

## Foreword

The following Fifth Annual Report of the National Science Foundation presents the major accomplishments of the Foundation, not only for the year ending June 30, 1955, but for the 5-year period. Of equal importance it describes the nature of many of the important problems with which the Foundation is concerned and what has been accomplished with respect to them, and what is in process toward the solution of some of them.

During the 5-year period it is evident that the public has become more and more aware of the importance of the development of science for national defense; for the general welfare; and for international cooperation. Indeed, during recent months it has been made quite evident in many ways that the promotion of science is not merely important but an urgent national problem requiring the cooperation of many private, educational and industrial institutions, and in many respects support and leadership by State and Federal Governments. It seems quite clear that the urgency will increase with the growth of scientific knowledge and its application through technology, with increasing specialization and complexity. One can hardly read this report without being impressed with the difficulty and complexity of an adequate solution of the tasks before us.

It seems much clearer now than it did when the National Science Foundation was established that the Federal Government must play an indispensable role in what must be a great and determined national effort. This role is only partly financial and only partly related to national security. It will be evident in the following pages that leadership by the central government will be necessary with respect to many phases of the work, particularly in the securing of factual knowledge about what is going on in science and technology, about who are carrying on scientific work, about the availability of future workers and about the resources available and needed for the continuation of scientific effort. The emphasis surely must be placed upon the development of both the competence and the interest of individuals. This has heretofore been nearly exclusively the function of the colleges and universities and of private foundations. Thus far, the support for the development of indi-

viduals by the Federal Government has undoubtedly been small compared with that given by the educational institutions, the private foundations and private individuals. That given through the National Science Foundation, through fellowships and grants for research, though increasing each year, has been relatively small.

It seems clear that the magnitude of the problem is such that the aid of the Federal Government will become increasingly indispensable in the development of an adequate cadre of scientific personnel. Moreover, in the last 15 years a revolution has occurred in scientific work in that much of it now calls for exceedingly expensive structures and equipment for accelerators, observatories, high pressure apparatus, ships, electronic computers, etc., which already have outrun the financial capacity of private resources, and this will increasingly be the case. Only the Federal Government, that is, all the people, will be able to meet the deficiency after all possible private resources have been utilized. Both the needs of national security and the promotion of the general welfare justify this support, although it must be asserted that the limiting factor should be the availability of men rather than of dollars. It seems probable that the maximum funds that can be effectively utilized for the promotion of science will be relatively small in proportion to the national budget, simply because the number of individuals competent and willing to be scientists will always be limited.

The situation we now confront was envisaged by Congress in the establishment of the National Science Foundation. Its mission is to promote science and the development of scientists in this country. Other agencies of the Government are, of course, involved and interested in this effort and to some extent will necessarily endeavor to support pure science research in fields related to their missions. Only the National Science Foundation, however, has as its exclusive function and reason for existence, leadership for the Government in the promotion of science and the channeling of Government support therefor without any other functions to color its ability to act and to give authoritative advice to the Government and other agencies with respect to governmental policies relating to science. These functions are those of leadership rather than direction. The increasing need for coordination can be accomplished almost spontaneously by the development of facts regarding the aspects of the scientific situation and much more can be accomplished by facilitating communication between scientists and scientific institutions. A number of instances of this is given in the following report.

The stimulation of increased collaboration is one of the means by which the National Science Foundation discharges its task. This

view of the functions of the Foundation is really embodied in its organization as prescribed by the National Science Foundation Act. It provides for a Director appointed by the President, supported by a permanent and part-time staff, and this part of the organization is quite analogous to that of any other Government agency. The other part, however, consists of the National Science Board. Its members, appointed by the President with the approval of the Senate, though technically officers of the Government, are not in any ordinary sense employees of the Government. They are, on the contrary, representatives of communities. They are required to be selected from the community of scientists, educators, and of general affairs. They are not paid salaries but are given small fees for the attendance of meetings. They are not, however, a mere advisory body.

In addition to the fact that awards in support of basic scientific research and for fellowships must be approved by the Board, the Board formulates, considers or endorses appropriate answers to questions of policy. It therefore functions for the Federal Government in the field of science promotion in the way somewhat analogous to that of many public school boards who control distribution of public funds as a voluntary service without remuneration. During the 5 years of its work this peculiar organization, depending upon cooperation between the Board and the Director, has worked exceedingly well. Enough time has now elapsed so that it is appropriate to record that the Board has been well pleased with the results obtained by the staff under conditions frequently difficult. The expression "well pleased" does not, however, mean that the job is satisfactorily behind us. On the contrary, the magnitude of the task is now much clearer and the extent of "unfinished business" now seems to be really large.

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