

more uniform and finer-quality powders, and its work on quality control and grading has led to the adoption of a comprehensive system of grading by size characteristics, with limits for chemical impurities.

Basic research by the British Leather Manufacturers' Research Association in the past five years has been concerned with the hide and skin proteins and the isolation and identification of constituents of vegetable tanning materials. In applied research the advantage of sodium chlorite over sodium hyperchlorite as an antiseptic in soaking has been demonstrated, and a water-proofing process developed in which the addition of rubbery polymers to the silicone solution greatly reduces the amount and cost of silicone needed. An intensive study of batch tannages in the laboratory and on the small-works scale enabled the duration of vegetable tanning to be reduced from 6–12 weeks to 14–21 days. The Hosiery and Allied Trades Research Association has given considerable help in the development of new knitting and wet-

processing techniques for tailored synthetic fibre yarns, and suggested a scheme for the continuous processing of nylon hose. The British Launderers' Research Association has established the practicability of medium-temperature washing and cold-water rinsing, and has set up a Special Projects Group to investigate and develop new methods and equipment which should permit laundering on a continuous-flow basis. Psychological tests on apprentices in nineteen firms by the National Institute of Industrial Psychology have yielded a good correlation between performance at the tests and performance at technical colleges, and the tests should give a valuable forecast of probable performance during apprenticeship. Work still in progress includes inquiries into relations between satisfaction and efficiency at work, between management structure and managers' satisfaction and effectiveness in their work, methods of measuring 'personal' values relevant to people's occupations and the development of new tests of colour vision and colour-matching skills.

THE FRANKLIN INSTITUTE

AT the annual meeting of the Franklin Institute held on January 20, the president, Mr. W. L. LePage, gave a summary of the activities of the Institute during 1959, and presented the annual report of the board of managers for 1959*.

The year 1959 marked the one hundred and thirty-fifth anniversary of the founding of the Institute and the twenty-fifth of its fine building on the Parkway, Philadelphia, and the report makes special mention of the remarkable growth of the Institute's activities since its modest beginning in 1824 as an organization for the mutual benefit of a few citizens of Philadelphia. To illustrate the Institute's present wide sphere of influence, the highlights of the activities for 1959 are presented in the annual report in the form of a spiral, the focus of which is taken as at the Institute's headquarters in Philadelphia and the unbroken curves of which reach out through the Delaware Valley, the nation, the world, and the universe beyond our planet. Each of these areas is taken as the title of one of the sections of the report, and the Institute's activities are discussed according to the area in which their contributions to science were the largest.

Five of the Institute's main activities—the Science Museum, the Astronomy Department, the educational radio and television programmes, the science meetings, and the Library—are confined almost entirely to Philadelphia and the Delaware Valley. The number of visitors to the Museum during 1959 was 410,433, of whom approximately 290,000 were school children. Sixteen permanent exhibitions were added during the year, of which the two most spectacular were the full-size *Matador* missile and the smoke tunnel in the Hall of Aviation. The demonstration, "Our Biggest Satellite—the Moon", which was shown in the Astronomy Department during September–October, proved extremely popular since that period coincided with the launchings of the *Lunik II* and *Lunik III*. Other exhibits included a *Vanguard* exhibit and a

model of the 600-ft. radiotelescope which is being erected in Virginia. The radio and television programmes for schools in the area consisted of a weekly series of radio broadcasts covering science subjects and six television broadcasts featuring aspects of work being carried out in the Institute's laboratories. The titles of the twenty-one lectures presented at the Institute's meetings are listed in the report. They include, "The Impact of the International Geophysical Year on Science and Engineering" given by H. Odishaw; "Fundamental Particles" by H. A. Bethe; "The Fuel Cell" by H. A. Liebhafsky; and "The Science of Yesterday, To-day and To-morrow" by W. F. G. Swann. The number of accessions to the Library during the year was 4,281, bringing the total of holdings to 167,135, and the number of journals currently received rose to 1,336, including nineteen Russian journals and fourteen English translations of Russian serial publications.

In recent years the part played by the Institute in the scientific life of the United States of America has grown greatly in importance, mainly because of the work of the Institute's Laboratories and the series of technical symposia and conferences sponsored by the Institute. The symposium on space medicine electronics, held in the spring, and the international symposium on gas-lubricating bearings, held in the autumn, attracted large audiences from afar. The Computing Centre, which completed its third year of operation in 1959 and its first year as a separate activity, drastically reduced its machine-use charges and many more industrial firms availed themselves of its services. Contracts received during 1959 by the Institute's Research and Development Laboratories passed the four million dollar mark for the first time. New equipment included the latest model electron-microscope and Varian instruments used in studies of nuclear and electron-spin resonance. Projects undertaken included the production of an ultra-pure iron bar of 1-in. diameter by zone refining; apparatus to measure speed by detecting the light of an ionized gas at two points along the travel of a

* A summary and full text of the illustrated report appear in the April issue of the *Journal of the Franklin Institute* (269, 315; 1960).

wave; the preparation of a text-book on thermal stresses in nuclear reactors; and several projects related to missiles and satellites, including the design and construction of an advanced type of satellite.

