

The Michelson echelon came very opportunely for the study of this (the Zeeman) effect announced by Zeeman in 1897, and was very much used during the next ten years for that and for measurements of fine structure by many observers (Galitzin, Koch, Janiki, Nagaoka, Merton, McLennan, and Zeeman himself). Latterly, the quartz Lummer-Gehrcke plate has to some extent supplanted the echelon, chiefly on account of the fact that the lines of greatest interest lie in the ultra-violet, which is beyond the range of the transmission instrument. Together with the Fabry-Perot interferometer, these instruments have contributed in no small degree to the development of modern physics.

Quite recently, Michelson's original idea of using the grating as a *reflection* instrument has been successfully realised. This is more powerful than the transmission form, and can be used not only for fine structure work in the ultra-violet and Schumann regions, but also for substandard wave-length measurements in these regions, to an accuracy very much greater than that hitherto available. If the study of hyperfine structure, which is now just developing, fulfils the expectation of contributing to our knowledge of nuclear physics, it would seem that it is to Michelson's reflection echelon that we shall have to look for the greater share of the work.

F. T.

WE regret to announce the following deaths :

Dr. Alwin Berger, an authority on succulent plants and cacti, who contributed a monograph on the Crassulaceae to Engler-Prantl's "Natürliche Pflanzenfamilien", on April 20, aged fifty-nine years.

Prof. J. H. Comstock, emeritus professor of entomology in Cornell University, and an honorary fellow of the Entomological Society of London, on Mar. 20, aged eighty-two years.

Commander Sir Trevor Dawson, Bart., R.N., a past president of the Junior Institution of Engineers and an authority on armaments, on May 19, aged sixty-five years.

Prof. W. D. Halliburton, F.R.S., emeritus professor of physiology at King's College, London, and president of Section I (Physiology) of the British Association at the Belfast meeting in 1902, on May 21, aged seventy years.

Dr. Rudolf Marloth, who was president of the South African Association for the Advancement of Science in 1914 and author of works on the flora of South Africa.

Dr. Frederick Muir, known for his entomological work, especially in the Hawaiian Islands, formerly president of the Hawaiian Entomological Society and vice-president of the Entomological Society of London, on May 13, aged fifty-nine years.

Prof. Louis H. Pammel, professor of botany in the University of Iowa, who was a vice-president (Section G) of the American Association in 1919, on Mar. 23, aged sixty-eight years.

News and Views.

ON May 20, Lord Rutherford, as chairman of the Advisory Council of the Department of Scientific and Industrial Research, delivered an able and informative speech in the House of Lords on the problem and prospects of obtaining liquid fuel from coal. We import, he said, liquid fuel of various kinds to the value of £40,000,000 annually, and failure of this supply would have disastrous consequences to national life. So far as can be foreseen, coal is the only possible source of oil in Great Britain. Two methods are known for obtaining oil from coal, carbonisation at low or high temperatures, and hydrogenation. Lord Rutherford discussed the technical problems associated with low-temperature carbonisation and the steps taken by the Fuel Research Board to encourage the development of new retorting systems and to modify and improve low temperature tars, so as to enable them to replace natural products. Hydrogenation of tars offers promise of giving good yields of serviceable oils for various purposes, and large-scale tests are to be made. Much greater yields of oil per ton of coal can be obtained by direct hydrogenation of the coal, which has been shown to be technically possible. The development of carbonisation and hydrogenation offer great advantages, but the main problems are economic, for natural oils are available to-day in abundance and at very low prices. Progress in carbonisation depends on how far the nation is prepared to pay for a purer atmosphere by using cokes instead of coal. The hydrogenation process is limited by the degree of willingness of the nation to pay for independence in this matter of liquid fuels. Lord Rutherford ended by saying that a full

scientific understanding of this problem is more essential to Great Britain than to any other country.

LORD PARMOOR, as a Government spokesman, spoke appreciatively of the importance of having in the House men like Lord Rutherford, who are able to deal authoritatively with scientific matters and expound them clearly and adequately to laymen. In contrast, on the same day, the House of Commons debated the representation of the universities in Parliament. Arguments in favour of ensuring representation of science and scholarship in the House of Commons were resisted in favour of the counting of heads. Unfortunately, the case of the universities has been weakened by their own action in selecting members according to their political complexion rather than for their intellectual stature. The debate in the House of Lords provides a good argument for the presence of scientific members in the legislature.

