

100 MW. graphite-moderated, water-cooled reactor power station in Siberia. In the United Kingdom gas-cooled, graphite-moderated reactors developing towards exit gas temperatures of 550° C. and 750° C. promise to lead to higher efficiency and ratings and a 30 per cent fall in capital costs of nuclear power stations is predicted with the development of the present main types. The application of radioactive isotopes continues to grow, including the use in industry of control instruments based on radioactive isotopes, such as thickness gauges. Total sales of radioisotopes and related products rose from £650,000 to £800,000, the proportion exported remaining at about 60 per cent, to 55 countries. Plans for the extraction of radiocesium from radioactive waste are being considered in the United Kingdom and the potential output amounts to tens of millions of curies per annum. In raw materials, developments during the year confirmed that the present over-supply of uranium is likely to persist at least until the late 1960's, and the uranium requirements of the free world's current military and civil programmes can now be met by mines already in production, and it seems likely that the forward price of uranium may fall below 8 dollars per pound.

Apart from its first aim of ensuring the successful construction and operation of the nuclear power stations now under construction for the electricity boards, the Authority's reactor development programme comprises extensive work on the development of more advanced types of reactor, the aim of which is to provide progressively cheaper sources of nuclear power, and here the achievement of lower capital costs is a major objective. Efforts are being made to develop ways of using as fuel the plutonium that will gradually become available from the burning of uranium in the early stations. Beyond the natural uranium reactors two stages of development are envisaged. First, the advanced gas-cooled reactor and the water-moderated reactors seek to attain lower capital costs by using slightly enriched fuel. Secondly, the high-temperature gas-cooled reactor being developed at Winfrith Heath as a joint project with other member countries of the European Nuclear Energy Agency, and the fast breeder reactor at Dounreay are characterized by both low capital costs and negligible net fissile fuel consumption. While the present type of gas-cooled, graphite-moderated reactor may command a market overseas where large stations are required, the report points out that considerable advances in nuclear technology will be required before smaller reactors (20–100 MW.) become competitive in normal circumstances. The study of plutonium utilization in reactors continued

as well as reactor physics studies in several zero energy reactors.

The report summarizes further research on controlled thermonuclear reactions. The main object of the present experimental programme on *Zeta* and *Sceptre III* is to discover the reason for the excessive loss of energy to the torus walls during the current failure. Work on smaller-scale gas-discharge devices was considerably expanded and some of the formidable technological problems involved in building a thermonuclear reactor are being studied. An Advisory Committee under the chairmanship of the Board Member for Scientific Research was set up in December 1958 to examine and keep under review all aspects of the Authority's research programme on controlled thermonuclear reactions, to advise the Member responsible for research policy on the merits of proposals for new work, and to make recommendations on changes in policy which seem necessary. Other research and development work being carried out by the Research Group, the Industrial Group and the Weapons Group is also briefly summarized. The first ranges from metallurgy, the physics of the solid state to work on particle accelerators. That of the Industrial Group extends far beyond the Group's laboratories, and extramural agreements between the Group and universities, research associations and industry now accounts for about a tenth of the Group's annual expenditure on research and development. That of the Weapons Group is illustrated by its examination of soluble chelate complexes of the alkaline earth metal ions and by its measurements of particle size, including use of a centrifugal system to increase the rate of sedimentation with the photo-sedimentometer.

Since its establishment in 1958 under the chairmanship of Sir Douglas Veale, the committee advising the Authority on the supply of specialized health and safety staff has had detailed consultations with many Government departments, hospitals, universities and industry. An interim report to the Authority recommended the initiation of courses in radiobiology and radiological physics at selected universities and provision of studentships if possible for the 1959–60 academic year. This recommendation has been accepted in principle by the Authority and details of the scheme are being worked out in collaboration with the University Grants Committee and the Department of Scientific and Industrial Research. The amount of research and development work contracted out by the Authority continues to increase and more than three hundred professional staff and technical staff from industry have worked with Authority staff during the year.

THE INSTITUTE OF PHYSICS

THE main sections of the thirty-ninth annual report of the Board of the Institute of Physics for 1958 (Pp. 18. London: Institute of Physics, 1959), which was presented to the annual general meeting of the Institute on July 7, deal with membership, examinations, education and publications. During the year, 851 applications for election or transfer to the various grades of membership were received. The total membership increased by 415 to 6,309, with a slight decrease in the number of subscribers (430 compared with 453 in 1957), but

with fairly large increases in the associateship and student membership grades. Seven technical colleges which had applied for recognition as institutions possessing courses of study approved for the purpose of the membership regulations were visited by representatives of the membership and examinations committee and six of the applications were approved. In addition, the application by the Borough Polytechnic, London, for recognition of courses on which the Diploma of Technology in physics is awarded was granted. Twenty-six of the eighty candidates

who presented themselves for the examination for the graduateship grade of membership were successful; twelve were university graduates and fourteen held the Higher National Certificate in applied physics. Forty-one colleges presented 637 candidates for the Ordinary National Certificate in applied physics and twenty colleges 246 candidates for the Higher National Certificate.

