

FOREWORD

The following report of the National Science Foundation records such matters of fact as should formally be made available in a public document. It shows what the Director and his staff, with the approval and the cooperation of the Board, and with the advice of many scientists, have accomplished despite two annual appropriations inadequate except to begin to perform the functions contemplated in the act establishing the Foundation. Insofar as this reflects the general need for economy in a huge national budget, it is not appropriate to comment here. But insofar as the financial limitations upon the Foundation's program reflect lack of understanding of the purposes for which the agency was created and of their importance to the Nation, I shall discuss these matters below.

First, however, a few remarks on the general organization of the Foundation are in order. The National Science Foundation consists of a Board of 24 members, appointed by the President with the consent of the Senate, and of a Director, who is *ex officio* a member of the Board, also appointed by the President with the consent of the Senate. The Board may meet as frequently as it deems necessary, but must meet at least once a year. It is composed of men and women eminent in various fields of science, education, and general affairs, so selected that all geographic sections of the country are represented to the extent possible in a Board of this size. Since December 1950, when the Board was organized, it has held 16 meetings. In view of the fact that all Board members are actively busy with professional and administrative duties and in most cases serve on other boards and committees, and that absence from the country and illness have interfered, the attendance has been remarkably good. It has averaged 83.7 percent.

Eight members of the Board were originally appointed for a 2-year term, eight for a 4-year term, and eight for a 6-year term. During the past year, President Truman reappointed all members whose terms expired in 1952 and all were willing to accept. Although change in the membership of a Board of this kind is desirable, I think it has been helpful in this initial period, when many problems of policy and pro-

cedure require consideration, for the President to reappoint these members. This action has had a stabilizing effect.

A Board of as many as 24 members still fails to represent many special branches of the sciences. The Congress recognized this fact by providing for Divisional Committees and other advisory groups to the Foundation. With great satisfaction I note here that the Foundation has been highly successful in enlisting competent men and women from all over the country to serve on its committees and panels. This evidence of the support of the scientific community over the difficult initial period has greatly encouraged the Board and the Director and his staff and deserves to be widely recognized. Its importance cannot be overemphasized, for the tasks required of the National Science Foundation cannot be effectively accomplished without the support of these men and women and of their institutions.

Nor is this all. An ever-present danger inherent in any governmental organization for promotion of basic science lies in its propensity to exercise the kind and degree of control which is appropriate to research and development more closely related to immediate practical ends. The chief safeguard against this danger, outside the integrity and understanding of the Director and members of the Board, is the extensive, active cooperation of scientists who are not part of the regular staff of the Foundation. For wise judgment of the merits of specific research proposals the Foundation depends upon those most competent and respected in their various fields. Such advice is a personal thing, relating not only to subject matter, but to character, scientific competence, and integrity of those to whom support is to be given.

The collaboration of scientists is also indispensable in the discharge of the functions of the Foundation in evaluating scientific progress and scientific needs. The term "evaluation" suggests to many the idea of direction or control—factors thought to be inimical to effective basic scientific research. It has been widely held that creative and imaginative research in science as in certain other fields is necessarily individualistic and unorganizable except for informal or more or less spontaneous collaboration. In large degree this may always be true, but it may well be that we have reached the stage of social development where deliberate collaboration of specialists and concerted development of ideas is possible and necessary. It has already become so in the ascertainment of facts and tests of hypotheses in a few important fields. In any event the act requires the Foundation to evaluate scientific progress and to locate fields that need scientific development, and it is difficult to see

how the Foundation could carry out its functions otherwise. In so doing, however, the Foundation should guard against the danger of indirect control and avoid too strict adherence to scientific "orthodoxy" as well as the danger of discouraging independent research in fields of great potential importance. Clearly, in embarking upon the problem of evaluation—an undertaking of great delicacy and intricacy in which our society now must pioneer—the collaboration of the scientific community is indispensable.

Before concluding these remarks, I return to a subject mentioned in the first paragraph concerning basic research and support for this Foundation in solving problems relating to basic research. The significance of basic science for our national life, indeed for our international interests, is not well understood. This partly results from confusion with respect to the spectacular technological results of certain *ad hoc* researches which indeed have been almost glamorous—a fact not improperly exploited by industrial organizations which have had much to do with them.

It may also in a deeper sense be related to the fact that until comparatively recently, it has been generally impossible to look for practical results from application of science except to very specific problems and quite sporadically. This is still true, of course, in many branches of science, where the density of knowledge is low and the comprehensiveness and utility of theory is restricted, but we have now reached the stage of social organization and scientific development where these earlier limitations are being much reduced. This justifies the expenditure to a degree not possible earlier of manpower, resources, and money solely to extend our knowledge and develop fundamental scientific ideas for their potential, if not immediately apparent, practical significance. Thus, we have reached the stage where the maintenance of an expanding pool of tested scientific knowledge is good economics as well as indispensable in the effective utilization of the world's natural resources for the needs of an increasing and largely half-starved population and necessary for maintaining the competitive position of this Nation for military or economic purposes.

Whether such competition is desirable or merely unavoidable depends on the point of view. In any event the bottleneck in the future will be men. The proportion of our population potentially capable of assimilating the training required of scientists, or having the curiosity, interest, and ambition to pursue effective scientific careers, is narrowly limited compared with the need for such trained individuals in the development of basic science. Thus, the proportionately limited amounts of funds

now required, even with the most liberal estimates, are of small consequence in the economy that we are here concerned with.

Our national interest requires full development of our potential scientific manpower resources and sufficient funds for this have not been available. Indeed, the present restriction in the National Science Foundation Act holding appropriations to a maximum of \$15,000,000 in any year seriously limits the capacity of the Foundation to carry out effectively its statutory directives.

CHESTER I. BARNARD,
Chairman, National Science Board.