

yet been verified experimentally. Great interest is attached to the 'spectrum' of the rays incident on the earth's atmosphere, since they should give some light on a possible origin for the rays. It is rather remarkable to find that the spectrum of the rays can be represented roughly by a simple power law over a range of energy of above a million to one. More precisely, the number of rays with energy greater than some given value is roughly inversely proportional to the square of the energy, over the energy range from a thousand million to a thousand million million volts. It can scarcely be doubted that this remarkable law must have some profound, but at present unknown, cosmological significance.

Fuel in Science and Practice

THE monthly periodical *Fuel in Science and Practice* has completed eighteen volumes since it was launched as a supplement to the well-known mining journal *Colliery Guardian*. It was established on the initiative of the Coal Research Club in order to provide a medium of communication for those interested in the scientific study of fuel, and coal in particular. It was the first journal of its kind in the English language and has proved very successful, the success being doubtless due in a large measure to the efforts of its first editor, the late Prof. R. V. Wheeler. The first number of the nineteenth volume has now appeared under the editorship of Dr. R. Lessing, who has been associated with the venture since its inception. This, it may be taken, will ensure continuity of policy. It will continue to aim at providing a clearing-house for the results of investigations and a bridge between the science and practice of fuel technology.

The Institute of Fuel has decided to adopt *Fuel* as its research journal for the benefit of its members who wish to be kept informed of the results of recent investigations into coal and other combustibles. The Coal Research Club, assisted by an editorial committee, will continue to direct its policy and ensure the maintenance of its old and successful traditions. It seems probable that the importance of fuel technology for some years to come will ensure a prosperous future for this journal. At the same time, it is pertinent to recall the unsatisfactory state of the documentation of science. While it appears relatively easy to publish journals containing interesting articles, the thankless task of publishing systematic abstracts is a growing burden the support of which meets steady reluctance.

Coal-Gas and Fuel Research at Leeds

PROF. D. T. A. TOWNEND, who succeeded Prof. J. W. Cobb as head of the Department of Coal-gas and Fuel Industries and Livesey professor in the University of Leeds, has now issued his first report, covering the session 1938-39, to his Advisory Committee. He takes an opportunity therein to pay a tribute to the late Prof. Smithells, who died during the term under review and who was a member of the Committee from the time of its formation. To him also was due, more than to any other man, the formation of the Fuel Department in the University

and, a few years later, the establishment of the Livesey chair by subscriptions from the gas industry.

In the body of the report, Prof. Townend reviews in turn the varied activities of his department, which has developed in several directions, not only fuel and gas engineering, but also the cognate subjects of refractory materials and metallurgy, in both of which teaching and research have made much headway. A post-graduate diploma in fuel and refractory materials has been instituted along similar lines to those already given in gas engineering and in fuel and metallurgy. The first opportunity will be taken to give a more systematic course in chemical engineering, which is, in effect, so largely the subject of the departmental teaching. Research continues to be supported by the gas industry and the Iron and Steel Institute. Prof. Townend is continuing work on flame, which had engaged him in London, and independent research work carried out by the staff and students continues to be a marked feature of the departmental activity.

Modern Colour Printing

IN the *Electrical Review* of February 2, an illustrated description is given of some of the new equipment installed by Geo. C. Caster and Co., Ltd., commercial and colour printers, who recently transferred their works to Cromwell Road, Peterborough. In accordance with modern practice the factory has been set out on a single floor, with a planned layout for the speedy handling of work and an uninterrupted continuity of production. There is no shafting, and individual direct electric drive is employed on all machines. One of the large high-speed letterpress machines is a two-revolution Miehle capable of a maximum output of 3,000 sheets, 25 in. by 40 in., per hour. Another large two-revolution machine takes bigger sheets (30 in. by 40 in.) and can print 2,300 sheets per hour. For small sheets up to 13½ in. by 20 in. vertical Miehle machines are brought into service. These are specially suitable for high-class colour printing. A maximum of 4,500 prints an hour can be handled by each machine.

The use of a general lighting system of high intensity throughout the factory makes local lighting unnecessary (except under the machine boards). In the composing room an illumination intensity of 35 ft.-candles at the working plane is obtained with Benjamin reflectors, which are also used in the binding department to provide 10 ft.-candles. To facilitate the matching of ink colours, daylight reflectors have been installed in the machine department to give 14 ft.-candles.

