, but it seems to have no especial advantage, and is more complicated. Porcelain tubes are quite satisfactory, but the iron is to be preferred on the whole.

By employing a tube of about 5 cm. diameter the anomalous spectrum can be projected, but the appearance is so very inferior to that of the phenomenon when seen subjectively that the method is not recommended.

Royal Astronomical Society, January 10.—Dr. J. W. L. Glaisher, F.R.S., president, in the chair.—In a paper on periodic orbits Mr. E. T. Whittaker communicated two theorems relating to the periodic solutions of the differential equations of dynamics and astronomy. The first theorem furnished a criterion for the discovery of periodic orbits; if a certain function of position be negative for all points of a closed curve and positive for all points of a curve enclosing this, then a periodic orbit exists in the ring-shaped space between the curves. The second theorem was concerned with an integral, the value of which when integrated over the region bounded by a periodic orbit is equal to the number of centres of force enclosed by the orbit.—Prof. H. H. Turner read a paper by Major Burrard, of the Indian Survey, on the attraction of the Himalaya Mountains upon the plumb-line in India. A chart was exhibited, showing a supposed underground source of attraction running across central India.—Lantern slides were shown of photographs taken by

Mr. Ritchey at the Yerkes Observatory of the nebula surrounding the new star in Perseus, and Mr. Newall described Prof. Kapteyn's suggested explanation of the apparent rapid motion of the nebula as shown in the photographs.—Mr. Lewis read a paper on the orbit of the binary star Σ 1639 in Coma Berenices. —The secretary read a paper by Mr. Robinson, of the Radcliffe Observatory, Oxford, upon a comparison of the visual and photographic magnitudes of Nova Persei.

Linnean Society, December 19, 1901.—Prof. S. H. Vines, F.R.S., president, in the chair.—Prof. G. B. Howes exhibited a marine organism received from Dr. Gilchrist, of South Africa. It measures 15 cm. in length, and is structureless and transparent, in section four-sided, with its angles prolonged and each intervening area concave. A central tubular cavity is present, and at one end a deep constriction, which may be due to wave-action or other artificial causes. Ideas of a ctenophoran, the cast-off test of a tunicate of the distoma type, of a myxicolid worm-tube, an egg-capsule, and others which had occurred, had all been discarded; and after having submitted the object to a dozen trained experts, he put it forward in the hope of obtaining a clue to its significance and zoological position. In commenting upon this exhibit, the president said he believed the occasion was probably the first in the history of the Society upon which an object had been laid upon the table to which no one could give a name.—Prof. Howes also exhibited a mounted specimen of the giant argulus (*A. scutiformis*) from a Japanese Tetrodon. —Mr. J. E. S. Moore exhibited the entire specimen and a microscopic preparation, with drawings, of a new polyzoon, encrusting the shell of Paramelania, dredged on the west coast of Lake Tanganyika, at a depth of 25 fathoms. He showed it to be typically gymnotæmatous, and to present characters most nearly suggestive of the marine genus Arachnidium.—Dr. C. W. Andrews gave a short account of his recent visit to Egypt, and showed lantern-slides illustrating some of the districts in which vertebrate fossils were collected. The most important journeys were to Mozara with Mr. T. Barrow, and to the Fayûm with Mr. H. J. L. Beadnell, officers of the Egyptian Geological Survey. In the former locality remains of Mastodon, Brachyodus and other vertebrates of Lower Miocene age were found; and in the latter a large series of bones from Middle and Upper Eocene beds was collected. These bones include a number of very interesting forms, some of which (Palæomastodon and Mœritherium) seem to be early proboscidians, and indicate that that group originated in an Ethiopian land-area which became united to the Palæarctic land in Oligocene times. A number of plaster-casts of some of the more important specimens were shown.—Mr. Miller Christy exhibited and made remarks on a specimen of White's Thrush, *Turdus varius*, Pallas, which had been shot near Clavering, in Essex, so long ago as January 1894, and had been preserved for Mr. Rolfe, but had only recently been identified as a rarity. Mr. J. E. Harting stated that about the same time another bird of this species, which he had seen, had been procured near Southampton, and that the two might well have arrived in company from Siberia. After pointing out the geographical distribution of the species and its distinguishing characters, he exhibited coloured figures of the egg, which is one of the rarest in collections; and, for comparison, a figure of the egg and nest of the allied *Turdus lunulatus* of Australia.—The Rev. John Gerard exhibited a nest of the sand-martin (*Cotile riparia*) made within the nest of a dipper (*Cinclus aquaticus*), found near Bashall Hall, Yorkshire, in which eggs of the former bird had been laid and hatched after the latter had ceased to occupy it.—Mr. S. Pace exhibited specimens of the common Torres Straits snail *Planispira* (*Trachiopsis*) *delessertiana*. He likewise exhibited a specimen and drawings from life of a rare pelagic tectibranch, *Euselenops* (*Neda*) *luniceps*, taken in Friday Island Passage, Torres Straits. —Mr. S. Pace read a paper on the gasteropod Pontiothauma, Sm., giving an account of the anatomy of this remarkable genus, with special reference to the proboscis and its associated parts, as observed in a specimen from the Indian seas, furnished some years ago by Dr. Alcock, of the Calcutta Museum.—Mr. F. Chapman read a paper on the Ostracoda collected round the Funafuti Atoll. This collection, which had been placed in his hands for examination and description by Prof. Judd, C.B., F.R.S., was obtained from various sources during the work of the expedition for the purpose of boring in the Atoll. The specimens represented the recent deposits obtained by dredging outside the Atoll, chiefly at moderate depths, but many were also selected from the dredgings in the lagoon, as well as from the beach-sands, the deep-sea deposits and the sands from the Atoll boring. The total number of species was fifty-two, six of which were found to be undescribed. The occurrence of the genus Limnocythere was considered noteworthy on account of its fresh-water habit.

