

chamber, as is done by Prof. Sampson at the Royal Observatory at Edinburgh. The other condition is much more difficult. There is, besides the almost inevitable friction of the escapement, the effect of the buoyancy of the air. This last can be avoided by enclosing the whole clock in a glass case, tightly fitted, in which the air can be slightly rarefied and maintained at a constant pressure below that of the atmosphere. This would seem to offer a very satisfactory solution of the difficulty. Temperature error and buoyancy error having thus been to a great extent mastered, we come back to the forces connected with the maintenance and recording of the motion as the principal sources of uncertainty. And let no one suppose that little has been effected. Perfection in this, as in other human pursuits, is doubtless unattainable, but we approach it asymptotically, and we are farther along the asymptote than might be imagined. Prof. Sampson tells us that in his thermostatic chamber and barostatic cases, and with the Riefler, Cottingham, and Synchronome escapements which he is studying, the errors average no more than one-hundredth of a second per day—that is, at the rate of one minute in sixteen years, if the clock could run so long without stopping—truly an almost miraculous accuracy, unrivalled, I imagine, in any physical measurement. Anyone, therefore, who hopes to improve upon this has a difficult task before him. If it is true that *le mieux est l'ennemi du bien*, it must be acknowledged that *le mieux* has against him a most formidable antagonist.

[The lecture was illustrated by a number of working models.]

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

EDINBURGH.—Dr. James Drever has been appointed Coombe lecturer in psychology.

The University Court has resolved, subject to the approval of the Senatus and to the co-operation of the Town Council, to invite the British Association to hold the annual meeting in 1921 in Edinburgh.

An important step has recently been taken in the purchase of 100 acres of land for University extension. The land lies on the south side of the city, about two miles from the present University, and in the neighbourhood of the Royal Observatory on Blackford Hill. There will be ample scope in the immediate future, not only for the building of laboratories and hostels, but also for accommodation for sports and athletics.

GLASGOW.—The following doctorates were among the degrees conferred on April 22:—*M.D.*: W. E. Boyd. Thesis: "The Colloidal State of the Blood Serum and its Electrical Reactions." *D.Sc.*: D. Burns. Thesis: "On the Physiological Significance of Guanidin, especially in its Relation to Creatin-Creatinin Metabolism," with other papers.

THE standard of education in Central Europe presents notable divergences from that to which we are accustomed. It is measured by the percentage of illiterates among those who exceed the age of six years. As one goes east the percentage increases. Among the northern Slavs, the Czechs are well educated, their percentage being 4; next come the Slovaks with 20 per cent.; then the Poles of Galicia with a percentage twice that of the Slovaks; and finally there are the Ruthenes, or Little Russians, of Galicia, Hungary, and the Ukraine, with a percentage of 80, double that of the Poles. Among the Slavs of the south, the Slovenes who border on Italy have a per-

centage of 20; then come the Croats with a percentage of 60, and the Serbs with one of 70. Between the two branches of Slavs lie the Italians, who vary from 7 to 40 per cent. in illiteracy; the Germans of Austria, whose numbers lie between 2 and 20; the Magyars of Central Hungary, who are about as well educated as the Slovaks or Slovenes; and, finally, the Rumanians of Transylvania, three out of four of whom are illiterate. These differences are a result of two factors: first, nearness or remoteness from Western civilisation, and, secondly, religion—the western folk are Roman Catholics and the eastern folk adhere chiefly to the Greek Church.

