Overview of the National Science Foundation's Intergovernmental Program

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The Intergovernmental Program of the National Science Foundation is designed to facilitate the maximum integration of scientific and technical resources into the policy formulation, management support, and program operation activities of state and local governments. This paper traces the evolution of the program from its inception in 1967 through the present time. The program began with an assessment of the scientific and technical needs of the executive branches of the states and the development of a community of interest in state and local governments, universities, industry, and other resource institutions that came together to develop the significant potentials for policymaking and operations that were apparent. The paper describes selected activities conducted with National Science Foundation support in the state executive branches as well as in the state legislative branches, local governments, and the federal laboratories, which have also emerged as major areas of program concentration. Significant changes have occurred during the period that the program has been in existence with regard to improved understanding and capabilities in state and local governments and the potential of science and technology as technical resource bases to assist in dealing with domestic policies and issues. Similar beneficial change has occurred in the way that state and local governments and resource centers relate to each other and to their noncounterpart institutions.

For about the last 10 years, the Intergovernmental Program of the National Science Foundation (NSF) has worked with other federal, state, and local units of government in an attempt to address the issue of disjointedness in our national system for science and technology.

The Intergovernmental Program became part of the foundation's Research Applied to National Needs (RANN) program in 1971. We are now being realigned into a new directorate, which is entitled Applied Science and Research Applications. In several ways the goals of TRB are close to those of our Intergovernmental Program. For example, TRB seeks to stimulate research and development on domestic-sector problems, it attempts to facilitate the dissemination of research outputs, and it strives to promote the application of research in a domestic setting. Our program at NSF is based on the premise that, although a great deal of technology (new ways of doing things, innovative methods) is being, and has been, transferred throughout such functional systems as transportation, a great many dysfunctions exist in our general institutional system insofar as how it might best facilitate the coming together of people who need new knowledge and people who have such knowledge. The Intergovernmental Program is designed to work with both ends of the spectrum—the user and the provider—to try to help maximize the input and the integration of new ways of doing things (i.e., new knowledge) into the decision-making and operational processes at state and local levels.

Science and technology, as defined in this small part of the NSF, is extremely broad. We deal with hard science, soft science, management science, and social science. Effectively, we deal with all sorts of new knowledge that may help state and local governments do their jobs.

COOPERATION WITH STATE EXECUTIVES

NSF's initial activities were undertaken in partnership with several state executive branches, generally with the governors' offices. During 1969-1970, a series of regional conferences and a national conference were conducted around the country by people from state government, local government, universities, private nonprofit research operations, federal laboratories and centers, and industry. They came together to talk about how, particularly at the policy levels in state government, the scientific and technological resources of the country could be better tapped to help the states deal with some of their problems and to help them improve their operations and policy-formulation processes. These were exploratory conferences and resulted in an extremely high degree of interest in all of these segments of the society to go further and to explore the potentials that existed in this area.

As a result of early interest, and, in particular, through a basic study of science and technology in state government, which was conducted by the Council of State Governments, a number of states began to try to develop new ways of strengthening their capacity to tap the scientific and technological resources available to them through such mechanisms as science advisors, scientific staffs, forecasting, planning, and operational analysis. NSF, with a relatively small amount of money, responded to these initiatives and provided some support for demonstration projects in California, Hawaii, New Hampshire, and Michigan. A high degree of interest was generated among the states during this period. For example, we began to work in considerable depth with the Council of State Governments, the National Governors' Association, and regional groupings of states, such as the Federation of Rocky Mountain States (now the Western Governors' Policy Office).

COOPERATION WITH STATE LEGISLATURES

We also recognized at an early stage that one of the parts of the system that needed better access to scientific and technological information was the state legislative community. A number of legislatures are not well staffed at this point, some do not meet for long periods in the year, and many have had limited access to technical resources. Since we have been involved with the legislatures, a trend has developed toward improvement and strengthening of the institution. We have worked with the legislatures to help them to develop further their in-house science and technology capabilities and to improve their relationships with the knowledge-generating community.