ON May 24, Prof. Einstein, after having had the degree of D.Sc. conferred upon him by the University of Oxford, delivered at Rhodes House his third and last lecture on the latest developments of the theory of relativity. The general theory of relativity, in its original form, was defective, inasmuch as the electromagnetic field was not expressed by means of the metric of the space-time continuum as was gravitation. A physical basis for such a unified structure was lacking, and one could only be guided by considerations of mathematical simplicity and logical form. Prof. Einstein's new development depends on a modified form of the Riemann geometry, which admitted distant parallelism (integrability of the law of displacement).

The spatial structure is described by sixteen functions, and the fundamental problem consists in deducing the differential equations of the field for the sixteen vector components. Actually, four types of field equations are evolved, of which two contain the old gravitational equations as special cases. The other two types may be discarded. Of the first two, the one which does not involve Hamilton's principle is the simpler, and Prof. Einstein proposes to adopt it. He also suggested that the results of quantum mechanics may follow from his new theory; whether his own speculations on the nature of space-time are in accord with reality can only be settled by the very difficult integration of the equations.

ACCORDING to a dispatch from the Peking correspondent of the *Times*, dated May 24, Sir Aurel Stein has left Kashgar for India, having been compelled to abandon his work in Chinese Turkestan owing to the obstruction of the local authorities. He had received permission from the Nanking Government to remain in the province for a period of three years in order to explore the ancient caravan routes. It would, therefore, appear that the efforts of the Chinese Society for the Preservation of Ancient Relics to secure his expulsion have been successful. It will be remembered that we referred in *NATURE* of April 11, p. 565, to the activities of this body in placing difficulties in the way of expeditions from abroad. In spite of the difficulties which beset relations with China, it would be unfortunate if the matter were allowed to rest here. It is not a matter which affects archaeologists alone. China, as events in the last few years have shown, is becoming increasingly important in several branches of scientific research; and if international co-operation has been successful in one science, a *modus vivendi* should be capable of arrangement in other fields. Assuming that the Chinese Society for the Preservation of Ancient Relics is not entirely dominated by political motives, and that there is a genuine desire to preserve Chinese antiquities for China, it should be possible to arrive at an international agreement similar to those which have been framed for other countries in which the circumstances are, or were at one time, not dissimilar. Such an arrangement would make possible co-operation in the scientific development of the country, while preventing its exploitation. When a man of science of the standing and reputation of Sir Aurel Stein is prevented from carrying on, in a perfectly legitimate manner, work which is of worldwide interest and not merely of local import, the present position is obviously unsatisfactory and calls urgently for action.

THE Royal Dublin Society will celebrate its bicentenary during June, as it was founded on June 25, 1731, at a meeting held in the rooms of the Philosophical Society in Trinity College, Dublin. The Society at its foundation was known as "The Dublin Society for improving Husbandry, Manufactures, and other useful Arts and Sciences", and during the two centuries of its existence its activities have ranged over all the subjects included in the original title, and have been extended to include pure science, the fine arts, and

music. They include to-day such diverse functions as the Dublin Horse Show, recitals of classical music, and the provision of radon for therapeutic purposes throughout Ireland. The bicentenary celebrations will be held at the Society's headquarters at Ball's Bridge, where ample accommodation is available for the large gatherings that a membership roll of nine thousand is likely to entail, during the period June 23-27. The functions will include an opening *conversazione*, special scientific and general meetings (the latter on the bicentenary date, Thursday, June 25), a garden party, and a period ball. In addition to these functions at Ball's Bridge, their Excellencies the Governor-General of the Irish Free State and Mrs. McNeill have kindly promised to invite the special guests of the Society to a garden party which will be held in the grounds of the Viceregal Lodge on Wednesday, June 24. An exhibition will be staged in some of the halls and grounds illustrating the advances made in agriculture, industry, science, and art in Ireland during the past two centuries. An interesting feature of the bicentenary week will be the presentation to Sir John Purser Griffith of the Society's Boyle Medal, which has recently been conferred on him in recognition of his work in engineering science.

