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Science and Federal Programs: The Continuing Dialogue

Academic values can be extended in the context
of major support derived from public sources.

James A. Shannon

To address this distinguished group is not only an especial honor, but also a welcome opportunity to express some personal views on certain aspects of a matter which is demanding increasing attention from all of us. I refer, of course, to the vital and complex relationships evolving out of the federal government's major involvement in the support of science. I am prompted to an informal exploration of this subject by the superb presentation of the problems of this relationship and the wise conclusions drawn in the recently issued report of the Committee on Science and Public Policy of the National Academy of Sciences, developed under the able chairmanship of George Kistiakowsky.

In the present stage of national consideration of these matters, I think this report is most timely and contributory. I believe it also to be clear confirmation of the important historic function of the Academy in providing

advice to the federal government and leadership to the scientific community in matters vital to the advancement of science in the national interest at a time of important change. My comments have been engendered by reflecting upon the issues of "federal support of basic research in institutions of higher learning," as presented in the Kistiakowsky report.

It is now possible to view the progress and support of science in some perspective after a period of intense growth and change. It is also possible in this process to see issues emerging which are broader than research and technological development—broader than science itself, for they encompass major national needs relating to higher education and the very basis of scholarly activity. It is my hope that these remarks will evoke discussion, now and henceforth, and sharpen our perception of the issues. This, in turn, may contribute to the further resolution of the continuing dialogue relating to national policy on science and its support. It is through this continuing dialogue that valid concepts must come

for guiding the legislative and executive branches of government, as well as the scientific community and its institutions, in the formulation of sound policies.

The Appeal to Science in

Times of National Crisis

History reveals that science and technology have been of particular concern to the federal government in times of national crisis, when urgent national problems reveal deficits in our knowledge. Although the founding fathers of our nation were preoccupied with science and its role in government, no lasting federal relationships were established until the Civil War. The need to provide for scientific assistance and advice in a time of peril is in a very real sense the event contributory to the founding of the National Academy of Sciences. In a similar manner medical research in the Public Health Service had its birth in the threat of grave epidemics during the great period of immigration in the 1880's, in the context of beginning scientific knowledge and capability deriving from the germ theory of disease. Thus, the Hygienic Laboratory, originally set up at the port of New York, evolved into the National Institutes of Health.

World War I was the next major crisis that compelled the federal government to call on the nation's scientists in a large-scale manner. The existence of a burgeoning industry bereft of basic scientific support from abroad led to a search for technological and scientific aid from American scientists and institutions for the solution of war-born problems. Accordingly, the Academy established the National Research Council as a practical

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means of making science available to federal agencies.

Finally, and within the memory of all of us, there was the great scientific and technological effort undertaken amid the rigors and perils of World War II. Science and technology, particularly science in the university setting, were directly engaged through the Office of Scientific Research and Development. This direct involvement of university science in the service of public needs, albeit needs deriving from prosecution of the war, constituted the beginning of a momentous relationship. The transfer of the residuals of this program to NIH on the one hand and the Office of Naval Research on the other, at the close of the war, set the stage for the forging of a major and lasting commitment between the federal government and the universities and the scientific community, as the nation turned its resources to the preservation of peace and the meeting of human needs. Thus, a relationship born in crisis has, because of the force and consequence of scientific development and the course of human events, become a crucial dependency.

Implications of the New Dimensions

This set of circumstances has implications quite different from those of the earlier federal involvement with science, and obviously a more far-reaching significance to our institutions of higher learning. First, it is of great magnitude: expenditures for all research and development in the United States were in the neighborhood of \$18.5 billion last year. Second, it has the elements of permanence, as indicated by the fact that R&D has risen from 1 to 3 percent of the gross national product since 1950 and now is unquestionably of major national concern. Finally, the current support might be described, for the most part, as special-purpose and built upon the project concept—a paramount characteristic from the standpoint of the university.

I will not minimize the importance of past general-support programs of the federal government in areas relevant to science. The development of the university structure in this country, for example, owes much to the land-grant program of the 1860's. Scientific investigation was furthered by

the broad federal support of agriculture and agricultural industry, and by the programs of the Department of Interior concerned with the exploitation and later the conservation of natural resources. But in magnitude, impact, and timing, these movements progressed at a slow rate, permitting absorption of some program elements and adaptation to others without striking modification of the concurrent academic scene.

The present events, on the other hand, derive mainly from a major new set of programs that are large in scale and have an accelerating rate of growth. The thrust of major components of the federal government concerned with science today is predominantly oriented toward specific missions. This is clearly represented by the nature of the basic responsibility of the major federal supporters of research: the Department of Defense, AEC, NIH, and NASA. Even NSF is special-purpose in that its programs are confined to science alone. Thus, programs addressed to specific objectives and employing the "project-support system" predominate today in the federal support of science, and their impact is strongly felt by scientists, institutions, and education in general.

Here it may be well to comment on what I believe to be some of the values of the project system of support, since some of my subsequent comments may sound negative or at least critical of this basic mechanism. The development of the project system over the past 15 years has brought clearly to the fore these values:

- 1) The system is well suited to meet specific short- and middle-range scientific and technological needs of a mission-oriented program.