Royal Meteorological Society, December 15, 1901.—Mr. W. H. Dines, president, in the chair.—The Symons gold medal was presented to Dr. Alexander Buchan, F.R.S., for his work in connection with meteorological science.—The president in his address dealt with the theory of probability applied to various meteorological problems. He considered that for all practical purposes weather conditions may be looked upon as purely accidental, and that we may apply to them the laws of chance. They are not by any means in reality a matter of chance, for although we cannot discover it, there is doubtless a cause for each kind of weather, normal or abnormal. After speaking upon the subject of weather forecasting, he dealt with the question, How long is required to obtain a true average? He has come to the conclusion that ten years' temperature observations give a mean of which the probable error is a little under one degree; thirty years reduce this to half a degree, fifty years to one-third of a degree, and a hundred years to one-quarter of a degree. After dealing with barometer observations and rainfall, he proceeded to speak of weather almanacs, cycles, &c. In conclusion he said that meteorology is far more than a statistical science, and is very closely dependent upon theoretical mechanics and thermodynamics, and in the application of these subjects to meteorology lies the best hope of advance. The council for the ensuing year were then elected, Mr. W. H. Dines being the president and Mr. F. C. Bayard and Dr. H. R. Mill secretaries.

PARIS.

Academy of Sciences, January 13.—M. Bouquet de la Grye in the chair.—On the periods of double integrals and on a class of linear differential equations, by M. Émile Picard.—The preparation and properties of the hydride of sodium, by M. Henri Moissan. Metallic sodium is attacked by hydrogen gas at a temperature of about 400° C., the hydride thus formed dissolving in the excess of metal, from which it can be isolated in a slightly impure state by treatment with liquefied ammonia at −40° C. Pure sodium hydride was finally obtained by heating sodium wire in hydrogen at 370° C., keeping the upper portion of the tube slightly cooler. Under these conditions the hydride condenses on the cooler part in crystals, which upon analysis proved to be NaH. It is attacked by the slightest trace of water and catches fire in moist air. The hydride is attacked by gaseous fluorine and chlorine, but remains unaltered in the presence of liquid chlorine at −35° C. It resembles potassium hydride in its powerful reducing properties.—The cultivation of lucerne upon soils without lime, by MM. P. Dehérain and E. Demoussy. Lucerne and clover grow feebly in soils without lime if the bacteria-producing nodosities are present. The addition of lime increases the vigour of growth in both cases.—On integral parameters, by M. Alf. Guldberg.—On the theory of entire functions, by M. Pierre Boutroux.—On radioactive bodies, by M. P. Curie and Mdme. S. Curie. The authors have taken two hypotheses as guiding principles in their researches on the radioactive bodies; that radioactivity is an atomic property of bodies, and that each atom of a radioactive substance behaves as a constant source of energy. Experiments carried out over several years show that for uranium, thorium, radium and probably actinium, the radiant activity remains constant if the chemical and physical state of the radioactive body remains the same. Polonium alone appears to be an exception to this rule. —A principle relating to the distribution of the lines of magnetic induction, by M. Vasilesco Karpen. The principle is laid down that in a magnetic medium submitted to the action of a certain number of magnetomotive forces, the course of the lines of induction is such that the intrinsic energy of the medium is a maximum.—On the difference of potential and the deadening of the oscillatory spark, by M. F. Beaulard. A correction of an arithmetical error in a previous paper.—Telephony without wires through the earth, by M. E. Ducretet. By the use of a microphone, messages were transmitted through the earth with remarkable clearness, without any of the secondary noises so annoying in telephony with conducting wires.