Two lecture-demonstrations formed a noteworthy feature of the Royal Society *conversazione* held on May 20. Dr. William B. Brierley gave a lecture on a kinematograph film illustrating the formation of an intracellular inclusion in a plant cell infected with a virus disease. The preparation was made by Dr. F. M. L. Sheffield, Rothamsted Experimental Station. The film showed a normal cell with its flowing cytoplasm containing the nucleus. After infection the protoplasmic streaming becomes more rapid, and numerous small protein particles appear in the cytoplasm, which carries them passively around the cell. The particles increase in size and fuse, forming a few large aggregations, the motion of which becomes relatively slower, and after a considerable period the inclusions tend to break down, giving a number of protein crystals. The second lecturette was given by Mr. S. R. Wycherley, who showed natural colour kinematograph films made by Messrs. Spicers, Ltd., of Sawston, Cambridge, the preparation of which is described on p. 821 of this issue of *NATURE*. The subjects shown included indoor and outdoor scenes, photographed in the studio and out of doors, and also a film of Sir Gowland Hopkins demonstrating biochemical colour tests. The tendency in these films is towards a heightening of the colours, particularly of the blue-green, but the colour reproduction is, on the whole, very good, and the technical staff of Messrs. Spicers, Ltd., are to be congratulated on the results achieved. The fact that the films are used in an ordinary kinematograph camera and projector and are non-inflammable should ensure their speedy introduction in the kinematograph industry.

THE subject of Sir William Bragg's Friday evening discourse at the Royal Institution, on May 22, was "X-Ray Investigation of the Structure of Liquids".

Sir William pointed out that when a pencil of X-rays is sent through a liquid behind which a photographic plate is placed, the image when developed shows not only a spot where the pencil has struck, but also in general one or more circular rings surrounding the spot. Of these optical haloes there are at least three kinds. The rainbow may be set down as one of them. Rainbow colours are due to refraction in the spherical drops, and are seen when the observer has his back to the sun. The strangely shaped haloes of the Arctic regions are due to floating crystals of ice. The third kind is represented by the corona so often seen round the moon at night. In the latter case the sizes of the coloured rings depend on the sizes of the drops of water in the cloud or mist. The smaller the ring the larger the drop must be. The result is readily explained on the principle of the interference of light, due to Thomas Young. Particularly good colour effects can be produced in the laboratory by means of artificial fogs. The wave-length of the X-ray bears approximately the same proportion to the size of the molecule as the wave-length of light to the size of the water-drop; and some of the rings on the photographic plate can be explained in the same way that the coronæ are explained. But there is undoubtedly more than that in the phenomenon. It appears that sometimes the rings are due to arrangements of the molecules of the liquid in ordered array, as in a crystal, but the arrangements are only fleeting and irregular, so that the sharp pictures obtained with X-rays when crystals are used are blurred when the crystal is melted and becomes liquid. It has not been possible, until the X-rays provided the means, to demonstrate in a direct manner this tendency to arrangement; it may now be possible to examine its nature and extent in various liquids. It is probably an effective factor in determining liquid properties.

WE recently described a successful demonstration of the micro-ray system of wireless telephony between Dover and Calais. A new system of telephony called the single side-band system was demonstrated on May 21, between the wireless station at Trappes, near Paris, and the station of the Spanish National Telephone Company at Madrid. Both demonstrations were given by the engineers of the International Standard Electric Corporation. The single side-band system of telephony was first used some years ago in carrier communication on wire lines. In this connexion, its main advantage is that it doubles the number of speech channels available for the same total band width as compared with ordinary modulation with both side-bands. It has also been successfully used on the long-wave wireless telephonic circuit between New York and London. Difficulties had to be overcome in applying the side-band system to short-wave work. During last year, single side-band tests were carried out on the radio link between Buenos Aires and Madrid and the one connecting Madrid and Paris. It was found that the received quality was always as good as that obtained when using the double side-band and very definitely better during bad selective and fading conditions. With average fading, the improvement with the new system

was at least twice as good as in normal working with both side-bands. Rough tests on the improvement of intelligibility showed that it was about four times as high with the single side-band system. It appears that a new system applicable to commercial working has been evolved. Mr. A. H. Reeves, the English engineer who devised the new side-band system, is to be congratulated. In time, without doubt, his method will be applied to those systems of wireless communication for which narrow limits of synchronisation are essential.