The Achromatic Lens

THE contributions made to *Lychnos* during the last two years by Drs. N. V. E. Nordenmark and J. Nordstrom dealing with the invention of the achromatic lens and the part played by S. Klingenstierna, professor of mathematics at the University of Uppsala, in the process, have been issued as a pamphlet by Almqvist and Wiksells, Uppsala, with an English summary. Many of the original documents bearing

on the history of the invention are reproduced with illustrations. One of the most important is Ramsden's Royal Society paper of June 18, 1789, from which it appears that Chester Moor Hall had an achromatic object glass ground for him in 1732 or 1733 and that achromatic telescopes were made for him by the Strand optician J. Bird. The patent for the construction of such lenses from crown and flint glasses was taken out in 1758 by J. Dollond but no calculations were given, probably owing to the desire to keep the theory from other opticians. Klingenstierna worked out the theory, published it in the Transactions of the Swedish Academy in July 1760 and sent a copy to the Royal Society, which published it, although Dollond stated that it contained nothing which he had not done himself previously.

Early Agricultural Tractors

MR. R. H. CLARK, in the *Engineer* of February 2, under the title "Some Early Burrell Engines", recalls an almost forgotten chapter in the development of steam traction engines, built mainly for agricultural work. In 1846, James Boydell took out a patent for his "Endless Railway", and eight years afterwards patented improvements on it. His ideas were taken up by Charles Burrell and Co., a firm of country engineers established at Thetford in 1770, and in 1856 the first road locomotive was constructed embodying the principle of the "Endless Railway". The general arrangement of the traction engine was much as that familiar a few years ago, but each of the wheels, instead of running on the surface of the road or field, ran on a series of flat shoes which in succession were brought into position by links and pins attached to the wheels. There were six shoes to each wheel.

This arrangement of shoes allowed the engine to move over the roughest roads and over soft and marshy ground. One of the illustrations shows an engine drawing four two-furrow ploughs. In 1857 a Boydell engine drew a load of nearly 44 tons from Bury St. Edmunds to Woolwich Arsenal at an average speed of 3.1 miles per hour. The cost of transport was 2*d.* per ton per mile against 6*d.* if horses had been employed. Boydell engines were apparently being built up to 1868, when they were abandoned for engines with ordinary wheels.

Prevention of Diphtheria by Immunization

ABOUT 60,000 cases of diphtheria, chiefly among children less than fifteen years of age, are notified annually in England and Wales, with some 3,000 deaths. Yet it has been shown, particularly in certain cities in Canada and the United States, that by artificial treatment or immunization the disease may be practically banished. The Minister of Health has therefore issued an official memorandum urging that artificial immunization should be undertaken by county councils and sanitary authorities (Memo. 170/Med. H.M. Stationery Office. 1*d.* net). It is suggested that the immunization should be undertaken as early in the child's life as is practicable and should form an integral part of the work of child

welfare centres. The Memorandum gives technical details of the procedure and of the various forms of diphtheria prophylactic used, and of the need for Schick testing after treatment to ascertain whether this has been successful.

Lice

THE Minister of Health has recently issued a "Memorandum on the Louse and How to Deal With It" (Memo. 230/Med., 1940). Its publication comes at an opportune moment, when experience of evacuation has brought the louse problem into prominence. In the event of serious air raids large bodies of people may have to be removed to other districts. This, in itself, is liable to cause the spread of lice to localities, or among people, previously free from infestation. Ample powers are available under the Education and Public Health acts for the application of suitable control measures, and it is to be hoped that public medical officers and other officials will do all possible to reduce what has long been a standing menace to proper living conditions. Copies of the memorandum may be purchased directly from H.M. Stationery Office, or through a bookseller, price 2*d.* net.

Vitamin E

REFERENCE was made in NATURE of December 16, 1939, p. 1008, to a solution of vitamin E now available commercially. Glaxo Laboratories Ltd. put on the market in 1933 capsules of wheat-germ oil extract (thirty times as potent in vitamin E as wheat-germ oil itself). The capsules were given the name 'Viteolin' in 1937. Viteolin was the preparation used by Currie and M'Gonigle in their published clinical trials which confirmed in Great Britain the value of vitamin E in the treatment of habitual abortion. With the availability of vitamin E as a chemical substance (tocopherol) each 'Viteolin' capsule has been standardized to contain the vitamin E potency of 6 mgm. of tocopherol, the potency clinically established as the desirable daily dosage.

Institute of Physics and Freedom in Science

THE Institute of Physics has sent the following letter signed by its president, Prof. W. L. Bragg, to the Polish Ambassador: "On behalf of the Board of the Institute of Physics I have to convey to you, and through you to your Government, the deep sorrow with which British physicists at home and overseas have heard of the forcible closure of the Institute of Physics in Warsaw, the dispersal of its eminent staff and the confiscation of its valuable equipment. Our sympathy goes out to our Polish colleagues in this interruption of their labours for the progress of our science, and in the tragic and unmerited hardships and perils which they are enduring. We look forward to the time, which we pray may not be far distant, when, restored to its former freedom, the Institute of Physics in Warsaw shall once again take its place among the great scientific institutions, and continue its work for the advancement of learning, and the welfare of mankind."