A COPY of the calendar for 1917-18 of the Imperial University of Tokyo has been received. The calendar is published biennially, and an examination of the present issue serves admirably to illustrate what rapid strides in the provision of facilities for higher education have been made in Japan in recent years. Among other constituent colleges of the University the calendar deals with the College of Science, and gives full particulars of the extensive collections of specimens in the Natural Science Department and of the numerous adjuncts with which the college is provided; for instance, the Tokyo Astronomical Observatory, the Botanic Gardens of forty acres at Koishikawa, the Seismological Observatory, and the Marine Biological Station at Misaki, primarily intended for the use of instructors and students of the University, but available for other workers in biological research. Similarly, in connection with the flourishing College of Agriculture, every facility seems to have been provided. There are farm, nursery, and botanical gardens; laboratories for agricultural chemistry, forestry, fisheries, and for studying silkworm diseases, as well as numerous museums devoted to specific objects. A veterinary hospital is situated in the grounds of the college; a pomological garden has been laid out in Rokugo; and there are nine forests attached to the college. The University also includes an institute for the study of infectious diseases, where are arranged the investigation of the etiology, prophylaxis, and treatment of infectious and parasitic diseases, and experiments with disinfecting, prophylactic, and curative agents. The calendar runs to 402 pages, which teem with interesting particulars concerning the activities of the other faculties, and is illustrated also with charts, diagrams, and plans to make clear the working arrangements of this centre of higher learning.

THE British Science Guild has just issued a memorandum on the question of the appointment of a Departmental Committee to inquire into the existing provision of university and higher technical education in the United Kingdom, and also as to the desirability of appointing a consultative committee, including representatives of industry, to advise the Board of Education in matters affecting the relationship of science and industry to education. It is now thirty-seven years since the fruitful inquiry by a Royal Commission was held as to the provision for scientific and technical education, not only in this country, but also in Europe generally and the United States, which revealed our serious deficiency, and led ultimately to the adoption of the Technical Instruction Acts of 1889 and 1891, and to the valuable results which ensued. It is felt that the time is ripe for a further inquiry as to our present facilities for scientific and technical education with the view of ascertaining how far it is adequate to the needs of our chief manufactures in face of the great advances made abroad in the chemical, iron and steel, textile, optical glass, and other important industries. Especially is it desirable to learn what means exist for the encouragement and

adequate training of efficiently educated youths as leaders in our chief industries and what number avail themselves of such training. Certainly it would be found far below that of Germany or the United States, our chief industrial competitors. Inquiry should also be made as to the disposition of our chief technical institutions, especially those equipped for the efficient training of day students, and as to the desirability of the official recognition of such institutions as specialise in the science and technology of certain industries, e.g. iron and steel at Sheffield; cotton textiles and chemical products, particularly dyes, at Manchester; the leather industry at Leeds; shipbuilding at Glasgow, Newcastle, and Belfast; mining at Wigan, Newcastle, and Cardiff; textiles other than cotton at Leeds, Huddersfield, and Bradford; mechanical and electrical engineering at various chief centres, etc. There is reason to believe that public opinion is ripe for much larger support both from local and State funds. The new Education Act will certainly add largely to the number of capable students who will need the help of maintenance scholarships, which should, in consequence, be very largely increased, so as to enable them to proceed to higher institutions for whole-time study. It is to be hoped that this important memorandum will be circulated to every Member of Parliament and to all the education authorities and chief industrial associations throughout the kingdom.

### SOCIETIES AND ACADEMIES.

LONDON.

**Optical Society**, April 10.—**J. W. French**: The unaided eye. After a brief historical introduction, the principal dioptric features of the eye were considered, particularly those relating to the pupil reflexes. By means of a simple pupilometer the diameter of the pupil when applied to optical instruments was measured. The variations of the pupil with varying illumination of the whole retina, of the macula lutea, and of several zones of constant area were also measured and the results discussed. It would appear that for the macula lutea the pupil area varies as the fifth root of the illumination. The zone around the macula lutea is more sensitive, and the sensitiveness diminishes thereafter towards the margin of the retina. So far as the pupil reflexes are concerned, the two eyes are quite independent of each other; while the pupil area of the one eye under constant illumination remains constant, the other eye under simultaneous variation of the illumination varies in accordance with the above law. The variation of the pupil area with accommodation is quite independent of the illumination, and is determined by the refractive power of the crystalline lens.—**T. Smith**: The spacing of glass-working tools. In constructing optical systems the exact curvatures for the surfaces determined by calculation need not be employed, but the departures must lie between limits which will be functions of the nominal curvatures. It follows that a system of properly spaced tools should suffice to meet all normal requirements. The basis on which a system should be constructed is discussed, and a proposed standard list of tools is derived from an aberrational condition, together with assumed extreme relations between aperture and focal length and between aperture and radius of curvature. The total number of tools, which is finite, occurs as an independent variable in the formula on which the system is constructed, and in the absence of experimental investigations this must be determined by comparing the results obtained from an arbitrarily assumed value with the lists that manufacturers have found from experience to be reasonably spaced. A comparison between the

