

but cannot be separated chemically, and the atomic weights of which may differ slightly.

With regard to the study of the X-rays themselves, no outstanding advances were made for some ten years after their discovery, when Barkla obtained evidence of the existence of "characteristic" radiations from experiments on secondary X-rays. The discovery led to the wave-theory of the X-rays, which was completely substantiated at later dates by the diffraction experiments of Laue, the Braggs, Moseley, and Darwin. Barkla's characteristic rays are thus shown to be of the same nature as the rays yielding bright-line spectra in the case of ordinary light. The diffraction experiments led to the employment of the X-rays for two classes of investigation, in the hands of Prof. Bragg and his son, problems of crystal structure have been successfully attacked, while in the other direction the late Mr. Moseley has shown these phenomena to be a most powerful method of investigating the constitution of the elements. He showed that the critical property of an element was its atomic number, while its atomic weight was relatively of secondary importance. The important relationship between the frequency of the K or L series of characteristic rays and the atomic number of the element should be known as Moseley's law.

At the conclusion of the meeting the president presented to Sir Ernest Rutherford the first of the medals which will be given annually in commemoration of the Silvanus Thompson Memorial lecture.

#### SCOTTISH METEOROLOGY.

THE Journal of the Scottish Meteorological Society for 1916 retains the interesting character it has held of recent years. There are four articles besides the report of the council, and the statistical information, with fifteen pages of letterpress, on the weather of 1916 in Scotland.

Capt. Douglas gives a very interesting account of his observations on clouds as seen from an aeroplane, but as this was the subject of an article in the issue of NATURE for April 4 it is unnecessary to say more about it here.

The second article is by Mr. M'Cullum Fairgrieve, and discusses a chart suggested by Dr. Griffiths Taylor, and called by him a climograph. The chart is formed by plotting the mean monthly wet-bulb temperature against the mean monthly humidity on squared paper, and joining in order the twelve points so formed. The idea originated with Prof. Huntingdon, who was investigating the effect of climate upon the mental and physical fitness of a race. Both Mr. Fairgrieve's and Dr. Taylor's papers should be read—it is impossible in a brief space to give extracts; they are both very interesting, but the criticism that occurs to one is that the magnitude and prosperity of a big city do not depend very largely on its climate, but rather on its geographical position. Thus, Edinburgh or Liverpool has probably just as good a climate as London or New York, but the preponderance of the latter cities depends chiefly on other considerations.

Dr. Crighton Mitchell, in the third article, discusses the time of the occurrence of the maximum and minimum temperatures at Eskdalemuir. He has taken the frequencies at each hour of the day, and so formed a frequency table for each month. The standard deviation of the time of maximum is much less in the summer than in the winter. For the summer the time of maximum is 2 p.m. and the standard deviation 2.55 hours. For the winter these values become 1 p.m. and 5.85 hours. As at other stations, the minimum mostly occurs about the time of sunrise.

In the fourth article Mr. Smillie and Mr. Watt

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discuss a curious case of ground-ice which caused much inconvenience by blocking the inlet of a public water supply. The trouble occurred at Lochrutton Lock, near Dumfries, and is the only similar case recorded there, although many more severe frosts have occurred since the construction of the waterworks. There was no surface ice on the lock at the time, the inlet became clear, and no further trouble was experienced as soon as the surface was frozen. The authors discuss the reason of the formation of ground-ice and show that it is probably due to radiation.

The rest of the journal contains notes, reviews of current literature, a list of fellows, and a statement of accounts, as well as an interesting description of the weather of each month by Mr. Watt.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Foreign Secretary and the President of the Board of Education have invited representatives of universities to attend a conference to be held on May 9 to consider the possibility of establishing closer connection between British universities and those of the Allied countries. The proceedings will be private.

IN recognition of his services to the cause of science the sum of two lakhs of rupees was recently presented to Sir J. C. Bose, of the Presidency College, Calcutta, by some of the leading citizens of Bombay. In accepting the gift Sir J. C. Bose stated that it would be held in trust by a committee of three for the use of the Bose Institute.

THE Department of Agriculture and Technical Instruction for Ireland will next June award a limited number of trade scholarships. The object of the scholarships is to enable selected persons who have been engaged in certain industries in Ireland, for a period of at least two years, to obtain systematic instruction in the principles of science and art as applied to these industries. By this means it is hoped that the standard of workmanship will be raised and the industries, as well as the scholarship holders, thereby benefited. Candidates must be recommended by the managers of the industries in which they are employed, and must produce an undertaking from the managers to the effect that the latter will re-employ them after the termination of the scholarships. Scholars must also undertake to resume their employment on the termination of the scholarships. Scholarships will not be awarded to apprentices whose apprenticeships will normally terminate within the period of the training course. The scholarships will be tenable for one school session, and will be of the value of *£*1. per week during the period of instruction, together with class-fees and travelling expenses. Candidates unable to produce evidence of a satisfactory general education will be required to pass a simple qualifying examination in English, arithmetic, and drawing, and the standard will be equivalent to that of the sixth standard of the Board of National Education. For the session 1918-19 the industries selected are typography, cabinet-making, loom tenting, motor engineering, plumbing, and woollen manufacture.

