Academic Science and the Federal Government

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The federal government and academic science are today engaged as allies with the pressing challenge of the present. America is faced with many new physical, social, economic, and security problems. These problems and conditions will be neither removed nor resolved without new tools, new methods, new approaches. Since we do not have all the necessary tools, methods, and approaches, we must develop them. There is only one way to do that, and that is through research, and people who have been adequately trained to do it.

Three Paradoxes

The most unique tools, methods, and approaches come from basic research. I will try to describe concisely three paradoxes that must be resolved before academic science can join with the federal government in a creative partnership, and I will outline the characteristics of a structure that is needed to promote this partnership, and will list some of the recent concrete proposals for this structure.

The first paradox is this: science obviously is affected by funding, funding is dependent on public policy, so science must affect public policy. The paradox is that science is characteristically aloof from politicking, feeling that it is in the best interests of the functioning of the scientific method to ignore the exigencies of politics. But times have changed. I think it is in the best interests of science to get involved in both politics and public opinion. The reason is more than just the need to convince legislators that major cuts should not be directed at the vulnerable funds for basic research. It is the need to provide the public at large with continuing evidence that science and research contribute much to their daily living.

There seems to be a growing mood of anti-intellectualism in our country, perhaps because of recent campus disturbances, and dissent from the intellectuals. We must realize that these are the deep-set feelings of a significant portion of our society, to which our Congress must be sensitive. This mood must be counteracted. Some people say that our country's current crisis problems are the result of too much knowledge. Perhaps this is naive. There are literally millions of people who would have died or suffered terrible and disabling illness had not our knowledge progressed to its present state. There are millions who would never have reached our present standard of living. Let the full weight of human misery that would have been, had we not advanced as we have, provide sober second thoughts to those who so simply attack what has been learned.

It is true, however, that increased and careless applications of technology have brought with them new problems, and dehumanization. But just as evolution cannot proceed backward, but must work with what is, so also we must gain more knowledge, not less, to circumvent the undesirable consequences of technology. History provides ample evidence that the society that loses its power and facility to innovate dies. And so science must emerge from its self-imposed shell and devise new intersections with those governmental and public factors that affect its future.

Scientists themselves are saying this. George Wald of Harvard helped organize a meeting of several hundred biologists last August, at the Woods Hole Marine Biological Laboratory, concerning what action should be taken on recent federal cutbacks in research support. The meeting seemed to produce the consensus that "the only way for scientists to work effectively for their cause is to be more active politically." Dr. Lee DuBridge (new Presidential Science Adviser) has drawn attention to "the need for a widespread public discussion of the issues so that all . . . become aware of the real values and needs of basic science. . . ."

I hope these new activities of scientists, in addition to addressing themselves to the subject of federal funding and public opinions of academic research, encompass other important matters, such as the establishment of guidelines which provide for, and *prove*, the freedom of contractees from undue government influence—a matter which, if resolved, might help alleviate the apprehensions of academicians and the moral indignation of student activists which have been causing turmoil on campus. Still other matters should be discussed—for example, should there be more emphasis on block grants or some other form of wide-scale institutional grants, and can we eliminate or reduce the red tape that goes along with research grants?

The second paradox concerns the need of the federal government for assessment of current technologies and predictions of problems which might result from implementation of new technologies. Robert F. Kennedy, in his book *To Seek a Newer World*, described the Senate as "a place where problems are dealt with as they arise and attention and effort are devoted to the crisis of each moment." We are living in an age of very complex public systems. As a result, the crises which face the Congress are of such magnitude that solutions to alleviate them require years for effective implementation. Congress must recognize these crises as far in advance as possible. Indeed, whenever possible, the problems should be eliminated during the design of the technology. Consequently, our subcommittee [the House Subcommittee on Science, Research and Development] is promoting and reviewing the possibilities of arriving at various new structural formulas which would provide for expert advice on (i) priorities for science policies, (ii) what is needed, and (iii) what is to be expected in the long-term technological future.

The essence of the second paradox lies in the requirement for the opposing concepts of constraint versus flexibility, of detailed planning versus serendipity. We must strike a happy balance between these concepts in whatever struc-

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ture we arrive at if we are to accomplish successfully the inclusion of the "scientific estate" and "predictive" politics in the government-science relationship.