- 2) It permits early emergence of scientific competence within institutions with quite complex missions relating to instruction, service, and research.

- 3) It substitutes excellence for political considerations as a guide to support, and I use the term *political* here to encompass the many considerations apart from strict scientific merit which might bear upon the distribution of support.

- 4) The project system makes possible access to multiple sources of support and diminishes dependence upon the terms and conditions of a single source.

- 5) The project system helps strengthen the scientific environment within which the work is performed, through

detached assessment of staff capabilities and through maintenance of vigor within the environment.

These are really important contributions to the environment of scientific activity. In fact, the project system has operated in this country so well, and has benefited all elements of the science structure to such an extent, that most, if not all, agree that any modification of federal support programs in science should have as its takeoff point a continuation into the future of much the same sort of programs and program mechanisms that obtain today.

However, there are broad deficiencies in our current support system as it operates today, and these become increasingly important as one takes the longer-range view.

Federal Expenditures Dominant in University Financing

The magnitude of federal expenditure directed toward universities, when measured in all its dimensions—research, training, construction, student support—is enormous. In 1963 the colleges and universities of the nation received approximately \$2.5 billion from the federal government; in 1964, \$3 billion. New legislative authorizations will add an estimated \$580 million in 1965. These totals represent upward of a quarter of all university income; in some institutions the proportion reaches 50 percent.

As I have noted, most of this support is for mission-oriented objectives, only minor amounts being left for the institutions and education as such. Federal support to schools is predominantly for research—\$1.6 billion in 1963—and this, by and large, is "project" financing. This fact, coupled with the thrust of science in the 20th century, has elevated research to a position equaling and perhaps higher than that of education itself. What are some of the implications of this trend?

One is the tendency to relate senior faculty members to the diverse sources of funds, diminishing their tie to the university in a fundamental sense. The university is now felt to be the scientist's boarding-house rather than his intellectual castle. Thus the concept of the university as a precious and necessary environment for scholarly activity has, to a large degree, been lost.

The paragon of academic attainment

today is not the scholar but the productive scientist. There has been an erosion of the concept of scholarly detachment and its essential contribution to human knowledge, endeavor, purpose, and achievement. Yet strong, intellectually independent institutions of higher learning centered upon the protection and enhancement of scholarship are indispensable national assets. There is need, then, for a coherent body of principles which recognizes this point and provides a basis for intelligent, purposeful national action in terms of present and future demands for intellectual resources.

The new principles should relate federal support, in its present manifold terms, to institutions of higher education as such, and to the higher-educational process. They should provide a means of extending the support of mission-oriented research and development to the advancement of science in general. And they should relate the advancement of science, as *science* is understood in current restricted terms, to education and the broad furtherance of scholarly activity. The general objective, then, is to evolve a framework of relationships which will permit the pursuit of national goals while furthering all the basic university functions.

Obstacles to the Formulation of New Principles

We should recognize the complex circumstances that interfere with the development of such a coherent body of principles. Among those circumstances is the traditional role of private institutions as guardians of academic

excellence and intellectual independence. So strong is this tradition that it generates resistance to the concept that such academic values can be extended in the context of major support derived from public sources. Yet, in the national interest, they must be extended. The prevalent traditional fear of the government's intrusion into education is a further obstacle, since it militates against a broader federal role in support of the educational function.

Thus, to date, no means has been found, and no national intention has developed, to deal *generally* with institutions of higher education, significant as they are as entities in respect to the national destiny.

We have rationalized the agency sprawl which constitutes today's government-university relationship as providing the benefits of diversity of support. We have ignored the destructive impact of this random set of processes upon the integrity of the university and the concept of the scholarly community.

Moreover, the situation has led to a domination of the government-university scene by federal agencies whose missions currently receive the major share of public support. This has diminished the significance of the agencies with broader roles, such as the Office of Education and the National Science Foundation. The resulting imbalance of university programs is distorting to institutional objectives and thus falls short of meeting long-term national objectives.

The resolution of this set of problems is complex, since it calls for a national consensus on the long-term importance of intellectual effort and the re-

sources that contribute to it. Such a consensus must be reflected through the Congress. But the scientist, the scholar, and the teacher must also comprehend the indispensable role of the university as an institution centered upon preserving and furthering the values that are essential to intellectual activity.

The federal agencies, so long as diverse missions are the basis of support for academic science, must seek new means and arrangements permitting a significant contribution to the institution as a whole rather than just to the relevant parts. In this, the enunciation of broad principles and objectives by the Academy and by university groups is of great value in guiding the legislative and the executive branches. With a general understanding of the concepts and goals, the Congress, the federal agencies, and the nation's institutions of higher learning could effect a purposeful and productive evolution in the system of science support. This would be in the direction of designing a system to further broad, long-term objectives as well as to meet specific short-term needs.

A crucial dependency among the federal government, the universities, and the scientists is the hallmark of the present era of national development. With all its problems and many dangers, it provides, perhaps for the first time, a setting in which this nation can comprehend the vital nature of its intellectual resources and formulate the means to bring public support to bear on their cultivation in such a manner that the conditions necessary for intellectual achievement are sought as a paramount public good.