

STATEMENT OF (REV.) THEODORE M. HESBURGH, C.S.C.  
PRESIDENT, UNIVERSITY OF NOTRE DAME  
BEFORE  
THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT  
HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS

July 21, 1965

Mr. Chairman and Members of the Subcommittee:

I am most pleased to have this opportunity to participate in these important hearings. As you know, for the past eleven years I have had the privilege of serving as a member of the National Science Board. Also, for the past thirteen years I have been President of the University of Notre Dame. I am sure it must be evident to you that because of each of these two associations, I have had a deep and continuing interest in the activities of the National Science Foundation. But over and above these, as an educator and as a citizen of this country, I have observed the growth and development of the Foundation with great satisfaction-- for I believe that it has exerted, and will continue to exert, an important and beneficial influence on our science and technology and on the education of future scientists, and, through these, on the welfare of the nation as a whole. I believe that all of us have reason to be grateful to those who conceived the concept of a National Science Foundation, to those who enacted the wise legislation which created it and to those who have sympathetically supported it during these first fifteen years of its life. These have included, of course, not only Dr. Vannevar Bush but also four Presidents

of the United States and a great many members of the Congress.

As you know, the Foundation is comprised of a National Science Board of twenty-four members, appointed by the President, and the Director who, ex officio, is also a full member of the Board. The National Science Foundation Act assigns policy determination to the Board. The Director, appointed by and responsible to the President, is the Chief Executive Officer of the Foundation as well as a member of the Board. This is a unique organizational structure among Federal agencies and seemingly includes a division of responsibility which might, to some, appear to be theoretically unwise. However, I can bear witness to the splendid cooperation which has existed between the Board and the Directors--first Dr. Alan Waterman and, during the past two years, his capable successor, Dr. Leland J. Haworth. I can testify, from eleven years of personal experience, that the Board and the Director, working cooperatively and harmoniously toward common goals, have indeed been the Foundation as the act prescribes they shall be.

The original version of the NSF Act stated that no final actions relating to the award of grants or fellowships might be taken unless, in each case, the Board had reviewed and approved each such action. However, the Act as amended in 1959 permits the Board to delegate to the Director this authority of review and approval. During the early years of the Foundation, it became obvious that the Board should not concern itself with all of the many individual actions which are necessary. Accordingly, it has delegated such authority to the Director and limits its own

review and approval activity to those matters that involve special policy considerations or very large sums of money. The Director and his staff, on the other hand, have always taken pains to keep the Board informed in detail of all the actions taken under the delegated authority.

The Board, on its part, has concerned itself increasingly with more general policy matters relating to strengthening of the scientific research and education of the country. To this end, about a year ago we revised our committee structure to permit more effective policy consideration. We now have three principal standing committees in addition to the Executive Committee. One of these is charged with consideration of policy matters relating to substantive, programmatic areas of science and education. Another is concerned with policy problems which arise from administrative considerations, particularly those connected with Foundation-University relationships. The third committee deals with long-range program and policy questions pertaining to the role of the Foundation, in the context of the total Federal and national picture, in research and education in the sciences.

Although this committee structure is relatively new, it is already showing its usefulness. The committees meet frequently and are able to give deep and careful consideration to specific policy questions. Their findings and conclusions are reported to the Board which then has a basis for taking well considered action. With the Board freed of much of the detail work and with a mechanism for policy consideration and formulation operating so well, I believe the Board will be an even more effective

instrument for development of measures to strengthen our country's science enterprise.

I should like, Mr. Chairman, to turn now to some of the substantive aspects of the Foundation's operations. I shall not devote much time to discussion of the support which the Foundation provides for basic research through its project system, its facilities grants, institutional grants, the national centers, and so on. I believe there is common agreement that this support has had an enormous beneficial influence on the growth and development of our National science enterprise. The Foundation's influence has been most pronounced, of course, on our basic research effort which is to be found largely in our universities. The very act of creating a national agency devoted to basic research has lent a new prestige to this field of activity. Its nourishment through generous--though still inadequate--appropriations which were wisely administered permitted marked expansion and increased productivity. It is in considerable measure for these reasons that our basic research enterprise today is the envy of all the world. It is factors such as these which are responsible for our recent production of such a large proportion of Nobel Prize winners. And, to a considerable degree, these are the reasons behind the current strength and vigor and high level of excellence of our entire national scientific enterprise. Obviously we can all derive great satisfaction from this situation. I can assure you, Mr. Chairman, that I do.

I believe we all agree on these points and there is no need for me to belabor them. However, I should like to dwell for a moment on the Foundation's support of social science research. One of my early assignments as a member of the National Science Board was to chair a Board Committee on the social sciences. This, coupled with my own background training and interests, has led me to follow these activities very closely and with considerable attention. I single out the social science activities for comment not only because of the high regard I have for the Foundation's role in this field, but also because it has come to my attention that during previous sessions of these hearings some of you have evidenced considerable interest in this phase of its activities.