WE learn from a *Daily Science News Bulletin*, dated April 2, issued by Science Service, Washington, D.C., that Dr. Bruno Lange, of the Kaiser Wilhelm Institute, Berlin, has invented a new light cell, the sensitivity of which is many times greater than any at present in use. He deposits a thin layer of copper or other metal on the sensitive substance by cathodic sputtering. A wide mesh grid of metal is placed on this. By this means he is able to obtain much larger currents from the copper oxide 'sandwich' for a beam of light of given strength. Siemens and Halske are developing the new photocells, which are stated to have an efficiency at least fifty times greater than those now employed. A small experimental apparatus worked by sunlight has been driving a minute electric motor in dull daylight for some months in Berlin. It is stated that a square yard of copper oxide 'sandwich' can produce several watts of electric power when subjected to full sunlight. The efficiency of this invention will probably have to be improved many hundreds of times before it can be used to provide electric lighting and power on an economic scale. The solar generators will have to be placed in tropical regions where there is little rainfall. Like the alkali photocell, the new invention should find a large number of uses in scientific investigations and in applied science. For sound films and television it should prove very useful. It also makes telephony with infra-red rays a possibility. It may lead to devices which will enable ships to signal through fogs, and aeroplanes to determine the position of the sun through thick clouds.

It is known to motorists that up to a certain limit of speed the number of cars that can be accommodated in a given length of street continually increases, but above this limit the number diminishes owing to the greater distance that has to be kept between consecutive cars. This question has recently been investigated by the traffic committee of the American Road Builders' Association. Making average assumptions, they find that at 23½ miles an hour the number of moving vehicles that can pass over a given line drawn across the street per hour is a maximum. Above or below this speed the number of cars that pass the line per hour is less. If the cars have an average length of fourteen feet and travel at only five miles an hour, they need only keep five feet apart, and thus 1380 will pass the line in single file. If they run at ten miles an hour and are fitted with four wheel brakes the distance between them must be increased to eleven feet. In this case 2100 cars cross the line.

Proceeding in this way it is found that the maximum number of 2600 cars an hour is attained when the speed is $23\frac{1}{2}$ miles an hour. At a speed of 45 miles an hour only 1760 cars pass the line every hour, which is practically the same as the number that would pass at a speed of seven miles an hour, which with the modern type of car would be an uneconomical speed.

THE issue of the first numbers of the *Indian Journal of Agricultural Science* and *Agriculture and Live-stock in India* inaugurates the new series of publications in agricultural and veterinary science issued by the Imperial Council of Agricultural Research, which will take the place of the *Agricultural Journal of India*, the *Journal* of the Central Bureau for Animal Husbandry and Dairying and the *Memoirs and Bulletins* of the Imperial Department of Agriculture in India. The *Indian Journal of Agricultural Science* will be a scientific journal, issued in alternate months, and will largely replace the bulletins and memoirs, and at the same time afford a medium for material which has not been suitably provided for in the past. The original articles in the first number include an account of breeding investigations on *Toria*, and papers dealing with the inheritance of characters in Indian linseed and studies in Indian barleys respectively. *Agriculture and Live-stock in India* is intended to be a general journal appealing to a large circle of readers. During 1931 it will appear in alternate months, but it is hoped to issue it monthly in future years. The original articles in this first number cover a wide range of interest and include a report on the All-Burma tractor trials, a discussion on cattle-breeding policy, and papers dealing with various plant diseases. In addition, there are in both journals selected articles written by well-known authorities on subjects likely to be of special interest and help to those engaged on Indian problems. A new feature of these publications will be the abstract sections, whereby it is hoped to keep agricultural research workers in India more fully in touch with other investigators in the country, and permission has been obtained from the newly established Imperial Agricultural Bureaux to reproduce certain of their technical communications and abstracts. Attention is directed to the "instructions to authors" contained in these numbers, for only with the co-operation of all contributors in the manner prescribed can the Council achieve its aim of prompt publication of scientific work.

THAT India has set an example to other parts of the British Empire in forest research is well known. So far as research in connexion with tropical forestry is concerned, she has given a lead to the tropical world. In some of our colonies and dependencies the Indian example is being followed, and we welcome the first number of the "Record of Forest Research in 1928" of the Nigerian Forest Department (*Bulletin* No. 1, 1930). A commencement was made with the inauguration of an Investigation Branch in 1913. This branch started certain investigations into the composition of the growing stock in some of the better known Nigerian forests, and also into the technical and physical qualities of the common timbers. The

War put an end to these inquiries. The first of the new research officers, who are responsible for the present bulletin, are Messrs. J. D. Kennedy and W. D. Macgregor—both of whom received their forestry training at Edinburgh and, after a few years' work in Nigeria, were given a year's special course, partly at Oxford, on the Continent, and, more important, in India and Burma. It was a wise step to send the future research officers to study the progress made in India, for the Indian lines of advance more nearly approach those which many of the forest services of the Empire will follow than the more stereotyped European practices, once these have been correctly assimilated. The two officers returned to Nigeria in 1927, and the present report records their work during 1928. Mr. Kennedy was stationed at Sapoba, in North Nigeria, and Mr. Macgregor at Olokemeji. The latter place was at one time the Southern Nigeria Forestry Headquarters Station, and contains much of value and interest. The report gives evidence that the lines upon which sylvicultural investigations have been commenced are sound, and some interesting results may be confidently looked for. It may be noted that a forest utilisation officer and a wood-seasoning officer have also been added to the research staff. Whilst much forestry administration and executive work remains to be accomplished in Nigeria, the Department may be congratulated on this important departure in the matter of research.