In an early cooperative project, the California legislature established a policy body that was technology-based. Their advisory council performed long-range studies in areas like nuclear siting and population policy. Wisconsin buttressed their legislative research staff with technically trained interns. That approach is becoming increasingly popular with state legislatures around the country. Illinois and Massachusetts have adopted science and technology-related intern programs,

and Pennsylvania has coupled the six state-supported universities with the state assembly in a legislative office of research liaison. The Pennsylvania universities have committed themselves to providing answers to technologically related issues that face the legislature. In fact, at any one point in time, three faculty members from the participating universities are in residence in the state capitol to help the legislature and to relate to their campuses and to the others in the state for technical advice and assistance.

In the area of legislative information-sharing there have been many developments. For example, there is an association between a number of mission agencies like the U.S. Department of Transportation (DOT), the U.S. Bureau of Standards, the U.S. Department of Energy, the National Oceanographic and Atmospheric Agency, and the U.S. Environmental Protection Agency and the legislatures through the Model Interstate Scientific and Technological Information Clearinghouse (MISTIC), a science and technology information system that makes available to the legislatures the research outputs of these federal agencies. Also, the states are coming together now in an interactive way with a communications system through which they can exchange information on technological subjects. This eases the traditional problem of having 50 state legislatures working individually to reinvent the wheel. Issues dealt with include fluorocarbon regulation, pollution, and other environmental concerns. The legislatures are endeavoring now to develop a relationship with the Congressional Research Service (CRS) so that they can have access to the congressional computer and the extensive work that is done in abstracting and other services provided by CRS to the U.S. Congress. If this access is achieved, it could represent a significant breakthrough by opening up this important information base for the states.

Last year Congress passed the State Science Engineering and Technology Program, for which was authorized up to $3 million to provide funds to both state executive and legislative branches to help them assess

1. Where they are in regard to tapping science and technology resources,
2. How they could organize to do that better,
3. How they could improve their relationships with the resource bases, and
4. How they might begin to get better data on which to base decisions and to develop ways of providing services.

This program was mounted rather quickly, with the assistance of the National Governors' Association and the National Conference of State Legislatures. Executive branches in 49 states and legislative branches in 42 states received planning awards. At this point, no money has been provided for a full-scale implementation phase. Whether such funds will be forthcoming is problematical. But, nonetheless, the states will have gone through a beneficial exercise and, it is hoped, will be able to make improvements on their own, at least to a limited extent.

COOPERATION WITH LOCAL GOVERNMENTS

The focus for local governments is not on the transfer of individual technologies but, rather, on the disjointedness in the system and on the beneficial changes that might be achieved. Initially, a very few centers of activity, in terms of specific cities, were interested in new approaches in science and technology. Tacoma was a leader in moving ahead with the general issue of how to improve its capacity in science and technology. Philadelphia formed the Mayor's Science and Technology Advisory Committee. About 150 experts from industry, government, and the university community in Philadelphia joined as volunteers to support the mayor's efforts to deal with city problems. Four cities joined together in California with aerospace companies in the placement of technology agents in the city managers' offices to provide technology support. In Alabama, Auburn University took the initiative and established a capacity to support the cities and the states. Auburn has subsequently been joined by several campuses of the University of Alabama to form a consortium of universities to provide scientific and technological support.

At this time, there are a number of local government innovation networks around the country in the regions or states. The NSF's Intergovernmental Program provides a portion of the support of these groups. In California, the original 4 cities have increased to 11. There is a similar consortium of cities and states in the New England area, which is called the New England Innovation Group, and there are about seven or eight or more of these activities in various stages of development around the country. They are designed to try to facilitate the coming together of local governments to share the risk of taking an innovative venture, putting it to work in the individual cities, and facilitating the sharing process across the system.

At the national level, there are now three innovation networks of cities and counties. One of these, the Urban Consortium for Technology Initiatives, includes the 28 cities of more than 500 000 population in the country, and six urban counties. These jurisdictions united to develop research agendas that can be presented to federal mission agencies and others performing urban-related research. Another network of local jurisdictions ranging from 50 000 to 500 000 is called the Urban Technology System (UTS). In this network, technology agents have been placed in 27 cities and counties. This activity was originally a three-year experiment. We are in the process now of beginning to evaluate the effectiveness of this approach, which features the placement of technology agents in the cities to facilitate the implementation of new ways of performing the functions of local government.

The remaining national network is called the Community Technology Initiatives Program (CTIP). It is very new and includes local governments that have a population of not more than 50 000. Public Technology, Incorporated, which has a board of directors composed of representatives of the National League of Cities and the International City Management Association, is serving as the secretariat of these networks.

