

approximately eighteen times the total consumption of electricity in the U.S.S.R. to-day. Probably only 50 per cent of this can be developed economically, but even this figure provides a comfortable margin over the country's needs for many years to come. Research work is, however, being undertaken on peaceful uses of atomic energy, and atomic power stations are planned for areas where there are no local supplies of fuel and presumably no hydro-electric supplies of power.

The development of hydro-electric supplies is always combined with plans to improve the navigability of rivers and to improve irrigation. In most schemes rivers are converted into a series of large lakes and this must entail some loss of potential power through increased evaporation. In one scheme, however, in Armenia, it is proposed to lower the level of Lake Sevan over a period of fifty years in order to reduce the loss due to evaporation. According to the original scheme, the lake was to be reduced to one-sixth of its area, but a less drastic reduction is now under consideration, coupled with the diversion of water from other watersheds to make good the power lost.

The visiting engineers were generally favourably impressed with the quality of the constructional work carried out and with the technical knowledge of the engineers in control, but they mention seeing several instances of the use of rather poor concrete, and the finish of both constructional work and machinery was not always up to the best British practice. One interesting feature was the small use made of timber shuttering, pre-fabricated permanent concrete shuttering being more generally used.

Many of the structures and earthworks are founded on permeable material and a considerable research effort is devoted to the study of soil mechanics and the strength of materials and structures. Extensive use is made of models before starting full-scale construction. Most of the hydro-electric machinery is manufactured in the U.S.S.R., but the party were only able to visit two manufacturing plants. Factory workers work forty-six hours a week including six on Saturday. Overtime is paid at time and a half for the first two hours of each day and then at double time. There are also bonus incentives.

Eighty per cent of the potential water power of the country is east of the Urals, in relatively thinly populated areas, and considerable attention has, therefore, been given to transmission problems. A 400 kV. a.c. overhead line between Kuibishev and Moscow, a distance of 500 miles, has recently been completed, and there is a proposal for an 800 kV. d.c. line between Stalingrad and the Donbas area, a distance of 250 miles. Some indication of policy in the matter of electricity consumption is afforded by the fact that the private consumer may have to pay thirty times as much for his electricity as a favoured industrial consumer.

There is an interesting appendix giving the estimated total production in 1960 showing increases above 1955 ranging from 23 per cent up to a twenty-one-fold increase. Comparable British figures would have been helpful here, especially for the general consumption goods. These figures show, for example, two pairs of footwear per head of population and approximately one refrigerator, one washing machine and one motor tricycle for every 400 members of the population, as the annual production in 1960.

The members of the visiting party were Sir John Hacking, of Merz and McLellan; Mr. A. A. Fulton, of the North of Scotland Hydro-Electric Board; Dr. S. P. Hutton, of the Department of Scientific and Industrial Research Mechanical Engineering Research Laboratory; Dr. W. MacGregor, of George Wimpey and Co., Ltd.; Mr. R. W. Mountain, of Kennedy and Donkin; and Mr. H. West, of Metropolitan-Vickers Electrical Co., Ltd. A. H. M. ARNOLD

FRANKLIN INSTITUTE REPORT FOR 1956

AT the annual meeting of the Franklin Institute which was held on January 16, the president, Mr. S. Wyman Rolph, gave a brief summary of the activities of the Institute during 1956. The full text of the annual report of the board of managers appears in the March number of the *Journal of the Franklin Institute* (263, 229; 1957).

The report states that the year under review was a successful one, both financially and otherwise, for the Institute. The Laboratories for Research and Development, which celebrated their tenth anniversary in March 1956, became not only self-supporting but even accumulated a surplus, which can be used for the purchase of much-needed additional equipment. For the first time the gross value of the wide range of investigations carried out for industrial sponsors and the United States government exceeded 3 million dollars. The greatest increase in effort occurred in the field of nuclear engineering, and in November a separate Nuclear Engineering Division was established to handle this particular work. The work on air pollution, carried out by the Division of Chemistry and Physics, was expanded considerably, and a mobile laboratory for the analysis of polluted air was used to study the 'smog' problem in the Los Angeles area. A public semi-technical symposium on the subject of air pollution was held at the Institute in October during Philadelphia's 'Cleaner Air Week'. An electronic recorder for the recording of transient events in proper time sequence, which is most useful in the study of mechanical strains and in chemical kinetics, was designed and constructed by the electronics section of the Electrical Engineering Division, and a Remington-Rand 'Univac' digital computer has been installed, which will be used by the analysis section of the Division to solve engineering problems arising from projects in various departments of the Laboratories and also will be available for data processing for other organizations.

The circulation of the Institute's *Journal* increased from 4,734 at the end of 1955 to 4,876 at the end of 1956. The January 1956 issue commemorated the 250th anniversary of the birth of Benjamin Franklin. The group of associate editors of the *Journal* was increased during the year by eight new appointments to widen the coverage in electronics, mathematics, aerodynamics, thermodynamics, solid state physics, biophysics and nuclear engineering. Commencing with the July issue, Dr. J. S. Burlew succeeded Dr. H. B. Allen as editor. This followed Dr. Allen's retirement in January from the positions of executive vice-president and secretary of the Institute, and the appointment of Dr. Burlew as executive vice-president and Mr. H. V. Bail as secretary. In order to make the facilities of the Laboratories better known to industry, the Institute

has commenced publication of a series of brochures, of which two, dealing with computation services and industrial colloids and polymers respectively, appeared during 1956. A symposium on "Earth Satellites as Research Vehicles" was held on April 18 as part of a programme to promote the peaceful use of rockets; the full proceedings have since been published as Monograph No. 2.