list derived by assuming the total number of different curvatures in the complete set to be one thousand and the lists of two makers shows satisfactory agreement.

PARIS.

**Academy of Sciences**, March 31.—**M. Léon Guignard** in the chair.—**A. Lacroix**: The leucitic lavas of Trebizond and their transformations. From the data furnished by chemical analyses it is impossible to get an exact idea of the magmatic relations of these rocks, since the essential ratios are disturbed by chemical and mineralogical transformations of secondary origin.—**G. Bigourdan**: The observatory of Le Monnier in the rue Saint-Honoré. Historical account of Le Monnier's astronomical work and publications, and of his instruments.—**Ch. Barrois** and **P. Pruvost**: The stratigraphical divisions of the Coal Measures of the North of France.—**H. Douvillé**: Evolution and classification of Nummulites.—**C. Richet** and **H. Cardot**: Sudden mutations in the formation of a new race of micro-organisms. A study of the modification produced by an arsenical medium upon the production of lactic acid by a pure lactic organism. This organism does not gradually become accustomed to the poison, but the tolerance shows a series of sudden variations, each of which is marked by intense multiplication.—**M. de Sparre**: Conditions to be fulfilled for increasing the flow, and hence the work, in an hydraulic installation without modifying the pipe.—**G. A. Boulenger**: An interesting case of sexual dimorphism in an African snake, *Bothrolycus ater*.—**M. Eugène Casserat** was elected a non-resident member in succession to the late **M. H. Bazin**.—**P. Sabatier** and **G. Gaudion**: Catalytic dehydrogenation by nickel in presence of hydrogen. Pinene, limonene, camphene, menthene, and cyclohexene carried by hydrogen over nickel at 350°–360° C. undergo simultaneously hydrogenation and dehydrogenation. The reaction has been applied to compounds containing oxygen. Cyclohexanol gives phenol; pulegone, a mixture of cresol and thymol.—**S. Lelschetz**: The analysis of algebraic varieties.—**L. E. J. Brouwer**: The enumeration of regular Riemann surfaces of Genus I.—**A. Véronnet**: The temperature of equilibrium of a gaseous star for any ray.—**A. Colson**: The theory of solubility.—**C. Chéneveau** and **R. Audubert**: Absorption in turbid media. Dispersion by internal diffusion.—**P. Vaillant**: The production of a continuous current by the application of an alternating electromotive force to a voltameter with platinum electrodes.—**J. Martinet**: The mobility of the hydrogen atoms in organic molecules. The action of phenylhydrazine on dioxindols. Although neither aldehydes nor ketones, dioxindols give phenylhydrazones with great ease. The preparation and properties of several of these phenylhydrazones are described.—**G. Guilbert**: Some examples of "cyclone compression." Cyclonic centres sometimes present the phenomenon of disappearing very rapidly, in twenty-four hours or even less. This the author terms "cyclone compression," and directs attention to several examples which have occurred recently.—**A. Jauffret**: The determination of the woods of two species of *Dalbergia* from Madagascar, according to the characters of their colouring matters. The colouring matters extracted from these two species by solvents give different chemical reactions and absorption spectra. These characters are constant for each species.—**L. Daniel**: Researches on the comparative development of the lettuce in sunlight and in the shade.—**H. Colin**: The utilisation of glucose and lævulose by the higher plants. Analyses are given of total dextrose and lævulose and the ratio of these two hexoses in various parts of the plant in the case of beetroot, Jerusalem artichoke, and chicory.—**E. Esclangon**: The physiological sensations of