Although the Act does not specifically enumerate the social sciences as it does the natural sciences, it does include authority to award grants and contracts for basic research, as well as fellowships, in what are referred to as "other sciences." The report on the bill which became the National Science Foundation Act, and its legislative history, clearly indicate that it was intended that the Foundation should explore the needs of the social sciences and take appropriate action with respect to them. In 1953, the Foundation began to study what its proper role might be with respect to the social sciences. A limited research support program, begun in 1954, has been gradually and cautiously extended. In 1960 the Board approved the establishment of a Division of Social Sciences. This is coordinate with the other research divisions, and now supports research in anthropology,

economics, psychology, sociology, political science, geography, and linguistics. Current obligations for research grants in the social sciences are at the level of about ten million dollars per year.

As research support in the social science fields has grown, so have the social science aspects of the Foundation's education, training and other science support efforts. The programs which provide fellowships for graduate students, and those which support curriculum studies, science information activities, construction of laboratory buildings and facilities, science development awards,--all are open to the social sciences just as they are to the natural sciences. This experience has demonstrated that the same agency can indeed support the social and the natural sciences. Although the problems and methodologies differ from field to field, the objectives and intentions are similar. In all these fields, fundamental research is principally university-based and the standards and criteria are very much alike.

The same decade that has seen the Foundation expand in this area has seen the Federal Government as a whole become more involved in the areas of social science concern. We are all familiar with these. The problems of arms reduction, of population increase and mobility, of urbanization and of urban renewal, of equal rights and equal opportunity, of poverty and of peace--all of these and many other social problems are major concerns of our government. Many new programs directed toward amelioration

of these pressing social needs have been developed. The Foundation's support of basic research in the social sciences has helped to serve as a valued adjunct to these efforts. It may be difficult for some to see the immediate connection between an experimental study of human communication and increasing the possibility of peace in the world, or between an econometric model of the economy and learning how to prevent a recession or inflation. However, the potential is there and basic research in these fields, as in others, provides understanding which, in the long run, will surely have a great impact,--and particularly so in proportion to its initial cost.

In short, I believe it important that the Foundation has developed its social science support programs and that these operate in the same way and by the same principles and criteria as do the natural science programs. It is important that support of fundamental academic research in the sciences has been provided on a broad, non-discriminatory base and that this has helped to give recognition and status to the social sciences as legitimate areas of research. The development of such areas into full fledged fields of scientific exploration is a most significant contribution, and in my belief, should be continued and expanded.

I should like to mention several of the Foundation's educational activities which, in my view, are of very great significance to our national interest. One of these is its program of fellowships, supplemented more recently by a traineeship program. These have proven to be highly effective means of ensuring the future

scientific strength of the nation by providing opportunity for our young people of highest ability to continue advanced training in science, mathematics and engineering. I want to stress particularly those programs which are directed toward graduate students--the young people who have completed their bachelors work and have turned to pursuit of an advanced degree, the masters or the Ph.D. The Foundation's graduate fellowship is a form of grant to such an individual, selected in a national competition on the basis of ability and promise.

The graduate fellowship program permits the student to pursue that field of science which interests him most. It is based on the well founded premise that students at this educational level know quite accurately in what subject matter areas they wish to build their careers. Accordingly, fellowships are awarded--after national competition--on the basis of merit and ability without assignment of quotas by field or discipline. Only in cases of substantially equal merit do considerations such as discipline or geographical origin enter the picture.

In talking about the Graduate Fellowship Program, Mr. Chairman, I have referred to merit, ability and promise as criteria for selection of fellowship recipients. Speaking as a university president, I can verify that the Foundation's fellowship awards have been made to our most able graduates. And this is as it should be. Those who framed the National Science Foundation Act directed that fellowship recipients should be selected on the basis of ability. I believe this was a wise decision because if we are to provide the nation with the best possible scientific



talent, it is mandatory that we assure our most able and best trained young people the opportunity to work toward this end.

The Act also directs that the fellowship recipients shall be permitted to attend the institutions of their choice. As a consequence, they tend to select those institutions which are most outstanding in the quality of their offerings for training in the sciences. This is understandable, and is in the best interests of the nation. These high ability young people deserve the best possible opportunity to complete their development into mature scientists. However, it is clear that the resultant concentration of graduate students at a few institutions does not contribute directly to the development of graduate education at other institutions. Recognizing this situation as a further responsibility, the Foundation has sought means to extend the geographical and institutional distribution of high ability graduate students. A principal effort in this direction has been the introduction of the traineeship program which differs from the graduate fellowship program in several ways. One is that the university, rather than the Foundation, selects the award recipients. Also, in the traineeship program, the Foundation decides, within limits, on the distribution of awards among the various fields of science. Both these effects are achieved by permitting the university to apply for the number of traineeships it believes it needs for each of the several eligible fields of science. The Foundation then evaluates these requests, taking into account the resources for graduate training of each such department as

well as the capacity of the department to increase or accelerate its output of graduate students. On the basis of such evaluation, specific numbers of traineeships are awarded to each of the approved departments. Thereafter, the department and the institution deal directly with the student applicant and the selection remains a local one.