By its Committee of Science and the Arts, its *Journal*, and by the work of the Biochemical Research Foundation, for which the Institute serves as trustee, the Institute is best known throughout the world. The Medal Day ceremonies organized by the Committee were held on October 21, 1959. The seventeen individual recipients included H. A. Bethe, C. H. Townes, and C. M. Zener, and one industrial company. One of the achievements of the Biochemical Research Foundation in its concentrated attack on cancer was the successful isolation of a unique streptomycin-independent strain of *E. coli* which can be used as a screening organism in a search for anti-mutagens. Long-term studies of the effects of nutrition on cancer growth were continued, as well as studies of the metabolic processes of cancer cells. In addition to the *Journal* the Institute now issues *The Institute News* eleven times a year, and although intended primarily for Institute members, this four-page newspaper is also distributed to schools, libraries and others interested in science education.

The cosmic ray group of the Bartol Research Foundation of the Institute participated in the

International Geophysical Co-operation, and constructed a new cosmic ray monitor for installation at McMurdo Naval Air Facility in Antarctica, to complement the one in operation at Thule, Greenland. The detector for heavy nuclei contained in the satellite *Explorer VII* was designed by the Foundation. The Foundation's headquarters are located on the campus of Swarthmore College, and in addition to providing an active programme of scientific colloquia and public lectures, undergraduate students of the College have been encouraged to participate in the Foundation's research programme.

The report concludes by emphasizing that, though the Institute's Laboratories and the Foundation are self-supporting, the accounts indicate that the educational and general activities of the Institute, which must expand to meet the growing need, will soon face a critical financial situation. A total of approximately 204,000 dollars was received in 1959 in gifts, bequests and from other sources, but the net loss for educational and general activities, though reduced from the 1958 figure of 100,000 dollars, was still more than 20,000 dollars, and will rise as the planned expansion gets under way during the next decade. The managers of the Institute appeal to the increased generosity of members and friends of the Institute to provide the necessary additional funds.

THE ATOMIC ENERGY OF CANADA LIMITED

THE need for, and the extent of, a nuclear power programme in Canada is one of the main topics of discussion in the annual report of the Atomic Energy of Canada Limited for the year ended March 31, 1960, which has recently been published*. Although Canada has vast resources of oil, gas, coal and untapped water power, these are not uniformly distributed across the country and already some regions are approaching the point where the conventional power resources will need to be supplemented by nuclear power. The industrial area of southern Ontario is likely to be the first of these regions, and it is fortunate that conditions in this area are favourable to the early introduction of nuclear power, for not only is the generating capacity of the Hydro-Electric Power Commission which serves Ontario capable of absorbing the additional 200 or so megawatts, but also there are present in the province of Ontario extensive uranium deposits and large uranium mines.

After considerable examination of the various alternatives and several years experience in the operation of such reactors, it is still the conviction of Atomic Energy of Canada Limited that the type of reactor which is fuelled by natural uranium and moderated by heavy water offers the best promise for early, low-cost nuclear power in large units. The four nuclear power projects which the authority has in hand are described in detail in the report. The first two, the Nuclear Power Demonstration Station being built at Rolphton some twenty miles west of Chalk River, and the Douglas Point plant, are closely related. The reactor at the Nuclear Power Demonstration Station is moderated and cooled by

heavy water and uses pressure tubes instead of a pressure shell to contain the coolant. The fuel consists of natural uranium dioxide pellets sheathed in 'Zircaloy' tubes, and the tubes are grouped together in bundles. The Station, which is expected to have an output of 20 MW. (electrical) and to go into operation during 1961, is a prototype, and the results of tests carried out at the Station will be used to improve and modify the design of the Douglas Point Station, the construction of which was authorized in June 1959. The clearing of the 2,300-acre site on the eastern shore of Lake Huron began in February 1960, and the Station is scheduled for completion by mid-1964. Provision has been made for two 200-MW. units, but at present only one unit *Candu* (Canadian deuterium uranium) has been authorized and is under construction.

The third nuclear project, called *Ocdre* (organic cooled, deuterium moderated, reactor experiment), consists of the development of a nuclear power reactor of medium size which it is hoped will prove attractive to industrial concerns. A preliminary report on the design of such a reactor, which was to be available in August 1960, is to include an estimate of cost of the construction of an experimental reactor. The fourth project is devoted to the study of information relating to small nuclear plants suitable for use in remote regions of Canada.

At the Chalk River Research Establishment both the *Nry* and *Nru* reactors were in routine operation during the year, being fully occupied with research experiments, the production of radioisotopes and plutonium, and engineering testing. The several 'loops' in the reactors have been used by both the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. The

* Atomic Energy of Canada Limited. Annual Report, 1959-1960. Pp. 36. (Ottawa: Queen's Printer, 1960.) 25 cents.