This is an exciting endeavor. Not since the beginnings of the republic have we attempted to modify the basic format of the legislative branch. But the pace of rapid change and the spiraling levels of technology may now require just such an action. D. E. Kash, director of Purdue's Science and Public Policy program, states, "the growing calls from Government for the universities to do applied research in the civilian sector has many disturbing elements. It asks the university to provide for quality advice. In addition, it calls upon the university to become an advocate of that policy research. One can hardly be part of the university's tradition in this country without being initially appalled. . . ." But a new structural addition to our system of government would allow universities to continue on their independent course while helping to meet the need that the legislature now experiences. This postulated structure must retain two important characteristics which we value highly —the delicate checks and balances which are so much a part of our federal system and the independent and diverse input of differing opinions from scientists and engineers on matters of science policy.

The third paradox, which has already been implied, is the need for balance between the acquisition of new knowledge through basic research and the better application of current knowledge. Perhaps we must draw attention not only to budgetary cuts in funds for basic research but to the need to create imaginative new programs of research that will yield pertinent knowledge, or uses of knowledge. We have not used wisely all the knowledge we have gained. Nor have the goals we have designed for new technology been the best for our culture. Often whole technologies have followed only the directions of economic considerations. This is a prime target of the new partnership between government and the academic sciences. We will, hopefully, challenge each other, within the context of this new structure, to form more creative, healthy, and harmonious advances in technology. In other words, we must use knowledge more effectively in the human context as well as in the cost context.

"There is," said an Italian philosopher, "nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction of a new order of things." Yet I believe the best way to resolve the paradoxes that I have described is to formulate a new structure. Let me draw a parallel with biology. We have learned from biological research that certain basic functions of life can be resolved to the level of the basic dynamic structures of the cell. What we must do on the social level is create a structure which will provide the essential function.

What Is Needed

Let me outline what I believe to be the necessary characteristics of this new organization.

1) It must provide strategies for eliminating the causes of complex crisis problems we are *now* facing.

2) It must formulate these strategies in such a manner that they will not interfere with each other's implementation nor create new problems.

3) It must project or foresee undesirable consequences of a new technology and provide methods for eliminating these consequences before they reach crisis proportions, or simultaneously with implementation of the technology.

4) It must not interfere with the current system of checks and balances in the government, nor with the independence of scientists and engineers in the academic world.

5) It must intersect the established power structure in such a way that it wields enough *practical* power to insure its effective functioning. Merely influencing public opinion in a uniform manner is probably too idealistic a methodology, as well as being an almost impossible task, and, further, would not supply the other needed features of the proposed organization.

6) It must serve to evaluate, correct, and coordinate programs that are now in progress.

7) It is probably essential that it be interdisciplinary (governmental and nongovernmental) and that it make extensive use of concepts such as systems analysis and systems theory.

8) Finally, it probably must use and promote the most recent advances of social science, but also it should incorporate what can be learned, on an empirical basis, from the natural sciences concerning the evolution and optimization of existing complex physical systems. Studies such as the latter might provide guidelines for identifying areas of the social sciences that need greater clarification, as well as guidelines for social systems engineering.

Current Suggestions

There are many suggestions along these lines that are currently being supported by various factions of both science and government. It is my feeling, however, that at present these proposed organizations do not meet all the foregoing criteria—at least, in any one proposal.

Let me review some of these suggestions. They fall into four categories. First, some suggest a broadening of the activities and composition of the existing agencies—for instance, upgrading the President's Science Advisory Committee and putting the Vice President of the United States in charge of this group. Second, some suggest a Cabinet-level Department of Science and Technology, and this idea is gathering support from many leading scientists and policy makers, indicating, perhaps, the concern that exists about the diminishing support for science reflected in this year's budget. Third, some suggest a concretion of existing structure—for example, joining the Office of Science and Technology with the Marine Science and Space Council. Fourth, some suggest the establishment of totally new structures.

The National Academy of Sciences, in a preliminary report, suggests the foundation of a center called the National Institute for Advanced Research and Public Policy. Hubert Humphrey has suggested the creation of a National Domestic Policy Council which would act in domestic affairs in a manner parallel to that of the existing National Science Council. An entire branch of government parallel and coequal to the existing legislative, judicial, and executive branches at the federal, local, and state levels has been suggested by Nicholas Golovin of the Office of Science and Technology, who has received support from the Ford Foundation and has been working with Brookings Institution and the John Fitzgerald Kennedy School of Government in evaluating and refining this approach. Perhaps in the near future one or all of these approaches will give us a func-

tional structure which will serve to eliminate the paradoxes and meet the needs discussed above.

Conclusion

It has been said that "we are members of a society in transition and the university has been the source for many of those forces which are behind transition." We can be confident that academic science will provide the federal government with the scientific advice it needs; with cogent and timely suggestions on the assessment, evaluation, and direction of new technology; and with comprehensive structures for achieving these ends.

