

## INDUSTRIAL AND AGRICULTURAL RESEARCH IN BELGIUM

THE annual report of the Belgian Institute for the Encouragement of Scientific Research in Industry and Agriculture for 1962\* records the award during the year of 62 subsidies totalling 303 million francs, on which 319 research workers and 930 technicians were engaged. Of this total, 65 million francs went to the National Centre for Metallurgical Research for work in physical and chemical metallurgy, on constructional steel and special steels and the metallurgy of iron, etc. Eight grants, totalling some 20.4 million francs, also went to the Centre for Scientific and Technical Research on the manufacture of metals. The Committee for Mapping the Soil and Vegetation of Belgium received a subsidy of 23.5 million francs, and the Committee for the Study of the Diseases and Nourishment of Cattle 16.7 million francs, while another 16 million francs went to the Centre for Applied Electronics for investigations on impulsion circuits, industrial control systems and of amplifiers, modulators and oscillators for transistors. The Road Research Centre received a subsidy of 14.75 million francs, while the Scientific and Technical Centre of the Belgian Textile Industry was granted 11.5 million francs for research covering cotton, wool, jute, linen, rayon and acrylic fibres. Apart from a subsidy of 11.35 million francs to the Centre for Scientific and Technical Research of the Metal Manufacturing Industry included among the eight already noted, and one of 10.75 million francs to the Belgian Society for Nitrogen and Chemical Products of Marly, only the subsidies of 9.9 million francs to the National Committee for the Study of Fruit Cultivation and of 9.5 million francs to the Committee for the Study of the Solid State are worthy of special mention. The Committee for the Scientific and Technical Study of Milk received 5.8 million francs, the Committee for the Study of

\* Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture, Bruxelles. Rapport Annuel, Exercice 1962. Pp. 277. (Bruxelles: Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture, 1963.)

High Polymers 5.6 million francs for research on the behaviour of high polymers to irradiation on the degradation of high polymers used as insulators, and on photopolymerization, the Research Centre for Animal Breeding and Fodder in High Belgium 5.27 million francs, and the Scientific and Technical Research Centre for the Explosives Industry 5.25 million francs.

The only other grant of 5 million francs or more was to the National Centre for Herbage and Fodder Research, but 4.7 million francs went to the Belgian Institute for Improvement of Beetroot, 4.3 million francs to the Belgian Centre for the Study and Documentation of Water, for research including, besides investigations on potable and industrial waters, on corrosion and effluents, some work on atmospheric pollution, and 4 million francs to the Committee for the Study of the Structure of the Soil. Among other large subsidies may be mentioned 3.8 million francs to the Technical and Scientific Centre for the Brewing, Malt and Related Industries, 3.4 million francs for tobacco research, 3.4 million francs for investigations of vegetable reproduction, 3.1 million francs for work on the conservation of fruit and vegetables, and 3.1 million francs for research on vegetable parasitology; 2.2 million francs went to the Belgian Wood Centre and almost 2 million francs each to the Belgian Centre for the Study of Medicinal Plants, the Research Centre of the Belgian Ceramic Industry and the Committee for the Study of Agriculture. Grants totalling almost 3 million francs went to the National Centre for Scientific and Technical Research for the Cement Industry, of which some 1.3 million francs were jointly for the Scientific and Technical Centre for Construction for an investigation on the measurement of the resistance of bitumen to compression. The report indicates briefly the extent of the investigations for which the subsidies are given and includes a list of publications during the year dealing with the subsidized investigations.

## CIVIL RESEARCH POLICY

THE report of the F.B.I. (Federation of British Industries) Working Party on Civil Research Policy\* is the outcome of a remit from the Federation to consider recommendations as to how the Government should support civil scientific research and development in industry, bearing in mind the possible lessening of such support for defence research and development, which has had valuable civil application. Part of the memorandum is addressed to industry and part to the Government.

The prime concept of the report is the presentation of a case intended to find ways and means of increasing very substantially the financial resources to be put into civil research and development. The magnitude of the target is a sum of £100 million per annum. A considerable proportion of this, it is advised, should be spent as direct support of research and development in industry. The responsibility for determining the allocation of such funds to the many claimants is recommended to be assigned to the Minister for Science, advised by a Council having presumably wide representation.

The following comments on the report in question are based on a long experience in three distinct fields of scientific research: in industry with a company noted for

its technological development; in the university, in charge of a technological department; and in research associations, covering no less than seven in various capacities from member of research committees to Department of Scientific and Industrial Research visitor.

A very important statement of the Working Party, amounting almost to a reservation, is its expression of concern as to whether its ideas would be practicable in terms of man-power. This question, apart from the problem of finding the money, becomes the crucial one of the whole matter. Mere multiplication of numbers will not give a corresponding increase of achievement in respect of fruitful research though it may give acceleration of the rate of progress at possibly a relatively increased price. Rather should the means be sought of strengthening existing organizations. This is in some measure advocated in the report, but it is not suggested to apply in any marked degree to the industrial Research Associations. Induced as a broad generalization the Working Party says: "We are bound to confess that the opinion in industry about Research Associations is not universally favourable". But how could one in all seriousness expect a unanimous opinion from industry on so wide a matter? I suggest that on balance industry is favourably impressed by the system of Government-aided research

\* *Civil Research Policy: a Report of an F.B.I. Working Party*. Pp. iii+11. (London: Federation of British Industries, 1963.) 2s. 6d.

associations and by their achievements although it no doubt feels, as the report suggests, that methods of financing may need recasting and particularly that the measure of Government financial support is inadequate. It is true that in the past there has been a serious lack of means in Britain to put to their fullest use the results of research. For their part, the research associations have not had in general the means to pursue active development in this respect. This function has been regarded as the responsibility of industry, but it becomes increasingly clear that the large-scale development of important research results must in the future become the responsibility of the scientist, the technologist, industry and Government, each playing an appropriate part.