A joint committee of the Institute and the Physical Society has been set up to inquire into the post-graduate training of physicists and has held discussions with university and industrial physicists. The report on "The Teaching of Mathematics to Physicists", which was prepared by a joint committee of the Institute and the Mathematical Association and published originally in 1943, is now being revised. The Institute was invited to give its views on the subject of grants to students, and the text of the memorandum submitted by the Board to the governmental committee under the chairmanship of Sir Colin Anderson was published in the January issue of the Institute's *Bulletin*.

Satisfaction is expressed in the annual report at the standard and increased circulation of the Institute's older monthly, the *Journal of Scientific Instruments*. There was no significant change in the circulation of the other monthly, the *British Journal of Applied Physics*, but both journals suffered a further decline in advertisement revenue. New arrangements for selling advertising space to become effective during 1959 and for widening the scope and content of the *British Journal of Applied Physics* have been decided upon. A new feature in the 1958 *British Journal of Applied Physics* was the introduction, in the June and October issues, of a 'New Books' section which together contained reviews of 87 books. The type size of the *Bulletin* was reduced for the 1958 volume. This resulted in a considerable saving in paper, but the 366 text pages, comprising twenty-five articles and fifty-two book reviews, etc., contained more material than the 404 pages of the previous volume.

The first annual dinner of the Institute was held on March 26, 1958, at the Savoy Hotel, London, when 267 members and guests were present.

The Institute maintains nine branches and seven specialist groups in Great Britain, and two branches overseas, in Australia and Malaya respectively. The activities of these sections are briefly described in the annual report, together with extracts from the reports of the Board's representatives and nominees on joint and other committees and organizations. The South Australian Division held the sixth Australian instrument exhibition in Adelaide during August 19-22, at the same time as the Adelaide meeting of the Australia and New Zealand Association for the Advancement of Science. The second Einstein Memorial Lecture was delivered in October in Adelaide by Prof. B. J. Bok, who took as his subject "Stellar Evolution". The London and Home Counties Branch held a joint meeting in March with the London Section of the Royal Institute of Chemistry on the subject of science and society, and the South-Western Branch joined with the Education Group in a three-day conference in April at the University of Bristol on "Physics in Schools". The Electronics Group and the Midland Branch collaborated in a one-day symposium during April on some applications of solid-state physics in computers and automation, and in September the Group held a two-day conference on "Solid-State Memory and Switching Devices" at University College, London. The Non-Destructive Testing Group held its summer meeting in Paris jointly with the Société Française de Métallurgie, when the subject of discussion was "The Utilization of Physical Properties for Studying Relationships between the Constitution Structure and Service Behaviour of Metals".

At the general meeting of the Institute, the following were elected to take office on October 1: *President*, Sir George Thomson; *Vice-President*, Dr. J. M. A. Lenihan; *Hon. Treasurer*, Dr. J. Taylor; *Hon. Secretary*, Prof. F. A. Vick; and *New Ordinary Members of Council*, Dr. V. E. Cosslett and Mr. L. Rotherham.

SOME INTERNATIONAL GEOPHYSICAL YEAR ACHIEVEMENTS

THE Royal Society has issued under the above title a small pamphlet constituting an interim statement at the end of the observational phase of the International Geophysical Year. The pamphlet contains short notes, arranged under the fifteen subject fields, of statistical details of the work done and of important new deductions so far made from the International Geophysical Year observations. Some features of special interest are as follows.

Meteorology. Ozone observations at the Royal Society base, Halley Bay, Antarctica, show an annual variation in total ozone content with a sharp increase in early summer markedly different from the variation over the Arctic where there are smooth rises and falls about an autumn minimum.

Geomagnetism. Halley Bay is found to have been most advantageously sited for recording geomagnetic disturbances as it is the only antarctic station just outside the zone of greatest concentration of ionospheric currents. In one magnetic storm the range of the fluctuations in horizontal force reached the

enormous value of one-sixth the average value of horizontal force.

Ionosphere. Halley Bay has recorded remarkable features in the diurnal variation of ionospheric electron density in winter. The noon value in winter exceeds that at noon in summer and is ten times that at midnight. In summer the diurnal range is small with a minimum at midnight. These variation types change over suddenly near the equinoxes.

Solar activity. United States ionospheric observations made by rocket reveal the existence of a powerful flux of solar X-rays at the time of a solar flare. This X-ray flux produces the increase in D-level ionization which in turn affects long-range radio communications.

Cosmic radiation. Cosmic ray measurements made by Van Allen with the United States artificial satellites have, as is now well known, revealed the existence of an intense belt of cosmic radiation surrounding the Earth.