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## Finance for Scientific Research

THE publication by the Association of Scientific Workers in the *Scientific Worker* of the final draft of a memorandum on the financing of research, a preliminary draft of which has already been discussed in a leading article in NATURE (138, 51 ; 1936) focuses attention once more upon the provision of finance for, and organization of, research, and the arguments of the memorandum itself and the observations of the Advisory Council upon them deserve close study by scientific workers. A brief survey of the way in which the present position has developed appears elsewhere in this issue (p. 146). The comments of the Advisory Council on the scheme put forward by the Association indicate, indeed, complete agreement with the general thesis that there is need—and urgent need—for much greater application of science by industry. Disagreement with much in the memorandum is based on special knowledge of the difficulties to be overcome, for it is stated that some of the premises upon which the conclusions of the memorandum are based are incomplete and inaccurate.

In the first place, an explanation is given of the way in which Government expenditure on research is limited by the degree to which industry generally is prepared and able to apply scientific method and advance in scientific knowledge. Over a very wide field, though perhaps not necessarily the whole field of science, Government expenditure on scientific research will be largely abortive unless its results are ultimately used in industry, at least in its broadest sense. There are of course branches of research which the State cannot leave to the initiative of industry, such, for example, as work on the preservation and transport of food or the economical use of fuel and the work of the National Physical Laboratory on the application of exact measurement.

It is perhaps pertinent to refer here to one special field which has hitherto largely been left to individual initiative or voluntary support, namely, that of industrial psychology. The success which has already attended the work of the National Institute of Industrial Psychology, demonstrates the valuable service which research in this field can render not simply to industrial efficiency but also to health and safety in industry and in society generally. Work in these latter fields is of course also carried out by the Medical Research Council through the Industrial Health Research Board, with which the Institute has sometimes been associated. In spite of this, the position of the Institute is far from satisfactory. Lack of resources prevents it from pursuing promising lines of work, and the response to its recent appeal has been quite inadequate. Under such conditions the national importance of its work may fairly raise the question of State assistance or development on a much larger scale.

Allowing, however, for such exceptions, though even here the co-operation of industry is often invited and forthcoming, the Advisory Council holds that the worst way of attempting to secure increased expenditure by industry is to spend large sums of public money for its direct benefit in advance. If the importance of securing contributions from industry itself be conceded, the soundness of this view can scarcely be challenged. Indeed certain sections of industry might be in a healthier position had regard been had to this principle before according them the protection of tariffs.

The Advisory Council then proceeds to refute the assertion that fluctuating finance has been a main difficulty. While the Parliamentary Science Committee has probably overstressed the

importance of fluctuations in income—the real trouble is that the general average level of contributions is much too low—the Advisory Council appears to go too far in the other direction. Figures are quoted to show that the net estimates of the Department of Scientific and Industrial Research as laid before Parliament increased continuously from 1929 to 1937, apart from a slight decrease in 1931. The actual expenditure of the Department as given in its annual reports decreased continuously from £740,520 gross or £555,691 net in 1930–31 to £654,736 gross or £451,987 net in 1932–33, increasing again in 1933–34 to £664,482 gross or £476,877 net and thereafter continuously to its present level. These fluctuations cannot be described as violent, nor can they be dismissed entirely as negligible.

On this point, therefore, the difference in the views of the Advisory Council and of the Parliamentary Science Committee appears to be rather in degree than in kind.

As regards the substitution of a fund for a Parliamentary vote, the Advisory Council directs attention to the fluctuations which occurred before the exhaustion of the Million Pound Fund, and deprecates the validity of this argument for replacing a vote by a fund. There is much better ground, however, for criticizing the proposal that the control of the funds for research to be provided by the Exchequer should no longer rest in the hands of the Lord President as minister responsible to Parliament, but in an autonomous body with the Development Commissioners as its nucleus and containing representatives of the learned societies, the universities, medical and agricultural associations, etc. The main reason for employing a minister responsible to Parliament and advised by Government research councils, the members of which are selected on the basis of knowledge and experience as distinct from interests, is the necessity of obtaining a proper balance of research expenditure as between industrial, agricultural and medical research. It is the minister's responsibility to satisfy himself that such a balance is maintained and to that end to submit proposals to Parliament.

The Committee is undoubtedly right in pointing out that Great Britain has lagged far behind Germany, the United States and the U.S.S.R. in providing institutions of this type. The Committee suggests, in particular, institutions for research in optics, silicates and fibres, while chemical engineering, particularly in problems of materials

and unit operations, is a yet further field where a call is made. Institutions of this type would largely be concerned with the long-range or fundamental type of research, and there is no reason to assert, as the Advisory Council does, that, if a vigorous industrial policy in industry is provided, coupled with steady pressure from the Government, they will yield results greatly in advance of the capacity of industry to utilize them.