The traineeship program is much newer than the Fellowship Program and we have not had as much experience with it. However, I am confident that I reflect the belief of my fellow Board members when I say that we heartily endorse this second, but by no means inferior, mechanism for assisting in graduate science education. Through this means the Foundation is able not only to broaden its geographical and institutional distribution of funds and to assist in the development of graduate education at a larger number of institutions but also it is enabled to respond to immediate and short-run demands for additional trained manpower in particular scientific fields.

In speaking of the fellowship program, Mr. Chairman, I have concentrated on the education of young people seeking training toward the masters and Ph.D. degrees. I have not touched on the several programs for postdoctoral scholars and for summer study or research of teaching assistants. These, too, are important and worthy efforts. Of particular significance, I believe, is the program of Science Faculty Fellowships which enables undergraduate teachers at the smaller institutions to make progress toward their own advanced study or to obtain much needed intermittent

refreshment and updating on scientific subject matter. These fellowships permit more mature scholars to intermingle study with teaching and research. They are particularly profitable in that they assist in a material way to improve the quality of science teaching at our smaller institutions of higher education, especially those which are less heavily involved in research.

Another group of Foundation education activities which have always been close to my heart are those concerned with improvement of education in the sciences, mathematics and engineering. These consist of a group of programs designed to improve each of the two fundamental factors involved in education, namely, the effectiveness of the teacher and that of the subject matter which is taught. As you gentlemen know, these programs collectively are of impressive size, both in dollar expenditure and in number of persons affected by them. The number of teachers who have received additional training is large. The number of students affected indirectly is enormous. These programs have reached into every corner of our country with a major impact at the grass-roots level. We do not need to guess about the results. They are self-evident, for example, in the vastly improved preparation with which students enter college--so much improved that our beginning college courses in science have had to be revised to higher levels. What this means, of course, is that our young people are learning much more and more quickly and therefore are better prepared than ever before.

One of the most notable of the Foundation's innovations is the so-called "institutes program" which is aimed at improving

and updating of the teacher's substantive knowledge of the field of science being taught. It is to be remembered that knowledge in the sciences has been increasing at an enormous rate. In many cases, the teacher's last training in the field was taken ten or twenty or thirty years ago. It is understandable, therefore, that many such teachers, whose training dates from another era, find it difficult to teach the science of today. Accordingly, the institutes supported by the Foundation are designed to assist the teachers to catch up and to up-date their own knowledge of recent developments in their fields. Over the years, these institutes have been heavily concentrated at the high school teacher level--a concentration that has been quite conscious and deliberate. For it is in the high school that science first appears in the curriculum in the form of specific courses taught by special teachers. Therefore, the high school is not only a crucial point in science education but also it is the stage of the educational process in which the greatest and most effective impact could be achieved rapidly by teacher improvement.

It is important that students be subjected to good teaching at the earliest possible level. Education is a cumulative process, each level building on the previous ones. What can be taught at one level is determined to a considerable extent by what has been taught and how it has been taught at earlier stages. This is most clearly exemplified by mathematics, which is a separately identified subject as early as the first grade. It is even more cumulative in character than some of the other subjects and it is studied by all students for a number of years. Furthermore,

a mathematical foundation is necessary for most other fields of science--and a knowledge of mathematics is useful in all walks of life. Hence, the Foundation's teachers institutes have consciously given special attention to this subject. Indeed, in the case of institutes for elementary school teachers, those devoted to mathematics predominate.

Effective as the teacher institutes may be, however, they do not solve all problems. I remind you that in the institutes programs the teachers apply as individuals and are selected as individuals. This is as it should be. But it is a fact that something like half of the high school teachers of science and mathematics have never even sought admission to any of these teacher programs. Also, there is a continuing stream of new teachers entering the classroom and many of these have had less than adequate preparation at the outset. Much will have to be done about these matters. The Foundation is seeking intelligent ways to help with them. There are no easy solutions to such problems but the search for them continues.

While speaking of improvement of science education, I should mention that, in addition to increasing the knowledge and ability of the teachers, it is important that they be provided with the best possible modern, up-to-date curricular materials and aids. I refer to text-books, laboratory manuals, movie film strips, laboratory equipment, demonstration materials, and so on. These are being given serious attention by the Course Content Improvement Programs of the Foundation with notable success. I believe that the college physics professors of the country, for example,

would heartily agree that since the introduction of the so-called PSSC high school physics curricula, many students come to college enormously better prepared in physics than ever before. The same is true for chemistry, biology, and mathematics and now it is spreading to other fields. This, too, has contributed much to the educational revolution which has occurred in the last eight or ten years. I am proud that, in large measure, the Foundation was responsible for these advances.