CONCLUSION

An interesting resource base for technological assistance to state and local government is the Federal Laboratory Consortium for Technology Transfer. This consortium is composed of about 180 laboratories, which represent 10 federal agencies. Each of the laboratories has designated a technology-transfer coordinator to serve as contact point for the consortium to facilitate sharing of technology information among the laboratories and agencies and to persons in industry and in state and local governments.

The efforts of NSF in working with state and local governments could not have been as successful as they have been without the cooperation of the federal agencies that are testing and using some of the networks and other mechanisms that have been developed for strengthening governmental capacity and for technology transfer

to our state and local governments. Progress has been made in heightening the awareness of policymakers and top administrators at federal, state, and local levels of government with regard to the potentials of better use of the country's science and technology resources in dealing with domestic issues. Mutual interests have been highlighted and linkages have been developed. Also, beneficial changes have been achieved that will never disappear.

Overview of Federal Programs and Activities

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A general overview of technology-transfer activities of federal agencies is provided in this paper. Major emphasis is placed on factors and processes that appear necessary for successful transfer programs. U.S. Department of Transportation policy and activities are highlighted as examples of ways in which technology, including hard products, processes, and knowledge, can be transferred for greater utilization in the public sector.

There is now a great deal going on in the area of technology transfer at the federal level. It is rather heartening to those of us who have been in the business for quite a few years. I would like to first define what I mean when I talk about technology transfer. There are many phrases used to describe such activities. For example, we call our program technology sharing. The classical definition for technology transfer has really been associated with spin-off or secondary applications, that is, where you take a technology developed for the National Aeronautics and Space Administration (NASA) or the U.S. Department of Defense (DOD) and try to apply it to another sector, such as transportation, health, education, or other private sector. The federal government looks at technology transfer from a much broader definition, trying to get products, processes, knowledge, or whatever results from research, development, and demonstration programs, applied and used in the public or civil sectors. My definition encompasses secondary spin-off, but also includes the case where we are trying to transfer from the federal level to the state or local level, in a specific mission area, such as is the case in the U.S. Department of Transportation (DOT). Basically, the purpose is getting the products out and used. It has become a very important subject, and one of the reasons for this is because of fairly extensive interest from state and local governments and an expressed concern that a great deal of money was being spent at the federal level on research and development that had very little benefit to the public sector.

Although one could argue that numerous benefits accrued to the public sector, there was not enough emphasis on transfer. The concerns were also logical when one considers that from 1966 to 1976 the federal government spent $185 billion on research and development; a majority of that was for defense and space. NASA and DOD have their primary missions; their research and development is for products for their own use. But, even during that 10-year period, $50 billion was spent on research and development for the civil sector. What has resulted from that expenditure in the way of useful products for state and local governments and the public and private sectors? Such questions are being asked, and I believe an increased emphasis on technology transfer can help ensure positive answers.

The National Science Foundation (NSF) has been a leader in trying to establish mechanisms for the process of technology transfer. The disjointedness of technology-transfer activities is being addressed by many of the NSF programs. Other agencies are doing different things. Some agencies are moving aggressively in this area, others are not moving as rapidly. This paper will talk about some subtle key factors that will make or break the success of technology transfer, both now and in the future. If we look at some programs that have been successful in this area, I think some of these factors will become evident.

As an important aside, if you are interested in the technology-transfer activities of various federal agencies, there is a document titled the Directory of Federal Technology Transfer (1). This document summarizes the activities of some 40 agencies of the federal government in the area of technology transfer.

The factors I will cover are the following:

1. A commitment to technology transfer;
2. The rewards for people doing or trying to achieve technology-transfer successes;
3. Understanding of the intended users and tailoring of products and information for them;
4. User involvement throughout the process, not only at the end;
5. Public and media acceptance of technology transfer (which is really the acceptance of research and development or science and technology); and
6. Expectations that we and others might have on achieving successful technology-transfer programs.

COMMITMENT

The achievement of anything of significance and substance generally requires commitment. This is especially true in a relatively new field of emphasis (technology transfer is in this category for most agencies). Ideally, the commitment has to permeate the entire organization responsible for the area of interest. You can have an individual in the bowels of an organization who is totally dedicated and committed to technology transfer as the critical element in the process of solving problems, but if there is no commitment on the part of