A PAPER on "Technical Education in India: its Past and Future," was written by Mr. E. F. Tiple, of the Thomason Civil Engineering College, Roorkee, U.P., for the Indian Industrial Conference held in Calcutta in December, 1917. Mr. Tiple urged that practical education in India has been much neglected, and that courses for the technical education required for the management of industries should be provided, and

also the lower industrial training suitable for the actual workers. These appear to be essential if any progress is to be made, but India has lagged behind in most industrial matters. The existing system of family industrial training from generation to generation, which finally merges into the "caste" system, might be worked upon as the groundwork of the lower industrial training; but the higher technical education has been entirely neglected, possibly because, as Mr. Tipple points out, higher or university education in India has largely fostered courses which provide persons mainly equipped for Government service as lawyers, clerks, etc., but not for practical pursuits. He also deplors the fact that education in Indian schools has been arranged to lead up to university education of a literary type. He suggests that an Indian secondary-school career, instead of ending with an examination which is intended as an "entrance" into the existing universities, should end with a "school final examination." In such a school final a varied preliminary training suitable for diverse careers, such as industrial, commercial, and trade pursuits, might be provided for. This reform has been strongly urged during at least the last twenty years, and is essential if India is to hold its own in industrial work. It is to be hoped that the Indian University Commission, which has been taking evidence in different parts of India for some months, will give a much-needed lead towards more practical forms of education in India in the future.

A copy of the annual statement of the Rhodes Trust for 1916-17 has been received from the secretary of the trust. It is recorded that the war has interfered increasingly with the operation of the scholarship system. At the close of 1916 the American section of the scholarships was still barely affected; but on the entry of the United States into the war the difference between American and Colonial Rhodes scholars naturally ceased to exist. The trustees have decided to postpone for the present all further election to scholarships. This will not, however, interfere with the holding of the annual qualifying examination in the United States, or in Colonies where qualification is not obtained through affiliation of local universities with the University of Oxford. Altogether, there were in residence at Oxford for some part of the year eighty-five Rhodes scholars, of whom seventy-one were American and fourteen Colonial. Of the seventy-one Americans, the great majority are now serving in the United States Army. For 1917-18 there are at present eight Rhodes scholars in residence—six Colonial and two American. Of the six Colonials, five are medical students; and of these five, two have already seen service. Of the two Americans, one has returned from a year's ambulance work on the French front, and is temporarily engaged in Government work in the University chemical laboratory, while the other has been rejected, on medical grounds, for military service. In addition, one ex-scholar has returned after three years' military service in France, to complete his medical course. The scholarships set free under the Act of Parliament cancelling the German Rhodes scholarships have been allotted as follows:—One to the Transvaal; one to the Orange Free State; one to Alberta and Saskatchewan (which have hitherto had only one between them); and one to Kimberley and Port Elizabeth alternately (Kimberley to select in the first year). Fourteen scholars and ex-scholars have given their lives in the service of the Empire during the year, and others have won many military honours. Five scholars were admitted in the year to read for advanced degrees. The address of the trust is Seymour House, Waterloo Place, London, S.W.1.

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## SOCIETIES AND ACADEMIES.

LONDON.

**Optical Society**, April 11.—Prof. F. J. Cheshire, president, in the chair.—J. W. French: The balsam problem. For cementing optical parts together Canada balsam is almost invariably employed. Although starting or starring of the balsam layer, actual separation of the parts, or deformation of the optical surfaces frequently occurs, there is no appreciably better substance known. Optical parts may be combined with an air space between the surfaces, by optical contact with or without sealed edges, by optical welding, or by cementing. The disadvantages of the various methods were enumerated, the loss of light at transmission surfaces being particularly discussed. A considerable number of balsamed specimens of ages varying up to ten years had been opened and photomicrographs of the balsam layer were exhibited. In all cases there were fluid layers between the harder balsam and the glass surface, and the photographs demonstrated particularly the smallness of the adhesion to the glass. Specimens artificially produced were also exhibited. In many cases the age of the specimen was shown to be deducible from the configuration. So-called granulation of balsam was stated to be due to the action of moisture on the balsam surface. No trace of crystallisation of glass-quality balsam was found in any of the experiments, but a number of the photographed specimens showed definite right-angled fractures occasionally observed in torn gelatine films.

PARIS.

**Academy of Sciences**, March 25.—M. Paul Painlevé in the chair.—A. de Gramont: The spectrum test for boron. The bands obtained in the Bunsen flame, with or without the addition of hydrochloric or sulphuric acid, are diffuse and insensitive; the use of the oxy-acetylene flame gives additional bands, but still diffuse. The lines of boron given by the condensed spark are characteristic and more delicate, and the presence of three lines only in the ultra-violet shown by Sir William Crookes is confirmed. The line  $\lambda = 2497.82$  will just detect 1 in 100,000 of boron. Applications to metallurgy and mineralogy are given.—C. Depéret: An attempt at the chronological co-ordination of quaternary times.—S. Lattès: The repetition of rational fractions.—M. de Pulligny: Some values of the approximate quadrature of the circle.—G. Claude: The industrial preparation of argon. A method of fractional condensation and distillation of air is described by means of which a mixture is obtained continuously containing argon 75 to 80 per cent., nitrogen 1 to 2 per cent., the remainder being oxygen. The oxygen is readily removed by burning with the correct proportion of hydrogen.—M. Travers: The estimation of tantalum in its alloys with iron. The impure tantalic acid obtained by the usual method is freed from iron by fusion with caustic potash, and after igniting and weighing the tantalic acid, the silica still remaining is determined by volatilising the tantalic acid in a current of hydrochloric acid at 900° C.—F. Zambonini: The identity of shattuckite and plancheite.—A. Guéhard: The notion of "geosynclinal."—A. Polack: Inversion of the Purkinje phenomenon in congenital hemeralopy.—Ch. J. Gravier: A new copepod, *Flabellicola neapolitana*, parasite of a polychaetal annelid, *Flabelligera diplochaitos*.—L. Binet: The cerebral pulse in emotional states.

April 2.—M. Paul Painlevé in the chair.—L. E. Bertin: Obituary notice on Lord Brassey.—P. Appell: The notion of fixed axes and of absolute movement.—P. Termier: Contributions to the knowledge of the