Scientific Research and Modern Life.

THE recently published report of the Department of Scientific and Industrial Research[1] covers the period Aug. 1, 1928–July 31, 1929. It is signed by Lord Parmoor and includes the short report of the Committee of the Privy Council, and the longer report of the Advisory Council, together with summaries of the work done under the direction of the various research boards and by the research associations which have received grants from the Department, and also appendices dealing with finance, publications, and the organisation of industrial research in various parts of the British Empire.

Originally appointed by an Order in Council of July 28, 1915, the Committee of the Privy Council, consisting of the holders for the time being of certain Ministerial offices, is charged with the duty of directing the application of the sums of money provided by Parliament for the organisation and development of scientific and industrial research. The gross estimate for the present year is £644,379, of which £31,071 is for headquarters administration, £32,000 for grants, £512,570 for research work and research establishments, and £68,738 for the Geological Survey of Great Britain and the Museum of Practical Geology, the administrative control of which was transferred to the Department in 1919.

Much detailed information is given regarding the allocation of the money, from which it is seen that the net cost of the National Physical Laboratory during 1928–29 was £89,861, of fuel research £77,877, of building research £32,362, of forest products research £34,327, and of food investigation £18.546. Of the various research associations, during eleven years the British Scientific Instrument Research Association has received £100,484; the Woollen, Cotton, Linen, and Rubber Research Associations in nine or ten years have received respectively £54,643, £92,662, £57,282, and £30,983; while altogether twenty-three associations have received grants. The total expenditure on the National Physical Laboratory was £195,164, but the receipts from outside bodies, firms and Government departments, amounted to £105,303.

Though, considering the immense interests involved the sum at the service of the Department is comparatively small, it is probable that the influence of the work of the Department is felt in every part of the Empire, while perhaps no portion of the national income is expended with more beneficial results. Agriculture, food, housing, heating, lighting, clothing, transport, and communications, all profit by the investigations either directly carried out by the research boards or assisted by the Department, and science is not only applied to difficult industrial problems, but it is also made to minister to our everyday needs in a thousand ways. The storage of fruit, the production of beet, cutlery manufacture, laundry work, flax growing, boot-making, furniture, anthrax from skins and hides, coinage, the ageing of rubber, dentists' fillings, mites in flour, the cocoa moth, water purification, fish and salt meat, are all among the things which are being investigated and will undoubtedly pay for investigating. No fewer than fifty boards and committees are shown as directing the inquiries, which affect the whole population. On these committees sit some of the most distinguished men of science in Great Britain, and their services to the nation are none the less valuable because in many cases they are given voluntarily. These committees may indeed be regarded as a great general staff organised for the application of science to our common wants.

It is impossible in a short article to do justice to the great range of subjects that fall within the province of the Department, but to illustrate the close relationship of its work and everyday life we have selected the reports of the Fuel, Food, Building, and Forest Research Boards. Second in importance to none is the national question of fuel, whether used for industrial or for domestic purposes. Presided over by Sir Richard Threlfall, the Fuel Research Board has local committees in all the coal-producing areas and maintains the Fuel Research Station at Greenwich. Of this station the Advisory Committee remarks: "We take this opportunity of expressing to Your Lordships our appreciation of the value of the work of this Station. Your Lordships can be confident that we now have a national organisation for fuel research which is not excelled in any other country."

When the Fuel Research Board started its work, it gave a large degree of priority to all problems of carbonisation, these being considered of importance from the point of view of smoke abatement and of the production of oil from home resources. It was also desired to stimulate industrial development. Then, too, the Board was asked to advise on the composition and quality of gas for public supply. In connexion with these matters, problems in both high-temperature and low-temperature carbonisation have been attacked with noteworthy results. Now it is proposed to carry out a general investigation of furnace design with particular reference to the burning of pulverised fuel, which is being introduced both ashore and afloat. The chief technical problem here is to secure complete combustion in a small space; hitherto it has been considered necessary to have large combustion spaces, but for this there does not seem to be any basic necessity. The production of metallurgical coke, the manufacture of water gas, the hydrogenation of coal, and the composition of tar are all being studied. An outstanding feature of the year was the starting up of the low-temperature carbonisation plant at the Richmond Gas Works, erected to the designs worked out at the Fuel Research Station. After preliminary difficulties were overcome, the plant was successfully put into commission, and the new domestic fuel was placed on the market as 'Gloco'.