The Committee then returns to its former contention regarding the fluctuating income for research. It is of course desirable that research should be free to develop without violent fluctuations, and particularly that it should be pursued vigorously in time of depression, when in the past it has been liable to be curtailed. The point is, however, in our opinion insignificant compared with the raising of research contributions from all sources to a really adequate level. Moreover, one of the most important needs of to-day is the consideration of the utilization of research resources from the widest possible point of view. This will almost certainly involve the re-distribution or re-orientation of research effort.

It appears to us, therefore, that the Committee's strongest comments on the Advisory Council's report are its silence on this question of the need for greater co-ordination and on the extension of scientific research into fields which at present make little or no use of it. It is not really possible to separate the two aspects of the problem—the planning or co-ordination and the financing of research. More adequate provision for the finance of research is not more needed to-day than better provision for a really wide view of the national efforts and resources for research with a view to their better distribution, particularly between the physical and the social sciences.

It is probable indeed that this question will be an early consideration of the new Division of the British Association. What will then remain is the question of the authority which can give effect to any recommendations coming from such an influential and representative source. We find no evidence in the present report that the machinery now in existence is incapable of being developed or modified to meet this need without essentially changing its structure. It will be recalled that Sir Daniel Hall's proposal for a Planning Council, intended to pass a technical opinion on proposals submitted to the Cabinet or to Parliament, comparable with the Treasury review which is already provided, contemplates representation in the

Cabinet by the Lord President of the Council, and the ultimate enhancement of his status in the Cabinet.

This appears to us to be far more promising a line of development than that of the autonomous board proposed by the Parliamentary Science Committee. We regard it as essential that any great development on these lines in the expansion of scientific and industrial research should provide, not merely for adequate scrutiny in Parliament, but also for adequate discussion of the financial and technical details in the general sense by technical and professional bodies in general. Despite the excellence of the work of certain public utility corporations such as the British Broadcasting Corporation, the Electricity Commissioners or the Port of London Authority, it cannot be contended that this system provides adequate opportunity for discussion or debate in Parliament, or the information which renders possible informed discussion in the scientific and technical press or elsewhere.

It is no condemnation of the present system that in practice the vote of the Department of Scientific and Industrial Research is normally passed without criticism or debate. That may be merely an indication of the lack of interest which it should be the task of scientific workers to dispel. All the evidence in fact goes to show that the Department is increasingly desirous of co-ordinating its work with that of the Medical Research Council and the Agricultural Research Council, and that the existing machinery should be reasonably adequate if used. Moreover, the Department has already proved its capacity to establish *ad hoc* institutions for special purposes where required as, for example, the Bridge Stress Research Committee, the Steel Structures Research Committee, and the Locomotive Experimental Station Enquiry Committee.

If, therefore, it is conceded that the Parliamentary Science Committee has not made out an entirely convincing case for the establishment of an endowment fund for scientific and industrial research, particularly for the institution of an autonomous authority, neither has the Advisory Council advanced convincing reasons why it should not stimulate research on a somewhat larger scale, and particularly by increased Government grants. It should be remembered that, as the report states, the total expenditure on all kinds of scientific research in Great Britain amounts to only about £4,000,000 a year, or much less than

one tenth per cent of the national income, as compared with one half per cent in the United States and possibly one per cent in Soviet Russia. As has been pointed out from time to time, ultimately Government grants are provided by industry, and if industry is unable or unwilling to provide the required funds directly, increased Government support is merely an indirect means of achieving that end.

It is of course recognized that there are limits to Government effort in this direction, imposed no less by practice than by the educational position of industry as affecting its ability to utilize the results obtained. The field of work of a research association is by no means co-terminous with that of the research department of even the largest industrial firm. In the nature of things its work must be more generalized and less specific than that of an individual research department. On the other hand, a research association is well qualified to undertake the fundamental and long-range investigations which lie outside the scope or resources of even the largest individual research department, and it is precisely in this field that Government help is most desirable.

We do not suggest, of course, that fundamental or long-range research alone should be undertaken by the research associations, or that it is or should be exclusively their task. Much important work of this type is already undertaken by other Government research institutions, such as the National Physical Laboratory, and a strong case could probably be made out for a few more *ad hoc* research institutions. Moreover, such work belongs inherently to the universities also, and in this respect it is highly important that due regard should be had to all existing resources, particularly where, for example, as in chemical engineering, duplication involves the duplication of expensive equipment which may only be imperfectly utilized in any one centre.

Here is a particular case where co-ordination and planning appear to be called for and where some central authority might well on review find the increase in specific grants a sound policy. Never was it more essential to guard against sectionalism and to secure full flexibility if re-orientation and re-distribution are to be possible where required. It may well be hoped that the discussion of the report by influential associations as well as by individual scientific workers, may stimulate further attention to the national financing of research.