At the fifty-sixth annual general meeting of the Linnean Society of New South Wales, held on Mar. 25, Mr. E. Cheel delivered his presidential address. After a review of the Society's activities, he gave a general summary of the myrtle family. Upwards of 3000 species are known of the plants commonly called 'myrtles' and these are classified into 74 genera in the family Myrtaceæ. The Australian myrtles are widely different from those of other countries, and they form a very important group of the Australian flora on account of the value of their timber, the medicinal and industrial properties of the species, and the utility of the berried fruits. The Australian eucalypts play a prominent part in the sylvan culture of millions of acres of land in various parts of the warmer zones of the globe. Some eucalypts produce tannin; practically all of the Myrtaceæ are useful bee-plants; a number of species of eucalypts has given fairly satisfactory results in tests for wood pulping qualities; *Eucalyptus macrorrhyncha* has yielded a valuable dye-material, myrticolorin. Many species of the myrtle family produce timbers suitable for a variety of purposes. Forests of these have been exploited, without provision being made for rehabilitation, and re-forestation is now perhaps the most important forestry problem. Different groups of the Australian myrtles yield a variety of essential oils, some of which have a considerable commercial value. Following the address, Prof. T. G. B. Osborn, professor of botany in the University of Adelaide, was elected president for the ensuing session.

CAPT. T. E. JOYCE, leader of the British Museum's expedition of archæological exploration in British

Honduras, returned to London on May 23. This year's expedition, which is the fifth in succession, left England at the end of last January. Ten weeks were spent in the bush. One of the objects of the expedition was to retrieve the stone stela from Pusilhà, containing the longest and most important of known Maya inscriptions, which had to be abandoned on the return journey last year owing to difficulties of transport and weather. Two large plazas on a recently reported site, thirty miles from the coast on South Stann Creek, were explored. On the south side of the central dividing mound a collapsed staircase was found; but the buildings were in a bad state owing to the perishable nature of the material, and it was probably owing to the friable nature of the surface afforded by the granite of which they were made that the numerous stelæ showed no signs of inscription. On the return journey another site yielded two stone coffins made of slate slabs. No bones were found in these. Probably they had perished owing to the damp. The pottery which had survived was of the consistency of putty owing to this cause. Other finds were a finely worked and slender spear-head eighteen inches long, an incense burner, jadeite ornaments, greenish stone axes, and a stone knife. They are tentatively dated at about A.D. 500. According to a report in the *Times* of May 25, the objects found will be added to the British Museum, on the understanding that some of them will be returned to Belize should an archaeological museum be established in British Honduras.

THE Report of the National Physical Laboratory for the year 1930 is a quarto volume of nearly 300 pages, published by the Stationery Office for the Department of Scientific and Industrial Research at 12s. 6d. net. As in past years, it consists of a general report of the Executive Committee and of more detailed reports from the heads of the various departments. The latter give sufficient information as to the methods in use for the solution of the problems in hand, and as to the results which have so far been obtained, to allow the reader to judge for himself the importance of the work being done, whether it is of the scientific or of the industrial type. In most cases these reports are provided with illustrations, which add much to their interest. So far as the routine tests of instruments and apparatus are concerned, the work for the year does not differ materially in quantity from that of the previous two years, except that many more radium preparations have been examined.

VARIOUS government departments continue to call on the National Physical Laboratory for information which involves new experimental work, amongst them the Air Ministry in connexion with the *R101* disaster, and the Home Office with regard to the strength of chains. A large proportion of the research on scientific problems is directed by the various research associations which have been formed under the Department of Scientific and Industrial Research or by the Research Committees of the Laboratory. During the year, the Laboratory has lost the services of

Lord Rutherford and Sir Thomas Stanton by retirement, and of Sir William Smith and Mr. Campbell Swinton by death. The new physics building and the compressed air tunnel have been completed, and a new ship tank is in course of construction to meet the great demand for tests. There is a strong feeling on the part of the Executive Committee of the Laboratory that the demand for work for industry should not be allowed to crowd out research of a more fundamental character which will extend our knowledge and provide a basis for future advances in both pure and applied science.