—The influence of low barometric pressures on the frequency of the polar aurora, by M. H. Stassano. A clear connection is traced between the frequency of the appearance of the aurora and a low barometer.—The earthquakes due to folding in the Erzgebirge, by M. F. de Montessus de Ballore. The numerous slight earthquakes in this region are traced to the effect of three long folds in the strata, the Erzebirge being the longest and highest of the three.—On the aberration of sphericity of the eye, by M. Georges Weiss.—The preparation and properties of strontium hydride, by M. Henri Gautier. A strontium-cadmium alloy containing about 45 per cent. of strontium is heated in a current of hydrogen to a dull red heat. The hydrogen is slowly absorbed and the cadmium volatilised. Towards the end of the operation the temperature is raised until the mass is fused. Analyses of the compound showed that its composition was SrH_2. It proved to be analogous both in composition and properties to the calcium hydride of Moissan.—On the chemical equilibrium of the iron-carbon systems, by MM. Georges Charpy and Louis Grenet. The theory of Bakhuis-Roozeboom on the constitution of the compounds of iron and carbon, although complete from the theoretical side, has met with some objections from the practical point of view. The separation of graphite would appear to be largely conditioned by the amount of silicon present. An experimental study of the effect of silicon is given in the present paper.—On the thermoelectricity of steels and nickel-steels, by M. G. Belloc. The proportions of nickel in the nickel-steels studied varied from 5 to 35 per cent. The general form of the curve giving the relation between the electromotive force and the temperature for platinum-nickel steel couples is parabolic, the alloy containing 5 per cent. of nickel being exceptional in this respect. The steels containing 5 per cent. and 28 per cent. of nickel at about 400° to 500° C. show brusque variations, indicating molecular transformations. The 28 per cent. nickel steel is remarkable for its high neutral point and the great electromotive force developed.—The action of mixed organo-magnesium compounds upon trioxymethylene, by MM. V. Grignard and L. Tissier. Trioxymethylene reacts slowly at the boiling temperature upon an ethereal solution of the organo-magnesium compounds with the formation of primary alcohols. Numerous alcohols have been thus prepared synthetically, and the method appears to be of wide generality. Thus starting with ethyl bromide, normal propyl alcohol is obtained with a 65 per cent. yield; the reaction also holds in the aromatic series.—The preparation and properties of the imido-dithiocarbonic esters, by M. Marcel Delépine.—On the inversion of saccharose, by M. P. Petit. An attempt at the direct measurement of the heat of inversion of sugar.—On the solubility of calcium phosphate in pure water, by M. A. Rindell.—On the methods for the volumetric estimation of copper, iron, antimony, zinc dust, sulphur in sulphides, and glucose by means of stannous chloride, by M. Fred. Weil.—On the geographical distribution and adaptation to fresh water of some marine forms, by MM. C. Vaney and A. Conte.—On a crustacean commensal with Pagurus, *Gnathomysis Gerlachei*, a type of a new family of schizopods, by MM. Jules Bonnier and Charles Pérez.—The action of tannins and colouring matters on the activity of yeasts, by M. A. Rosenstiehl.—The mechanism of synthesis of an isomeric leucine, by MM. A. Etard and A. Vila. Leucine derived synthetically from amyl alcohol is different from biological leucine.—On the extraction of boletol, by M. Gabriel Bertrand.—On the fracture of the fore-arm due to a premature explosion in an automobile motor, by M. H. Soret.—The discovery of the mammoth and of a Palæolithic station in Basse-Provence, by M. Repelin.—On the structure of the subterranean hydrographic network in limestone regions, by M. F. Fournier.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 23.

