

29 Renewing the Federal Government-University Research Partnership for the 21st Century

National Science and Technology Council

Executive Summary and Recommendations

The partnership in science and technology that has evolved between the Federal government and American universities has yielded benefits that are vital to each. It continues to prove exceptionally productive, successfully promoting the discovery of knowledge, stimulating technological innovation, improving the quality of life, educating and training the next generation of scientists and engineers, and contributing to America's economic prosperity. As with all successful partnerships, it is occasionally appropriate to review and reaffirm the partnership and find ways to strengthen it.

At the urging of the President's Committee of Advisors on Science and Technology, state governors, industry leaders, elected officials, and leaders in education, the Assistant to the President for Science and Technology issued a Presidential Review Directive in September 1996, directing the National Science and Technology Council (NSTC) to review the government-university partnership in research and associated educational activities, and to recommend ways to strengthen it. The goal was to assess and reaffirm the principles of the partnership, promote cost-effective university-based research, ensure fair allocation of research costs,

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and support the linkage between research and education, all while maintaining appropriate accountability for expenditure of public funds. Where appropriate, the findings and recommendations emerging from this review also apply to nonprofit independent research institutes.

The review was carried out by a multiagency Task Force under the auspices of the NSTC Committee on Science. The Task Force solicited the views of universities, university associations, and the Federal research agencies regarding the issues they considered most pressing. These responses provided the basis for the interagency discussions and for the report's findings and recommendations.

The NSTC finds that the partnership is sound and continues to serve the nation in important ways. The NSTC identified a number of areas in which the partnership can be strengthened and will take action in three areas. First, the NSTC is issuing a proposed statement of the principles of the partnership to clarify the roles, responsibilities, and expectations of the parties and provide a framework for the development and analysis of future policies, rules, regulations, and laws. The principles will be finalized, in consultation with universities and other interested parties, including the Congress, within twelve months from the date this report is issued. Second, the NSTC reaffirms the importance to the nation, to the research enterprise, and to the future scientific and engineering workforce, of the linkage between research and education. The NSTC will take actions to strengthen this linkage, and urges universities to do likewise. Third, the NSTC, through the Federal agencies that fund university-based research, will implement a set of actions to help make the partnership more effective and efficient. Finally, the NSTC will establish a mechanism to provide for ongoing review of the partnership.

Introduction

American universities are a key component of our world-class research system, contributing to the development of knowledge and helping to advance societal goals. Our universities are the envy of the world, built as they are on a commitment to excellence. They have proven to be an exceptionally rich setting for the conduct of research because they are committed to the dual purpose of generating knowledge as well as educating the next generation of scientists and engineers.

Observers of the science and technology enterprise often look to Vannevar Bush's 1945 treatise *Science—The Endless Frontier*, to explain the origins of the Federal government's commitment to research and edu-

cation. But the history of these endeavors goes back even further. The fact that the United States has flourished, notwithstanding profound internal and external challenges, is partly attributable to our willingness as a nation to invest significant public resources for public goods not readily attainable by the normal workings of the marketplace. Our earliest declaration of national purpose commits us to promoting “the progress of science and useful arts,” a commitment which we honored immediately in 1790 with the first decennial U.S. Census. The census was followed by an historically unprecedented and nationally funded scientific reconnaissance of our landscape—its topography, geography, flora and fauna, wildlife, native peoples, land routes and waterways—which enabled citizens and entrepreneurs to realize the economic promise of our vast continent throughout much of the nineteenth century.

The manner in which we have chosen as a nation to invest in scientific and engineering research has, not surprisingly, reflected the pluralism of our communities and the decentralized structure of our governing institutions. The Federal government has relied on approaches as varied as the country itself to promote science and engineering. The advance of science and technology has often been coupled with other public objectives—especially education. The Johns Hopkins University and Clark University, our first explicitly research-oriented universities, were founded in 1876 and 1887. Since then, universities have served not only as critical research locations, but as a training ground for the next generation of scientists and engineers. The close coupling of research and education has become a hallmark of the U.S. system of higher education, producing the finest scientists and engineers prepared to perform cutting edge research and to manage high-technology enterprises across a broad range of disciplines and in multiple venues.

The partnership in research that has evolved between the Federal government and American universities has yielded benefits that are vital to each. It continues to prove exceptionally productive, successfully promoting the discovery of knowledge, stimulating technological innovation, improving the quality of life, educating the next generation of scientists and engineers, and contributing to America’s economic prosperity.