Time does not permit discussion of all of the Foundation's science education programs. I have mentioned only a few. But I may say that all of them are aimed at a single objective which is to assure our young people the maximum opportunity for development of their scientific potential. This is a worthy goal. It is my belief that these programs are doing a great deal to help us reach that goal.

Mr. Chairman, in the final portion of my testimony I should like to touch upon an area which, I am sure, is of interest to your Committee. I refer to the relationship between the Foundation and the institutions of higher education--the universities and colleges--of the country. I believe it is safe to say in this connection that, in the main, these relationships have been harmonious and beneficial both to the institutions and to the government. The Foundation is held in high esteem by the institutions of higher education and by their faculty members. It is considered a real mark of prestige and accomplishment to receive a Foundation grant. This is so because it is known throughout the academic world that the Foundation gives careful and fair evaluation to every request

and that, within the limitations of the funds placed at its disposal, it attempts to support the highest quality projects. Of course, with many more requests than it can support, there are many disappointed proposers of projects. But, on the whole, even those who are thus disappointed agree that the procedures and consideration have been fair and that the administration is honest and just.

Many persons in academic circles would like to see the Foundation receive larger appropriations so that it might support a larger proportion of the worthy projects submitted to it. It is recognized that although the Foundation's budget has grown considerably in these first fifteen years, it has not grown sufficiently rapidly, particularly if one bears in mind that it is the only Federal agency with responsibility for non-mission-oriented basic research and for the welfare of education in the sciences.

Of course, the philosophy of supporting the highest quality projects results in a considerable proportion of the grants being awarded to a few institutions. Although this is understandable, nevertheless it tends to create the problem of geographical--or, more correctly, institutional concentration of funds. This is a matter which has been of concern to many of us who are involved in the university life of the country just as it has been of concern to this Committee. We must continue to seek ways by which we can alleviate this situation to some extent. But it is obvious that simply dividing the available funds on a formula basis without regard to quality is not the way to do it. We must

strive to achieve two goals. The first is to maintain and nourish those centers of high quality in research and education that already exist. Surely, it will not be to our advantage to cut the peaks of quality down to those of lower level. These high quality institutions not only provide a goal toward which the others can aspire and work but also they are the sources of the teachers and researchers who, coming to the less well developed institutions, will help them to improve their own level of excellence.

Our second problem is to assist, wherever we can, the attainment of higher levels of excellence. This, it seems to me, promises the greatest possibility of alleviating the problem of institutional concentration of funds. And this is why all of us on the National Science Board are so enthusiastic about the Foundation's new activity which we call the Science Development Program. This program, which has just completed its first full year of active life, is designed to assist universities to develop groups of science departments to a higher level of quality. The institution must demonstrate that it already possesses a reasonable nucleus of quality in the areas to be developed and that it has the will, the resources and the planning required to maintain them at the higher level which the Foundation grant will help them to achieve.

Already, during this last year, the Foundation awarded such science development grants to ten institutions in various parts of the country. As you know, it is intended that during the



current fiscal year another group of institutions will be helped. Thus, over a period of a few years, centers or nuclei of quality can be built where previously only potential existed. I believe this program holds great promise for the institutions of higher education and, through them, for the country as a whole.

Mr. Chairman, as is evident from my remarks, I am very proud of the accomplishments of the National Science Foundation during its first fifteen years. I believe that its establishment fifteen years ago acknowledged a new dimension in the concern of the Federal Government for a previously largely ignored but most important segment of our national life. This acknowledgment has borne a very rich and beneficial harvest of direct and indirect consequences. Our research enterprise has been enormously strengthened. Basic research, the very foundation of our applied technological progress as well as of our understanding of man and his environment, has been given the respectable place it deserves and must have. Our scientific and technological establishment is now the strongest of all the nations of the world. Our educational enterprise has been accorded renewed recognition and consideration and, in the sciences and mathematics, has been given vigorous stimulation toward improvement. This now is being carried over to non-scientific areas with great benefit. The teachers of the country, once looked down upon, are more and more being recognized for the important role they play with the result that we can hope that additional first-rate people will make this field of activity their career choices.

In all these beneficial accomplishments, the National Science Foundation has played an important role. I can say to you most sincerely that I am proud to have been a member of its Board during eleven of its fifteen years and to have thus been associated with its accomplishments. All of us look forward to the continued success of the Foundation in the important role it has to play in the future. And all of us sincerely hope that in the years ahead the Foundation will continue to enjoy the same fine support of Congress that it has had in the past.