Details are given in the report of the various meetings and scientific lectures held by the Institute during the year under review; the awards of the Franklin and other medals by the Committee on Science and the Arts; the activities of the Bartol Research Foundation and the Biochemical Research Foundation; the changes in the number of the staff, which increased by twenty to 556; and preliminary figures concerning the finances of the Institute. Separate sections of the report deal with the Museum and public relations. The Museum attendance showed a further increase, continuing the upward trend which commenced in 1951. About 40 per cent of the total of 336,000 visitors were in groups of school children, and for some of them the Museum's Education Division arranged special programmes designed to interest the young people in careers in science and engineering as part of the Institute's effort to help alleviate the shortage of trained people in those professions.

Several events in connexion with the celebration of the Benjamin Franklin anniversary took place at the Institute. A luncheon was held on Franklin's birthday (January 17), at which the City of Philadelphia's special Franklin Medal was presented to Mrs. Eleanor Roosevelt. The Institute has also been responsible for several series of radio and television programmes, including a weekly feature "Science, Servant of Man", which was broadcast from four separate stations. The anniversary celebrations and the broadcasts were all handled through the public relations department of the Institute.

THE WILDFOWL TRUST

READERS of the eighth report of the Wildfowl Trust, Slimbridge, Glos, will quickly detect the quiet pride and confidence which the editors, Peter Scott and Hugh Boyd, and the contributors have managed to convey. The visit of H.M. the Queen in 1956 set a seal on the Trust's first ten years of life and gave it a recognition so well deserved.

The Trust has three main lines of activity and the way in which each of these has expanded is clearly brought out in a report which covers a period of two years. As the results of its earlier work have become known, the Trust's research programme has received increasing outside recognition. Although much of the scientific work is paid for by the Trust itself, the Nature Conservancy has been able to offer increased assistance, while considerable help has been obtained from other, non-governmental, bodies.

In the educational field the value of the Trust's collection has been recognized by a spectacular increase in the number of schools and organized parties visiting Slimbridge. This number rose from 374 in 1953 to 464 in 1954 and 719 in 1955. The recreational value of Slimbridge was reflected in the growth of the number of visitors from 40,000 in 1954 to 90,000 in 1955 and more than 120,000 in 1956.

Although the numbers of wild geese seen at Slim, bridge showed no striking increases during 1954-56, the ringing of geese and ducks, there and at other stations, expanded considerably. In 1954 the Trust assumed a large measure of administrative and financial responsibility for duck ringing in Britain. All the eight ringing stations are in the southern half of England and Wales and there is urgent need for ringing to be undertaken farther north and in Scotland and Ireland; this will be done as more money becomes available.

Although the population study of the pink-footed goose continues to be the main Trust investigation, studies were also made of comparatively small-scale ringing of greylags and white-fronted geese. These studies are particularly valuable for the indication they give of the general resemblances between the population dynamics of all three species despite the differences in their breeding places and migration routes and the extent to which they are pursued by man in Britain and other countries. An important parallel to the pinkfoot inquiry is provided by a study of the blue and lesser snow geese of North America by Graham Cooch, of the Canadian Wildlife Service. In his article, Cooch describes his technique for catching these geese during the flightless period of the moult; the method has been based on long-established Eskimo techniques.

Two complementary articles are concerned with wildfowl conservation in North America and in Europe. The first, by F. C. Bellrose and T. G. Scott, deals with conservation in North America since 1945. The second, by Hugh Boyd, shows how American experience has been used on the problems of restocking with hand-reared ducks in Britain; evidence collected by Boyd suggests that it is unlikely that hand-reared ducks can improve shooting on the foreshore.

Besides a wonderful collection of photographs and some black-and-white drawings which could have come only from the pen of the Director, the report contains all the financial information to show that the Trust is now well established; it must be congratulated on selling Christmas cards to the value of £1,341 in one year.

VARIATION IN THE NUMBER OF BUTTERCUP PETALS

FOR five successive years, girls of Westonbirt School have kept a record of the variation shown in the numbers of petals in buttercups. The species investigated was chiefly *Ranunculus acris* with some *R. bulbosus*, and no attempt was made to distinguish between the two in petal variation. The work was done by girls in the second year of a general science course, their average age being 12-13 years. It was carried out when they were first introduced to flower structure and function and could profitably be done by younger or older children. An account of the study has been given by E. A. Potter (*School Nature Study*, 52, No. 207; April 1957).

In the first lesson, each girl had a number of flowers, which she examined, noting and describing in the usual way the number and shape of the various parts. The number of sepals was found to be constant at five, and this result was anticipated for petals. Although the majority of flowers had five petals, there was considerable surprise when some with six,