While the wisdom of investments in research has proven itself repeatedly overtime, each era brings with it special challenges and opportunities. Neither universities nor the Federal government have remained immune from the historic shifts that have taken place in the last decade, including the globalization of the economy; the growing interdependence of the economy and scientific and technical advances; the increasing

reliance of industry on universities for the performance of basic research; and the continuing importance of research universities to the economic prosperity of states and regions. The partnership between the Federal government and the nation's research universities must evolve along with these changes, making this an appropriate time to review the fundamental principles of the partnership, renew the government's commitment to it, and suggest how the partnership might be strengthened so that it can continue to be effective and efficient and serve the nation into the next century.

It was in this context that the Assistant to the President for Science and Technology, at the urging of the President's Council of Advisors on Science and Technology, state governors, industry leaders, elected officials, and leaders in education, issued a Presidential Review Directive in September 1996 directing the National Science and Technology Council (NSTC) to review the government-university partnership and recommend ways to strengthen it. As noted above, where appropriate, the findings and recommendations emerging from this review also apply to nonprofit independent research institutes. The NSTC was charged to assess the policies, programs, and regulations that shape the partnership, associated educational activities, and the administration of research. The goal was to review the principles of the partnership, promote cost-effective university-based research, ensure fair allocation of research costs, and support the linkage between research and education, all while maintaining appropriate accountability for expenditure of public funds.

The review was carried out by a multiagency Task Force chaired by the Associate Director for Science of the Office of Science and Technology Policy, with the support of a Working Group, under the auspices of the NSTC Committee on Science. The review findings and recommendations, documented in this report, are based on inputs from universities, university associations, and the Federal research agencies received in response to a Task Force solicitation. The Working Group reviewed over 40 university and university association responses, representing hundreds of universities. The Federal Demonstration Partnership (FDP), a cooperative agreement among 65 academic institutions (including administrators and faculty representatives), 11 Federal agencies, and six affiliate members designed to enhance research productivity and reduce administrative burden while maintaining appropriate stewardship of public funds, offered valuable input and is expected to assist in implementation of the recommendations. The Government-University-Research Roundtable of the National Academies of Sciences and

Engineering and the Institute of Medicine, is the official convener of the FDP. The Government-University-Industry Research Roundtable, with its record of inquiry into areas of concern to this review, also provided valuable input to this review. So did the National Science Board, particularly on the role of the Federal government in graduate and postdoctoral education.

Findings and Recommendations

The NSTC finds that the partnership is sound, that it continues to serve the nation in important ways, and provides a sound basis for the transition of the partnership into the twenty-first century. The partnership contributes to America's economic prosperity, enhances national security, and provides the means to improve the quality of life for our citizens. The integration of research with education, effective teaching and mentoring, and awards based on merit provide the underpinnings of the system.

Federally supported university-based research is a critically important investment by the nation in its future prosperity and wellbeing. Federal investments in university-based research are an integral component of the larger research and development enterprise that has enabled approximately half of the nation's productivity and growth in the last 50 years. In 1997, the Federal government provided \$14.2 billion for academic research. These funds comprise more than 60 percent of support from all sources for university research, and account for more than half of Federal investments in basic research, and more than one-third of its investment in total research (basic and applied). Those fractions are more than are received by any other type of research performer. They reveal the extent of the nation's reliance on universities as the prime repository of core competency in basic research and underscore the importance placed by Federal agencies on coupling research and education in preparing the next generation of scientists and engineers. Federal agencies foster science and technology partnerships with universities in numerous other ways, such as providing university-based researchers access to unique, state-of-the-art research facilities. These facilities provide essential research tools for a wide range of disciplines and foster collaborative research relationships between researchers in Federal laboratories, industrial partners, and university students and faculty.