The Food Investigation Board is presided over by Sir J. G. Broodbank, while Mr. W. C. D. Whetham

[1] Department of Scientific and Industrial Research. Report for the year 1928–29. (Cmd. 3471.) Pp. v+200. (London: H.M. Stationery Office, 1930.) 3*s.* 6*d.* net.

is chairman of the management committee of the Low Temperature Station for Research in Biochemistry and Biophysics at Cambridge. Our fuel supplies are ample; our food supplies come from all over the world, and the successful preservation and carriage of fruit, vegetables, meat, and fish affect every home. The storage of fruit has been studied for ten years, and it is proposed to publish a comprehensive report on it. Special attention has been given to apples, and recent investigations show that there is a critical low temperature for each variety of apple, below which the fruit rapidly deteriorates in storage. For the study of fruit an experimental station is being erected at East Malling, and for the study of fish a research laboratory is being inaugurated at Aberdeen. Towards the cost of these the Empire Marketing Board is assisting. The value of the fish landed in Great Britain last year was £18,000,000; the value of the meat imported, £109,000,000—figures which indicate the importance of the trade in these commodities.

While many of the inquiries led to long and difficult experiments in the laboratory, an example of work of more immediate practical application arose through requests made by the Sheffield and Leicester Corporations. The question was whether the hanging of meat improved its palatability. Experiments were made with meat conditioned at 32° F. and 41° F. up to ten days hanging, and it was found that the palatability was improved, the flavour was retained, and the texture and juiciness of the meat improved. In the tests, assistance was received from members of King's College for Women and the staff of Messrs. J. Lyons and Co.

Houses, furniture, and clothing are as necessary as food and fuel, and the work of the Building Research Board, the Forest Products Research Board, and that done by the Cotton, Woollen, Silk, Leather, Boot and Shoe, and other Research Associations, afford many examples of the value of the scientific method applied to age-long problems. Limes, plasters, cements, paints, breeze, artificial stone, the weathering of stone, the vibration of buildings, wind pressure on structures, are being investigated by the Building Research Board, while the Forest Products Research Board is dealing with the anatomical structure of woods, the seasoning of furniture timbers, the shrinkage and deterioration of timbers, the testing of pit props, and the habits of the various insects which destroy our roofs and furniture. Many firms apply to the Boards for information, and, in addition to advisory work at home, much has been undertaken for places so far apart as Burma, British Honduras, Australasia, and Kenya.

In other directions work is proceeding on metals and alloys, boiler plates and ingot steel, corrosion, the fatigue of metals, electro-deposition, springs, radio telegraphy and telephony, lubrication, cast-iron, refractories, and many engineering problems. While one department is engaged on the study of steel, another is considering the advisability of establishing a national locomotive experimental station, and yet another is doing work of value for our cathedrals and churches. Canada, Australia, New Zealand, South Africa, and India are all following in the footsteps of the Mother Country: they all have research organisations, and of their activities the report gives a brief review.

A New High Voltage Research Laboratory.

THE opening by Sir Ernest Rutherford of the high voltage research laboratory of Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, Manchester, on Feb. 28 is a noteworthy event. The increasing use of the outdoor type of construction for high voltage apparatus makes it necessary to determine how this apparatus will act during gales, thunderstorms, and snow-storms. As the standard pressure for distributing electrical energy in Great Britain is 132,000 volts, and a factor of safety of three or four is desirable, it is very advisable that all devices for use in high voltage lines should be tested at pressures of several hundred thousand volts.

In the present state of our knowledge, the performance of insulating material under very high pressures can in general only be determined by experiment. Although there are now several laboratories abroad which have facilities for testing at a million volts with a large reserve of power, yet with the exception of the high voltage equipment at the National Physical Laboratory, Teddington, there was none in England. It is highly satisfactory, therefore, that one of the largest industrial firms should have built a million volt laboratory under the supervision of its able engineers.

The present laboratory consists of two semi-independent main buildings and an annex. The smaller of the two main buildings, which is 47 ft. long by 67 ft. broad, was built in 1923 as a 500,000 volt-power frequency laboratory. When it was decided to extend the equipment to give a million volts, the second main building, 67 ft. by 86 ft., was laid down with a wall in common with the original building. The latter is now equipped with devices for producing transient voltages and is called the 'surge' laboratory. The annex contains the materials and physics laboratories and a machine room where all the generators and running machinery are isolated so as to reduce noise.

The main electrical equipment consists of two 500,000 volt, 500 k.v.a., 50 cycle transformers, one being located in the main laboratory and the other in the surge laboratory. For producing a million volts, the two transformers are connected in cascade by the well-known Dessauer method. The second transformer, the one in the main laboratory, is shown in Fig. 1. As the primary winding of this transformer has a potential difference to earth of 500,000 volts, the whole transformer has to be thoroughly insulated from the earth. This is done by means of pedestal pillars which support the tank