THE March issue of the *Decimal Educator* reproduces the section of the *Chinese Economic Bulletin* for Oct. 25, 1930, which deals with the new standards of weights and measures adopted by the National Government on Feb. 6, 1929, for the whole of China. The ultimate standards are the metre and the kilogram, and, during the transition period, the old weights and measures, which vary considerably throughout China, are to be unified and defined in terms of the metric standards. The Sheng is in future to be the Shih Sheng of one litre, the Ch'ih is to be the Shih Ch'ih, one-third of a kilogram. The British quart, pound, and yard are stated to have the approximate values, a litre, half a kilogram, and a metre respectively. It is noteworthy that these approximate values given in the Chinese document should be those which the Decimal Association in Britain and the Metric Association in the United States advocate for the transition periods in those countries.

SIR CHARLES CLOSE, president of the Hampshire Field Club and Archaeological Society, recently addressed the Society on "On the Deadliness of Museums", and if his criticisms of the provincial museums of Great Britain were of the obvious and usual type, his suggestions, though not startlingly novel, were based on sound common sense. If a provincial or local museum is to be wholly or primarily an instrument of popular education, then the ideal which Sir Charles held up to the curator in his picture of the Neolithic Room was admirably conceived. He pointed out that it remains an ideal unachieved as yet in Great Britain, though he finds steps towards it in a few museums, among which, with due regard to his audience, he placed the Cloth Hall at Newbury and the new museum at Basingstoke. His final suggestion is that the caretaker (presumably in such a smaller museum) might act as guide; the value of the suggestion depends on the caretaker. In general, we believe that the defects of which Sir Charles complains are due not to lack of goodwill or brains in the curators, but to want of means.

THE Czechoslovak National Research Council, which is incorporated in the International Research Council, and is an offshoot of the Czech Academy of Sciences, completed the seventh year of its activities at a general meeting held in Prague on Mar. 21. Succeeding Prof. F. L. Syllaba, who died on Dec. 30, 1930, Prof. B. Němec was elected president. Dr. J. Bašta delivered a lecture on "The Spirit of Opposition in Scientific Research", in which he emphasised that

the principle of opposition is a fundamental one both in the reactions of matter as well as in the investigator's mind.

MESSRS. Adam Hilger, Ltd., have issued, under the title of "Spectrum Analysis in Mineralogy", a valuable review by Dr. A. A. Fitch of the technique of mineralogical spectrum analysis and the results that the method has so far yielded. The topics dealt with include preliminary treatment of the mineral; optical apparatus; excitation of the spectrum; spectroscopic and spectrographic technique; and methods of qualitative and quantitative analysis of minerals, concentrates, rocks, meteorites, and mineral waters. Reference is also made to X-ray spectrum analysis of minerals and to mineral determination by means of absorption spectra. A long list of examples of the elements found in various minerals by spectroscopic analysis has been compiled, with references to a bibliography of 91 items. This alone makes the pamphlet indispensable to all workers in this rapidly advancing field of research. Scientific workers will be grateful to Messrs. Hilger for providing them with this convenient summary of technical methods and published results, particularly as the latter are scattered through a very wide range of periodicals.

THE great advances made in our knowledge of the elements in recent years has led to a desire on the part of many teachers for modern periodic law charts in which this new information has been included. Mr. John Murray, Albemarle Street, W.1, has just published such a chart, prepared by Mr. W. H. Barrett, of Harrow School, which should meet the requirements of teachers in schools. It comprises four separate charts, one of the Periodic Table and Atomic Numbers (after Bohr), one of the Periodic Table and Atomic Weights (after Mendeléeff), one of the Periodicity of Atomic Volumes (after Lothar Meyer), and one of Melting Points and Atomic Numbers. It will be seen that these new charts (which together cover an area of 6 ft. by 2 ft. 2 in.) will serve to illustrate the main features of the modern Periodic System, and they will be found most useful in senior courses in chemistry. The printing is very clear and the charts are free from unnecessary complications. The price of the set, unmounted, is 5s. 6d. net, or mounted on linen, 9s. 6d. The chart is also available mounted on linen, varnished, and on rollers, for the price of 15s. 6d. net. When the great advantage of such a modern set of charts is kept in mind, these prices must be considered very reasonable. The diagrams are sufficiently large to be suitable for classroom teaching, and their use should considerably simplify the teacher's work.

