

## STATE-AIDED RESEARCH IN FRANCE AND FRENCH SCIENTIFIC INSTRUMENTS

ON February 8, M. Jean de Saily, Commercial Counsellor to the French Embassy in London, opened at the Science Museum, South Kensington, London, an exhibition of French scientific instruments. M. de Saily remarked upon the international character of the event, which was made possible only by the closest co-operation between British and French interests. This is the first time in many years that it has been possible for the scientific tools of another country to be examined in detail by a wide scientific public in Great Britain.

Any narrow nationalism in science is to be deplored, but a country which finds it excels in some art or skill may take legitimate pride in it. As Prof. E. N. da C. Andrade observed at the opening ceremony, the French technician exercises his aesthetic judgment in his final designs, which results in an elegance which accords well with the requirements of precision. The exhibition exemplified this principle at many points, and it showed, moreover, how the traditional French genius in optics and mechanics is in no way diminished in the newer fields of electrical technique.

A second aspect of the exhibition was perhaps more significant in the wider view of world science. It is a commonplace that the team has virtually supplanted the individual in much scientific endeavour, and it is further evident that in some branches of scientific study, neither team nor individual can long survive without the patronage of the State or of organised interests of comparable size. It was therefore of more than passing interest to see the exhibition reproduce in miniature the organisation of State-aided research in France. Thus, apart from the contribution of some individual instrument manufacturers, some bearing old and honourable names, there were to be seen main sections from some of the leading French official research agencies.

After the opening ceremony, Sir Ben Lockspeiser presided at the delivery of two addresses on the official organisation of science in France, by Prof. Edmond Bauer, professor of physical chemistry in the University of Paris, and M. Volkringer, head of the Inventions and Patents Department of the Centre National de la Recherche Scientifique. From their surveys one can extract a general picture.

State-aided research in France has a long history, and it has always extended as much to humane studies as to natural science. Indeed, the history can be traced as far back as the foundation of the Collège de France by François I in 1530. There followed the foundation of the Museum of Natural History in 1626, the Observatory in 1667, and the Academy of Sciences in 1666. The Revolution saw the reorganisation of the French universities, and the emergence of the Grandes Ecoles for higher technical education.

The time passed when important research could be done with inexpensive equipment, but no aid was given by the Government until the First World War produced a change in official attitude. At the end of 1915, a Directorate of Inventions was set up for subsidizing war research, a notable outcome being the work of Langevin and Schilowsky, whose system of submarine detection is perpetuated in the ASDIC system.

After 1918, French government support for science again declined until 1930, when a National Scientific Fund was formed through the enlightened collaboration of Jean Perrin and Edouard Herriot, representing respectively the worlds of science and of politics. A period of development and adjustment followed, culminating in 1939 in the fusion of bodies previously devoted separately to pure and to applied research into the Centre National de la Recherche Scientifique. The Second World War and the German occupation failed to destroy the Centre, and it finally achieved its present-day form under Prof. F. Joliot.

The tradition of subsidizing research in humane studies as well as in natural science continues, and a balance is struck between pure and applied research.

The line of historical development has led most directly to the Centre National de la Recherche Scientifique; but no single agency can represent the whole body of scientific effort. It is natural, therefore, that the past twenty years should have seen the growth of other official research agencies in France, and it is tempting to look for parallels with British practice. The temptation must be resisted, however, since national needs and opportunities have differed too much for any very close resemblance to exist. With the important difference that the Centre National deals with humane studies, we may liken it most closely to the Department of Scientific and Industrial Research in Great Britain, but, as will appear, the analogy is not complete.

The Commissariat à l'Energie Atomique has broadly the same terms of reference as the combined atomic energy divisions of our Ministry of Supply. The Office National d'Etudes et de Recherches Aéronautiques resembles the Royal Aircraft Establishment in its experimental studies and in its link with national defence organisation, but its liaison with the Centre National is closer than that between the two British bodies.

The Centre National d'Etudes des Télécommunications must not be compared too closely with the Telecommunications Research Establishment in Britain, nor the Institut du Pétrole with the Fuel Research Station, but it is sufficient to say that there is much common ground. The Institut National de la Recherche Agronomique and the Institut National d'Hygiène are both young organisations, and have not yet the experience of the Agricultural Research Council and Medical Research Council, but the possibilities of development are clear. Their growth will be watched with interest and sympathy in Great Britain.

Full maturity has been reached only by the Centre National, and it is the chief single influence in the scientific life of France to-day. Although attached to the Ministry of Education, it is financially autonomous. In 1949 its budget was about two and a half million pounds. Its total staff numbered 2,800, of whom about 1,000 had a status equivalent to the 'scientific officer' grades in the British Scientific Civil Service. It has thirty research laboratories, the most important being at Bellevue, with a staff of about 350. It has certain specialized services, such as a breeding centre for experimental animals, a

training service for research workers, a documentation service, and an inventions service.

