Scientific and Industrial Research in Britain

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THE PROBLEM of government help for science in industry is to secure the advice of both science and industry on what is needed, and then to combine reasonable continuity with some broad measure of democratic control. Like other problems of organization which are a little out of the ordinary, it has been handed in Britain to the Privy Council.

This is a centuries-old body which derives its authority directly from the King, and so carries weight; and as it is a purely formal body with no well-defined terms of reference it can conveniently concern itself with this problem. It is the Privy Council which nominally runs Britain's Department of Scientific and Industrial Research for the King. But the £4,199,625 which is the department's estimated expenditure for 1949–50 is provided in the normal way by Parliamentary vote, and the Lord President of the Council, chief of the Privy Council, is a cabinet minister. The advantage of the Privy Council connection is that it provides an administrative umbrella for an advisory council which is genuinely active. This consists of a mixture of outside scientists and industrialists, particularly those connected with industrial research, with two trade unionists as a more recent addition. The secretary of this advisory council is the permanent head of the department—at the present time Sir Ben Lockspeiser.

Of the department's staff of 3,200, more than 1,900 are engaged in research or technical work, including the supply of information. The department has twelve research stations of its own, supports some forty cooperative research associations, which among them cover the greater part of British industry, and by a system of grants encourages what it considers promising research at universities. Finally, through its headquarters, the department aims to act as a general clearing house for the exchange of scientific information of interest to industry; and with the same object, research associations are being encouraged to provide sufficient outside staff to bring information, and the means for information, directly to individual firms. No one and no organization can be omniscient, but an efficient information service can and should know where up-to-date information is to be found—whether in print or from someone who knows.

Gaps in Research

The main job of a research department is to fill gaps in research. Such gaps may be of different kinds and arise for different reasons. One is where the cost and size of certain equipment are greater than could be afforded without the help of the department. This is true of the wind tunnels used for the study of airflow and the design of aircraft, and the two 650-foot ship tanks at the National Physical Laboratory, Teddington, London. Both are competitively necessary for the industries they serve, not only for testing particular designs, but even more for the building up of a secure foundation of knowledge on which advances in design can be based.

The National Physical Laboratory is also responsible for maintaining national standards of length, weight, and so on. This is not research in the ordinary sense, but it involves research, and is of direct importance to industry, for in the long run all accurate measurements of whatever kind go back to laboratory standards.

A second kind of gap is where the demand for improvement comes from the user, rather than from manufacturer or producer. An example is the work of the chemical research laboratory of Britain's Department of Scientific and Industrial Research on the corrosion of metals. The laboratory is at the present time studying the thin surface films which give metals protection, and its work on the corrosion of iron pipes by bacteria in certain types of soil may well repay the running costs of the laboratory for all time. The chief users in this case are water supply undertakings, for the most important buried pipes are water mains.

In the case of noise, the user is anyone whose home is in a block of flats. This problem is a special case of the replacement of traditional methods of building by others less extravagant in time and materials, and the basic research on accoustics is undertaken at the National Physical Laboratory.

Food Refrigeration

Research on the storage and transport of food is also in the ultimate interest of the British public as eaters of the food. The older side of the department's work was on low temperature storage, and its prin-

cipal laboratories were at Cambridge, Aberdeen (for fish), and at East Malling in southeast England (for fruit). Examples of practical achievement have been the refrigerated gas storage of fruit and meat. A pest infestation laboratory was established in 1939, at a time when the government was much concerned over the wartime conservation of the nation's food stocks, chiefly grain. Since it is now a world, as well as a national, problem to obtain the best use from available food resources, it is probable that work on these lines will continue permanently.

The Forest Products Research Laboratory at Princes Risborough, near London, is used by interests in Britain, although it works closely, too, with the forestry departments of overseas territories on the suitability of particular timbers for various uses. It is concerned with the seasoning and preservation of timbers, as well as with their properties, and its work has been considerably increased by the wide use recently of substitute timbers.

The Building Research Station at Watford, near London, has played a large part in British postwar housing plans by working out standards of construction and methods of testing. It is a "user" laboratory, in the sense that neither individual local authorities nor small builders could be expected to carry out the necessary research if left to themselves, and it is directly in the interests of the householder that this research should be carried out.

Fuel and Radio Research

A third category of research is that directed to the best use of any national asset too important to be left to take its chance. The outstanding example in Britain is that of coal—and this brings in the Geological Survey, in the finding of coal and the collection of samples for examination; the Fuel Research Station at Greenwich, London, on the properties of different coals and their efficient use; and the Building Research Station, on domestic heating.

Other laboratories, which have not been mentioned, deal with road research and river pollution. Radio, and particularly radio propagation, is an old interest in the department which has already paid dividends in the development of radar and the use of radio methods in weather forecasting. Radio research, generally, is at present divided between the National Physical Laboratory and a small subsidiary station near Slough, outside London. A site is being sought for a new station at which the department's radio work can be centralized. A second new station, for work on mechanical engineering, is already being built at East Kilbride, near Glasgow, and a third for work on river and harbor models will be built when a suitable site is found.

All these activities are designed to close gaps which, it is felt, can be best closed by government action. And the search for such gaps continues. At the present time a committee is considering needs for research in chemical engineering. Finally, it may again be emphasized that all these institutions are centers of information as well as of research. They are collections of experts as well as of machines and equipment. And they are at the service of other government departments, cooperative research associations, and individual private firms which may have problems to present, with the intelligence division of headquarters as a general signposting unit.

TECHNICAL PAPERS

Qualitative Differences of Malignant Tissue

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Recently, Carruthers and Suntzeff (*2*, *3*) have published two important papers. Based on polarographic investigations, they conclude that, in opposition to the current view, certain tumor lipids show qualitative[1] differences from those in normal tissues. These lipids seem to arise at the moment of carcinogenesis, for in the preparative stages no differences are observed. They are soluble in alcohol-ether mixtures; probably they are bound to proteins.

We would like to draw attention to the fact that, long ago, several immunologists (the field of cancer immunology seems to be somewhat neglected in recent years) showed that there exists a true tumor antigen of lipid character, which is able to incite the formation of specific antibodies in the rabbit, though only in a few animals (Hirzfeld and his school—1931 *et seq.*).

We will also refer to the early paper by Waterman and de Kromme (*6*) (1929) wherein it was shown that iso-

[1] In a nature-philosophical sense there exist, of course, no qualitative differences, since all matter is built up from the same element in varied distribution.