The research associations have in this connexion an important potentiality which a number of them have developed very successfully, namely, the practicability of close collaboration between the technical elements of industry and the scientific staffs of the associations. The technical staffs of industry become closely associated with the progress of the work of projects in which they are interested. There can be developed active collaboration by many avenues; co-operation of member firms in joint researches, conferences, joint committees and frequent contacts between the technical staff of the works and the research station. The intelligence service of the research association alone is a powerful instrument in developing the growth of that research-mindedness which, as the report says, "cannot be achieved until all heads of companies become fully research minded nor until

adequate status is accorded to those responsible for research and development in the business". This is done successfully in some industries in Britain and more often in some countries abroad, notably France. On the other hand, the scientist should not expect the advocacy of his case to be undertaken by his lay brethren. The attitude to be adopted should be that a worthy cause deserves support.

Noteworthy is the point in this respect that the many achievements of the research associations have been made with only a small fraction of the public support that the Working Party now suggests as being necessary.

In the scheme advocated there could be new problems arising from lack of co-ordination, particularly in the privately inspired research and development contract, while at the same time there could arise a danger of over-rationalization by centralization of civil work at fewer centres. The secret of successful research I believe to be freedom from external interference of the skilled team, for team it must be to-day in much applied research. The largest organizations inevitably become unwieldy in administration. To be able to remain successful they have to resort ultimately to decentralization. There is a point of balance between the extremes of insufficient and over-control, which may become a critical issue.

It should of course be realized that the elements of progress are at work all the time. Often the most important are those about which there is least publicity. It is to be hoped that those who are called on to operate the 'priming-pump' may have the wisdom to guide the stream rightly.

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## THE MELLON INSTITUTE, PITTSBURGH

THE fiftieth annual report of the Mellon Institute\*, covering the year ended February 28, 1963, includes a historical sketch of the development of the Institute written by Dr. E. R. Weidlein.

Dr. Weidlein traces the growth of the Institute and of the industrial fellowship established by Dr. R. K. Duncan at the University of Kansas in 1907, and the Department of Industrial Research he established at the University of Pittsburgh in 1911 with the support of A. W. and R. B. Mellon. The Mellon Institute of Industrial Research and School of Special Industries was first established in 1913 as a part of the University of Pittsburgh, becoming independent as the Mellon Institute of Industrial Research (shortened to Mellon Institute in 1962) in 1927, although it still maintains close co-operation with the University. Functionally a centre for pure and applied research, it is also a clearing house for advanced scientists and a clearing house on specific scientific information. At the end of the year, out of a total personnel of 573, 118 held Ph.D.s or other doctorates, 33 were M.Sc.s and 303 were employed in scientific activities, while in addition 49 specialized technicians and craftsmen were mainly concerned with servicing research projects. Operating expenditure on independent and sponsored research amounted to 6.2 million dollars, and 600,000 dollars were also spent on improvement of existing or purchase of new equipment.

In biochemistry, investigations of acid-fast bacteria established that *p*-aminobenzyl alcohol is hydroxylated to *p*-aminophenol, and a new pathway for the metabolism of *p*-aminobenzoic acid has been established chemically by the use of radioactive isotopes. The carboxypeptidase *N* of human plasma fraction IV-I that activates the hypotensive peptides, bradykinin and kallidin, have been further investigated, and a mica replica technique used to examine macromolecules and various polymers of myosin in the electron microscope. In organic chemistry the

rotational isomerism of some mono- and di-substituted propenes has been investigated by nuclear magnetic resonance spectroscopy, *cis*, *cis*, *cis*-1 : 4 : 1-cyclonona-triene synthesized from indane in seven steps and also the pseudo-aromatic hydrocarbon, hexaphenylpentallene, and dioxocyanogen, the first difunctional nitriloxide. A multi-state mechanism has been proposed for homogeneous ionic polymerization, studies of the statistical thermodynamics of dilute polymer solutions continued in an examination of the equation of state for solutions of branched polymers, and the light-scattering behaviour of dilute solutions of macromolecules was studied as a function of temperature with a precision photometer having close temperature control, high angular resolution and signal stability. In geochemistry, investigation of the origin of stony meteorites was a major project, and in inorganic chemistry the study of the geometric isomerism of the diphenylalkylphosphine complexes of nickel halides continued; new routes to compounds containing four-membered heterocyclic rings of the type metal

were discovered for nickel, cobalt, iron, manganese and molybdenum, and a unique chemical system capable of carrying molecular oxygen or hydrogen.

In physical chemistry, investigations of the scattering of electrons by molecular gases were initiated and experiments on the vibrational spectra of various compounds completed, while the structures of tetraphenylsilicon and tetraphenyltin were refined by full-matrix 'least-squares' technique using anisotropic temperature parameters for all atoms. In radiation chemistry, investigations of the reaction kinetics of halogenated radicals have been extended to the examination of the relative rates of combination and disproportionation of trichloromethyl radicals with various other radicals. In continued investigations of the normal stress effect, the concentration-dependence of solutions of polyisobutylene in cetane has

\* Fiftieth Annual Report of the Mellon Institute for the fiscal year ended February 28, 1963. Pp. 48. (Pittsburgh: Mellon Institute, 1963.)