ROYAL SOCIETY, at 4.30.—(1) Mathematical Contributions to the Theory of Evolution. XI. On the Influence of Natural Selection on the Variability and Correlation of Organs; (2) On the Correlation of Intellectual Ability with the Size and Shape of the Head. Preliminary Notice: Prof. K. Pearson, F.R.S.—A Short Description of the Culicidæ of India, with Descriptions of New Species of Anopheles: F. V. Theobald.—The Affinity of Tmesipteris with the Sphenophyllales: Prof. A. P. W. Thomas.—On the Excretory Organs of Amphioxus: E. S. Goodrich.—On the Mechanism of the so-called "Peripheral Reflex Secretion" of the Pancreas. Preliminary Communication: Dr. W. M. Bayliss and Prof. E. H. Starling, F.R.S.

ROYAL INSTITUTION, at 3.—Recent Excavations at Delphi and in the Greek Islands: Dr. A. S. Murray.

SOCIETY OF ARTS, at 4.30.—Bengal: the Land and its People: F. H. Skrine.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Earth Currents derived from Distributing Systems: E. B. Wedmore.

FRIDAY, JANUARY 24.

ROYAL INSTITUTION, at 9.—The Discovery of the Future: H. G. Wells

PHYSICAL SOCIETY, at 5.—The Factors of Heat. Part I.: James Swinburne.—Exhibition of some Twinned Crystals of Selenite: Eustace Large.

SATURDAY, JANUARY 25.

ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford, Essex), at 6.30.—Note on Occurrence of *Amanita citrina*, Gon. and Rab., in Epping Forest: George Massee.—Local Archæological Exploration: Charles H. Read.

MONDAY, JANUARY 27.

SOCIETY OF ARTS, at 8.—The Purification and Sterilisation of Water: Dr. Samuel Rideal.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Maldive Islands: J. Stanley Gardiner.

INSTITUTE OF ACTUARIES, at 5.30.—The Actuarial Aspects of Recent Legislation, in the United Kingdom and other Countries, on the Subject of Compensation to Workmen for Accidents: John Nicoll.

TUESDAY, JANUARY 28.

ROYAL INSTITUTION, at 3.—The Cell: its Means of Offence and Defence: Dr. Allan Macfadyen.

SOCIETY OF ARTS, at 4.30.—To the Victoria Nyanza by the Uganda Railway: Commander B. Whitehouse.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Sewerage Systems of Sydney, N.S.W., and its Suburbs: J. Davis.—The Bacterial Treatment of Trades Waste: W. Naylor.

WEDNESDAY, JANUARY 29.

SOCIETY OF ARTS, at 8.—Technical Education as applied to Paper Making: Clayton Beadle.

THURSDAY, JANUARY 30.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: The Chemical Origins of the Lines in Nova Persei: Sir N. Lockyer, K.C.B., F.R.S.—The Specific Volumes of Oxygen and Nitrogen Vapour at the Boiling Point of Oxygen: Prof. James Dewar, F.R.S.—The Distribution of Magnetism as affected by Induced Currents in an Iron Cylinder when rotated in a Magnetic Field: Prof. Ernest Wilson.

ROYAL INSTITUTION, at 3.—Recent Excavations at Delphi and in the Greek Islands: Dr. A. S. Murray.

FRIDAY, JANUARY 31.

ROYAL INSTITUTION, at 9.—The Ions of Electrolysis: Prof. A. Crum Brown, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Quay-Walls of Keysham Harbour: J. C. Collett and W. H. C. Clay.

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