

Foreword

The following *Fourth Annual Report* of the National Science Foundation gives a view of what has been accomplished and what inquiries are in progress. It calls attention to certain broad problems of national interest in scientific development that have become evident in the past year. The kind of report now submitted would not have been possible at an earlier date, because of the early limitations of funds, the emphasis upon recruiting of staffs and committees and organizing of the work, and the need for experience in carrying on one of the more recently recognized functions of government.

I believe that those who read this report will readily recognize the wisdom of the Congress in establishing the Foundation and in specifying its duties, and of the President in clarifying its functions in relation to those of other government departments and agencies. The national interest, whether for defense or for the improvement of the level of living and of employment, requires comprehensive understanding of our scientific resources in men, facilities and organization, a matured judgment of present and future needs, and perspective about the relation of science to the rest of the economy and culture. For the future our ability to defend ourselves, to develop usable energy, to conserve resources, to protect against old and newly evolving diseases of men, animals, and plants, will no doubt depend upon much more than what we now call science; but it is clear that science has been highly successful and, indeed, essential in the recent past and that it will continue to be indispensable.

It is the function of the National Science Foundation to furnish leadership—not to direct—in the broad effort to promote science and to assess the situation and the need. This it will do through factual inquiry and the mobilization of the judgments of those most competent, including those in the various fields of science and of education. Neither the colleges and universities nor the private foundations could perform, or accept responsibility for this function. It is a function that would have had little meaning fifty years ago and probably none a century ago. Today, it is clear that responsible, continuing and comprehensive appraisal of our scientific resources, needs and opportunities is an essential element of public policy.

The recognition that this function is of primary concern to the Federal Government might lead some to believe that government can and should direct the course of scientific development in this country. It is clearly the view of the members of the National Science Board that neither the National Science Foundation nor any other agency of the Government should attempt to direct the course of scientific development and that such an attempt would fail. Cultivation, not control, is the feasible and appropriate process here. Both individuals and institutions require public knowledge concerning science that they may continue to act, autonomously but more effectively, in the public interest.

The futility of central control of science arises in part because science is essentially non-national in character, being concerned with natural phenomena rather than polity, but also because pioneering into the unknown calls for imagination and novelty of conception and of method—abilities that are stifled by control and specific direction. This must be conceded to the scientists—not merely because they say so and because the history of science thus far confirms their view—but because it is true also of the application of science and of the management of affairs, public, private, industrial, social or military, though often in much less degree.

The promotion or cultivation of science in the United States is the central task of the National Science Foundation. Performance of the task still depends upon scientists, academic institutions, industry and the professional societies, not less, but more, than heretofore. Indeed, the Foundation, its staff, its Board, and its advisory Committees and panels are made up of personnel drawn chiefly from the roster of scientists and from their institutions.

In fostering scientific progress, we must henceforth be conscious of a multitude of interests—separate administratively perhaps, but nevertheless related and interdependent—such as general and technical education, financial support of schools, colleges, universities, and public and private laboratories, recruitment of talent, conduct of research, provision of physical facilities, and the relationships between governments, educational and scientific institutions and industry. This is not the time nor the place to indulge in comprehensive discussion of these matters. Many are touched upon in the present report. Here, I attempt only to note a few aspects of our general concern.

The first of these is the matter of incentives. It seems certain that the public interest requires for the future more scientists and other technically trained men in closely related fields than will be forthcoming at present rates. Not a large proportion of the population has both the

intellectual capacity and the essential interest to become scientists and it is evident that much potential talent is now being lost. Thus, as never before, the matter of incentives for the pursuit of scientific careers becomes an important social problem.

The primary and indispensable incentive is a deep, personal, and indefatigable interest in scientific discovery. To find ways to promote that interest is of first importance and leads directly to the quality of the teaching in the secondary schools and the early college years. But this does not imply that relative freedom, adequate monetary remuneration, and public recognition and appreciation can be neglected.

The increase in government contract work, security considerations, and the necessity for large-scale cooperation and team research may be limiting conditions on scientific freedom and in many cases impose a discouraging degree of anonymity upon individuals. The tendency of these conditions to restrict initiative, imagination, and persistence is a matter of real concern. The problem cannot be dissipated simply by the lavish and indiscriminate expenditure of money.

Scholarship and fellowship programs wisely administered are useful means for inducing and supporting the development of scientists. However, not merely financial assistance but the recognition and prestige that are conferred by the process of careful selection are required.

Scientific development also requires money for basic research. Abundant funds are necessary in many types of inquiries for physical equipment, energy, and personal services, for chemical materials, for biological specimens, and for travel and gear for field work. It is sometimes thought that such expenditures are solely for the acquisition of knowledge. This view misses the point. Mere accumulation of knowledge is not understanding, which is a human attribute. Scientific knowledge without scientists would be nearly useless, and scientists are made and acquire understanding by practicing science. Research is the school in which this is done. Financial support for research serves a double purpose—acquisition of scientific knowledge and development of scientists.

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