I believe that academic science will provide the public with the balance of intelligent and objective attitudes so needed in this time of great change. A dangerous polarity is occurring in this country, with both extremes, of left and right, forsaking and distrusting the American center. I hope you in "academia" use all the influence you possess to promote reason as a balance for the emotion in current political discussion and to help us in government solve the social problems which are the ultimate source of the unrest.

Dallas: Larger Education Role Proposed for Research Center

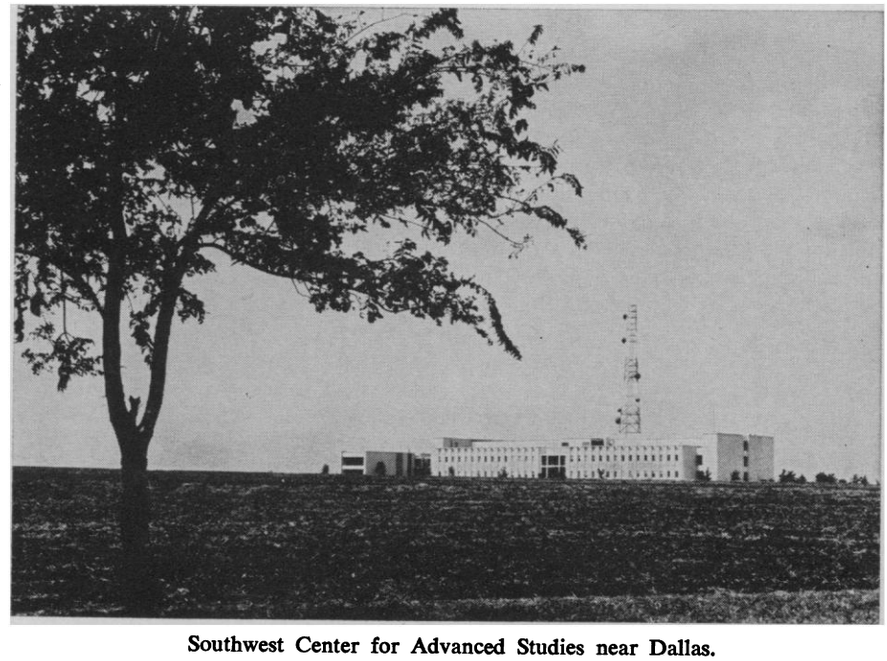
Dallas. The Southwest Center for Advanced Studies (SCAS) was established near here in 1962 under the leadership of Lloyd V. Berkner, distinguished physicist, member of the National Academy of Sciences, and one of the astute entrepreneurs of American science. Berkner, who died in 1967, had visions of SCAS stimulating graduate research activities in a region better known for abundant natural resources than for intellectual glitter. Though prospering from oil, gas, cattle, and farm products and, increasingly, from the growth of advanced-technology industry, the Southwest was, and is, forced to look to other regions for the bulk of its most highly trained technical manpower. SCAS, Berkner hoped, would develop close ties with universities of the region and, through joint programs with these institutions, greatly increase the Southwest's production of Ph.D.'s in the sciences.

Progress toward this goal has been discouragingly slow despite generous support of SCAS by the business community of Dallas. While SCAS has achieved some success as a contract research institution, its accomplishments in graduate education have been modest. In part, this has been because institutions in the area often have lacked the resources to undertake major programs with SCAS; and, in part, it seems to have been because SCAS, a new and somewhat alien force, has aroused among some local educators jealousy, resentment, and fear that a strong competitor for students, money, and influence was pushing its way on the scene.

The center's growth—in buildings, staff, and volume of research and teaching—has fallen far short of original projections. Even physically, the center, with its research and teaching facilities housed in a single building on a 1200-acre site just north of Dallas, looks lonely and unfulfilled.

For the past year or so SCAS has been, in the words of one of its division heads, a "static institution," a condition which can by no means be altogether attributed to the tight federal research budget. In fact, to many of the SCAS scientists as well as to the Dallas business leaders who have been behind the center it has become increasingly clear that SCAS may soon enter a decline unless it is taken over by the state and given a larger role in graduate education.

It now appears that just such a salvation may come to pass. On 3 December, the Texas Coordinating Board for higher education, by unanimous vote, recommended that the state legislature approve a proposal by SCAS and the University of Texas Board of Regents for the center to become part of the University of Texas system. Even though a part of the university system, the center would be free (subject to the Coordinating Board's approval) to



Southwest Center for Advanced Studies near Dallas.