At the annual general meeting of the Institute of Physics, held on May 19, Lord Rutherford was elected president for the year 1931-32.

SIR ARTHUR EDDINGTON, Plumian professor of astronomy and experimental philosophy in the University of Cambridge, has been elected a foreign member of the American Philosophical Society, Philadelphia.

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A LARGE earthquake was recorded at Kew Observatory at 2 hr. 27 min. 0 sec. G.M.T. on May 20. It is estimated that the disturbance originated 1200 miles away, the epicentre being under the Atlantic about 300 miles west of Cape St. Vincent.

THROUGH the generosity of Lady and Miss Darwin, who have founded a Darwin Trust of about £275 a year, augmented by a contribution from the Medical Research Council, a study of the cause of amentia (feeble-mindedness) is to be undertaken at the Royal Eastern Counties Institution for the Mentally Defective at Colchester. Dr. Lionel Penrose has been appointed research medical officer, and Miss Newlyn social investigator, for this investigation.

At the annual meeting of the Optical Society held on May 14, at the Imperial College of Science and Technology, the following officers were elected for the session 1931-32: *President*: Prof. A. O. Rankine; *Hon. Treasurer*: Major E. O. Henrici; *Hon. Secretaries*: W. B. Coutts (Business), E. T. Hanson (Papers); *Hon. Librarian*: Dr. J. J. Hedges; *Editor of Transactions and Assistant Secretary*: Dr. J. J. Hedges.

PROF. ABDUL HAMID BEG, Islamia College, Lahore, sends us a short description of an experiment on the recombination of white light by the use of a rotating mirror. Recombination by a rotating colour disc is not very satisfactory, as an impure white or grey is seen. A better method is to use a lens, or an oscillating mirror, to recombine the colours of the spectrum of white light. Prof. Beg substitutes for an oscillating mirror a rotating cube having plane mirrors on its vertical sides, and his device may interest some teachers of physics.

IN memory of its late editor, Prof. Eugenio Rignano, who died on Feb. 9, 1930, *Scientia* has founded a Eugenio Rignano Prize of the value of 10,000 Italian lire. The prize will be awarded as a result of international competition to the author of the best essay on "The Evolution of the Notion of Time". The works submitted should either be unpublished, or published since 1930, and should be sent for examination not later than Dec. 31, 1932. Further information may be obtained from the Editor of *Scientia*, 12, Via A. De Togni, Milano (116), Italy.

IN a note in *NATURE* of May 9 (p. 714) on the Manchester earth-shake of May 3, it was stated, on the authority of the local press, that the shock was not recorded at the Godlee observatory at Manchester. We have received a letter from the Rev. J. P. Rowland, *S.J.*, pointing out that no seismograph has yet been installed at this observatory. He also gives a revised estimate for the time of the initial movement recorded at Stonyhurst, namely, 8 h. 26 m. 0.5 s. (G.M.T.), and the time at the origin as 5 seconds earlier. The tremors were exceedingly small, the amplitude being not more than 6.7 μ .

A USEFUL and well illustrated guide to the larger moths of Eastbourne appears as a supplement to *Trans. Eastbourne Nat. Hist. Photog. and Lit. Soc.*, vol. 10. The author, Mr. Robert Adkin, has already

described the butterflies of the district, and this account of the sphingids, bombycids, noctuids, and geometrids forms the second of three instalments.

WE have received from the Zenith Electric Co., of Willesden Green, London, N.W.2, a copy of its latest catalogue of regulating resistances. These devices are well known in laboratories, and are now often used in electrical works. The latest sliding type of resistance gives very fine adjustment and is cheap. As they are flash-tested at 2000 volts alternating, they are safe to use in electrical testing rooms.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A professor of education in the University of Bristol—The Secretary and Acting Registrar, University, Bristol (June 6). A visiting teacher at the Hackney Technical Institute, for instruction to junior workers in the chemical manufacturing trades—The Education Officer (T.1), County Hall, S.E.1 (June 6). An assistant veterinary inspector under the Surrey County Council to carry out duties under the several Acts and Orders relating to milk and dairies; diseases of animals; and such other veterinary duties as the council may require—The Chief Veterinary Officer, County Hall, Kingston-upon-Thames (June 8). An assistant marketing officer under the Ministry of Agriculture and Fisheries—The Secretary, Ministry of Agriculture and Fisheries,