The documentation centre not only publishes its own material, but also subsidizes the publication of books and periodicals. It publishes a *Bulletin Analytique*, an abstracting journal with two unique features. It not only covers all the objective sciences, but has also a section devoted to philosophical studies, and it notifies unpublished matter deposited in the archives of the Centre National.

The Commission des Inventions has some kinship with the National Research Development Corporation in Britain; but may fairly claim at the moment to be in some respects the more advanced. It gives assistance to inventors from the Centre National, or from outside bodies, or to individuals, in all forms from technical advice to financial help in exploitation. Its small budget (some £10,000 last year) limits its scope, but it is dealing with some four hundred inventions annually, and it can initiate special grants, such as that made for the development of the calculating machine of the Institut Blaise Pascal.

Such in outline is the form taken by official research organisations in France; further information can be obtained from the Scientific Office of the French Embassy, 58 Knightsbridge, London, S.W.1.

Organisation does not make research, and the efficacy of the French plan must be judged by results: advances in natural knowledge, advances in material well-being, the overall balance between different fields, and so on. At the least, one may be grateful that the exhibition at the Science Museum has provided an opportunity of judging one other type of result, namely, that of advances in instrumental technique.

Instrument design is subject to fashion, and as new materials and resources become available, style and external appearance change. French fashion would appear now to favour bright colours, open access, easy substitution of alternative components and a much more robust construction all round than we have expected from commercial French instruments in the past.

Design, of course, is partly an individual function, partly a matter of influences, and it is more than amusing to note the differences in style between the different groups. One may certainly detect an American element in the atomic energy exhibits. The subject-matter is irrelevant here. The influence is seen in such details as style of name-plate, shape and size of control knobs and much else which reflects mere habit—a reflexion in turn of the close association which specialists in this field had with British and American activity for so long.

Although outside influences are apparent in the section contributed by the French instrument industry, family tradition, allied with long Continental practice, gives many of the instruments shown an unmistakable character.

These are superficial considerations. The technical accomplishment of French instrument technology is demonstrated by the Fonbrune micromanipulator, the Desvignes monochromator (which uses a single element but is comparable in performance with a double monochromator of conventional design, and has higher luminosity), an excellent recording micro-photometer, a compact short-period seismograph, a single-cylinder experimental internal combustion engine for combustion and lubrication studies, and a micro tensile test machine for studying the properties of single fibres. In all these, fitness for purpose is

clearly evident, as it is in many of the other instruments displayed. It is this same quality which gives interest to many other instruments for which no claim of originality is made; for example, the analytical mass spectrograph and the multi-unit polarograph shown by the Commissariat à l'Énergie Atomique.

The narrow spaces of an exhibition stand focus attention on the laboratory-bench aspect of experimental technique; but one must remember that some investigations necessarily require apparatus of large dimensions. A set of photographs, some striking for the beauty of the photography, showed the Modane high-speed wind-tunnel project of the Office National d'Études et de Recherches Aeronautiques. The size of the budget for this enterprise—some millions of pounds—will remind us that the French can match elegance with boldness when the aim is clearly conceived.

The lasting results of this exhibition cannot be assessed yet. Its appeal was not to the large majority looking for handy routine tools, but rather to the few who seek help in seeing science whole. If, as has been suggested, an exhibition of British scientific instruments is held in Paris, the other half of a pattern of joint effort will fall into place. As near neighbours, Great Britain and France have no choice but to collaborate in many spheres. Collaboration and understanding in the sphere of science hold a potential for good which exhibitions of this sort do much to advance towards ultimate realization.

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## YUKON-ALASKA EXPEDITION OF THE ARCTIC INSTITUTE OF NORTH AMERICA

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**D**URING this past summer (1949) the Arctic Institute of North America (New York branch) organised the second instalment of its programme of field research within the high interior of the St. Elias Range on the international boundary between Yukon Territory and Alaska. The first instalment took place during the field-season of 1948, and a summary of the results attained are given by Walter A. Wood, the leader and organiser, in *Arctic* (1, No. 2; 1948), the journal of the Institute. Referred to as "Project Snow Cornice", the object of this enterprise was glaciological work, as well as geological and meteorological, in a region scantily known and notoriously inaccessible. But the prime motive in the first instance had been programmes of intensive glaciological investigation, such as those which have been conducted in Europe, Greenland and Spitsbergen under Scandinavian, British and Swiss auspices, and which have been lacking so far anywhere in North America.

A high intermontane basin within the St. Elias Range, situated on the Yukon side of the border, and occupied by the Seward Glacier (or firn-field, *sensu stricto*), was chosen as the most suitable locality for these glaciological observations. Such an area of accumulation, approximately 750 square miles in