The NSTC found great encouragement in the ongoing and dynamic partnership between government and universities. But while the NSTC

concluded that the partnership remains productive, maintaining its vitality requires continued vigilance. The review identified a number of ways in which the partnership might be made more effective and is taking action in three areas outlined chapters 3-5. Chapter 6 addresses the need for ongoing review of the partnership. First, the NSTC concludes that mutual understanding and effectiveness would be enhanced by a clear articulation of the principles of the partnership. The NSTC will develop such a statement of principles in consultation with universities, and as a first step, is issuing a proposed set of principles, reproduced in chapter 3. To be effective, this process must be conducted in partnership with stakeholders, including the Congress. Second, the NSTC reaffirms the importance to the nation, to the research enterprise, and to the future scientific and engineering workforce, of linking education and research, and urges universities to do likewise. The vital and dual roles of students (undergraduates as well as graduates), as both researchers who contribute to the national research enterprise, and as students who gain research experience as part of their training, must be recognized and reflected in government and university policies and practices alike. Specific actions that the NSTC will take in support of this policy are outlined in chapter 4. Third, the NSTC, through the agencies that fund university-based research, will implement a set of actions that will help make the partnership more effective and efficient in areas identified by the review and discussed in chapter 5 of the report. Universities are likewise urged to examine their policies and practices for ways to improve the partnership. Finally, the NSTC will establish a mechanism to follow-up on issues that were identified by the review but which were not examined in detail and to provide for ongoing review of the partnership.

Principles of the Federal Partnership with Universities in Research

For the partnership to thrive, there must be a clear understanding on the part of both parties of the goals of the partnership and the responsibilities of the partners. Why does the Federal government invest in university research? What is the role of graduate students in the research enterprise? On what basis are the costs of research allocated among the parties? Federal laws, circulars, and regulations govern operational aspects of the government-university relationship in areas such as allowable costs, administrative procedures, compliance issues, and audit practices. Yet statements of the rationale, goals, and objectives of the

public investment in university-based research remain implicit, or are dispersed in a variety of legislative and other documentation. As long as this is so, the government-university partnership risks being defined primarily in an ad hoc manner, by detailed accounting, administrative, and financial management requirements, and not by broader national goals.

A clearly articulated statement of the principles of the partnership would help clarify the roles, responsibilities, and expectations of each of the partners and establish a framework for addressing future issues as they arise. Ultimately, an agreed upon statement of principles would also serve to shape future discussions, formulate policies, and help guide decision making. The process itself of engaging the government and university partners in a dialogue would increase mutual understanding and provide a good foundation for resolving complex issues in the future.

The NSTC, in this report, is issuing a proposed statement of the principles of the government-university partnership. These were developed through interagency review and discussion that benefitted greatly from the input provided by the university community. It is imperative that a more extensive dialogue take place among all stakeholders before the principles are finalized. In particular, it is especially important that universities become directly involved in these discussions and that the Congress also become engaged. To this end, the NSTC encourages internal university discussions and inter-university deliberations, in addition to the dialogue that will be facilitated by the NSTC between the government and university partners and any congressional deliberations that might occur.

The goal of all those involved in these discussions should be to foster an environment that promotes scientific discovery, technological innovation, and the development of the next generation of scientists and engineers. Government actions should be guided by a recognition of the national importance of the American university and by a desire to sustain that special resource for maximum benefit to the nation. It is also important for universities to demonstrate their understanding of the responsibilities to the American public that accompany the acceptance of Federal funds for the conduct of research. Both partners must also be committed to streamlining administrative processes while maintaining effective stewardship of Federal funds.

Proposed Statement of Principles

The following are guiding principles that govern interactions between the Federal government and universities that perform research.

Guiding Principles

Research Is an Investment in the Future

Government sponsorship of university research—including the capacity to perform research and the training of the next generation of scientists and engineers—is an investment in the future of the nation, helping to assure the health, security, and quality of life of our citizens. Government investments recognize that the expected benefits of research often accrue beyond the investment horizons of corporations or other private sponsors. Investments in research are managed as a portfolio, with a focus on aggregate returns; investments in individual research efforts that make up the portfolio are based on the prospects for their technical success, though not on a presumption that those outcomes can be predicted precisely.

The Linkage Between Research and Education Is Vital

The integration of research and education is the hallmark and strength of our nation's universities. Students (undergraduates as well as graduates) who participate in Federally sponsored research grow intellectually even as they contribute to the research enterprise. Upon graduation, they are prepared to contribute to the advancement of national goals and to educate subsequent generations of scientists and engineers. Their intellectual development and scientific contributions are among the important benefits to the Nation of Federal support for research conducted at universities. There should be compelling policy reasons for creating or perpetuating financial or operational distinctions between research and education. Our scientific and engineering enterprise is further enhanced by the intellectual stimulation brought to campus by students from varying cultural, ethnic, and socioeconomic origins.