10 Whitehall Place, S.W.1 (June 8). A full-time teacher of general elementary science and mathematics at the Technical College, Wolverton—The Secretary, Technical College, Wolverton (June 8). A lecturer in physics at the Birmingham Central Technical College—The Principal, Central Technical College, Birmingham (June 12). An assistant lecturer in zoology in the University of Bristol—The Secretary and Acting Registrar, University, Bristol (June 13). A library assistant at the University College of North Wales, Bangor—The Librarian, University College of North Wales, Bangor (June 13). A Thomas Wall reader in comparative education at King's College, London—The Academic Registrar, University of London, S.W.7 (June 15). A junior assistant (chemist) under the Department of Scientific and Industrial Research—The Secretary, Department of Scientific and Industrial Research, 16 Old Queen Street, S.W.1 (June 16). Keepers of, respectively, ethnology and geology in the Public Museums, Liverpool—The Town Clerk, Municipal Buildings, Dale Street, Liverpool (June 19). A Clothworkers' scholar in the University of Leeds for research in the physical properties of wool and other fibres—The Clerk to the Senate, University, Leeds. A graduate assistant master for engineering science and cognate subjects at the Cambridge and County School of Arts, Crafts, and Technology—The Education Secretary, County Hall, Cambridge.

Our Astronomical Column.

The Light-Variation of Eros.—*Astr. Nach.* 5784 contains two papers on this subject. S. Taffara, of Catania Observatory, discusses the period, finding the value 0.109796 day, which agrees exactly with that announced by L. Jacchia, of Bologna. Most observers take this value as the half-period, considering that the complete cycle contains two slightly dissimilar waves. The elongation observed at Johannesburg was stated to travel round in the double period 5 h. 16 m.

The other paper is from Uccle Observatory, by E. Delporte and P. Bourgeois. They determined the magnitude photographically, both by ordinary plates and by plates with a maximum of sensitiveness between wave-length 5200 and 5800. With the latter plates a yellow screen was employed, stopping all light of wave-length less than 4860. The curves obtained by the two methods are very nearly parallel to each other. The distance between them indicates a colour index of 0.77 mag. The colour has some influence on the parallax investigation, owing to differential atmospheric refraction. One advance in the present parallax campaign over that of 1900–1 is that on this occasion the spectral types of the comparison stars have been determined, so that it will be possible to make allowance for differential refraction, or at least to exclude stars of type differing much from that of Eros.

Absolute Magnitudes of *K*-type stars.—A method was recently devised by Strömberg for determining statistically the distribution of absolute magnitudes in a group of stars. The requisite data are proper motions and radial velocities, or derived functions of these quantities, from which accurate values of the frequencies of different absolute magnitudes in the group can be determined. Some interesting results have now been obtained by the author in applying

his method to *K*-type stars (*Astrophysical Journal*, vol. 73, p. 40). Amongst types *K*0 to *K*2, four distinct maxima appear in the frequency curve at absolute magnitudes -2.5 , $+0.3$, $+2.7$, and $+6.1$; the largest number (78.3 per cent) being of absolute magnitude $+0.3$. It thus appears to be necessary to subdivide the giants into three groups of mean absolute magnitudes equal to the first three maxima; and the designations of bright, normal, and faint giants have been provisionally applied to these groups. For stars of types *K*3 to *K*9 only three maxima appear, corresponding to super giants, normal giants, and dwarfs at absolute magnitudes -4.5 , -0.1 , $+6.7$ respectively.

New Catalogue of Comets.—Mr. I. Yamamoto has just published a new catalogue of comets in the current *Handbook* of Kwasan Observatory. Most of the book is in Japanese, but the catalogue is in English. It reproduces the orbits given in Galle's "Cometen-Bahnen", with the addition of those that have since been published, extending up to the end of the year 1930, so that it is quite up to date. The elements are given to the third decimal of a degree, which is near enough for most purposes. There is a useful separate table of the comets of short period, with the approximate date of their next apparition, and a list of the returns at which they were observed. There are a few errata. Some proper names are misspelt. Skjellerup's comet of 1927 is wrongly identified with De Vico's of 1846. Yamasaki's name is given, instead of that of Forbes, as the discoverer of 1928 IV. However, there are probably no catalogues of the kind that are quite free from mistakes. The book contains some other tables in English. They include elements of satellites and the more interesting minor planets, and a table for converting R.A. and declination into galactic longitude and latitude.