Excellence Is Promoted When Investments are Guided by Merit Review

Excellence in science and engineering is promoted by making awards on the basis of merit. Merit review assesses the quality of the proposed research or project and is often used in combination with a competitive

process to determine the allocation of funds for research. Merit review relies on the informed advice of qualified individuals who are independent of those individuals proposing the research. A well-designed merit review system rewards quality and productivity in research, and can accommodate endeavors that are high-risk and have potential for high gain.

Research Must Be Conducted with Integrity

The ethical obligations entailed in accepting public funds and in the conduct of research are of the highest order and recipients must consider the use of these funds as a trust. Great care must be taken to “do no harm” and to act with integrity. The credibility of the entire enterprise relies on the integrity of each of its participants.

Operating Principles

The following operating principles are intended to assist agencies, universities, individual investigators, and auditing and regulatory bodies in implementing the guiding principles.

Agency Cost Sharing Policies and Practices Must be Transparent

As in any investment partnership, each partner contributes to the research endeavor. While the primary contribution of universities is the intellectual capital of the researchers’ ideas, knowledge, and creativity, it is sometimes appropriate for universities to share in the costs of the research (and in some cases cost sharing is required by statute). Cost sharing can be appropriate when there are compelling policy reasons for it, such as in programs whose principal purpose is to build infrastructure and enhance an awardee’s institution’s ability to compete for future Federal awards. Cost sharing is rarely appropriate when an awardee is acting solely as a supplier of goods or services to the government since this would entail a university subsidy of goods purchased by the government. If agency funds are not sufficient to cover the costs of a research project, the agency and the university should re-examine the scope of the project, unless there are compelling policy reasons to require university cost sharing. Agencies should be clear about their cost sharing policies and announce when and how cost sharing will figure in selection processes, including explicit information regarding the amount of cost sharing expected.

Partners Should Respect the Merit Review Process

Excellence in science is promoted when all parties adhere to merit review as the basis for distributing Federal funds for research projects and refrain from seeking Federal funds through non-merit-based means. Federal investments in research are made with the expectation that the research community will select promising research paths more productively and wisely by relying on merit review than can a process that bypasses merit review to directly fund a specific individual or institution. Success in obtaining funds outside the merit review system can be discouraging to researchers who participate in the process.

Most significantly, bypassing merit review threatens to undermine research excellence. Merit review may be used in conjunction with other selection criteria to support agency or program goals.

Agencies and Universities Should Manage Research in a Cost-Efficient Manner

The goal of all those involved in sponsoring, performing, administering, regulating, and auditing university-based research and associated educational activities of the research enterprise should be to make maximum resources available for the performance of research and education. This goal can be accomplished by keeping agencies' and universities' costs of compliance with Federal requirements to the minimum required for good stewardship of Federal funds. For example, administrative requirements should rely on the least burdensome and least costly methods that can effectively provide needed stewardship. Universities should likewise manage their Federal grants as efficiently as possible.

Accountability and Accounting Are Not the Same

The principal measure of accountability must be research outcomes: have the researchers carried out a program of research consistent with their commitment to the government? Financial accountability is also important and should assure research sponsors that Federal funds have been used properly to achieve the goals of the research in a cost effective manner. Federal agencies must ensure that financial accountability requirements are limited to those that are reasonably required for good stewardship and that each measure adds sufficient value in terms of increased stewardship to justify the burdens and costs it imposes on universities and agencies.

The Benefits of Simplicity in Policies and Practices Should Be Weighed Against the Costs

The costs and benefits of simplicity in regulatory, administrative, cost accounting, and auditing practices should be assessed against the costs and benefits of accommodating diverse Federal programs and the multiplicity of university organizational structures in determining best policies and practices. “One size fits all,” or uniformity for uniformity’s sake, can unintentionally increase requirements and burdens, but a multiplicity of practices can also be costly. These tradeoffs should be carefully assessed whenever changes in government-wide or agency-specific policies and practices are proposed.

Change Should be Justified by Need and the Process Made Transparent

The process of change in the government-university partnership should be made as transparent as possible. Modifications in administrative, regulatory, or auditing requirements, or in cost sharing expectations, should be kept as infrequent as possible, consistent with the need to respond to changing circumstances. The impact of change in one part of the system should be understood relative to the whole. Reasonable time should be allowed for both agencies and universities to adapt to change.