



Executive Office of the President
Office of Management and Budget



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Office of Science and Technology Policy

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MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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SUBJECT: Updated Administration Research and Development Budget Priorities

This memorandum updates guidance on research and development (R&D) priorities and standards for program evaluation based on the R&D Investment Criteria. The Administration will continue to emphasize improved management and performance, in order to maintain excellence and leadership in science and technology.

The Administration sees certain areas of R&D as particularly important. Many fall mainly within the purview of a single agency, such as the new vision for space exploration (NASA) and research to improve human health (NIH), while some involve interagency R&D efforts, which is the focus of the second section of this memorandum. The updated R&D budget priorities reflect an extensive, continuous process of consultation with the President's Council of Advisors on Science and Technology (PCAST) and collaboration within the interagency National Science and Technology Council (NSTC) that will help shape the budget issued next February.

General R&D Program Guidance

The combination of finite resources and a multitude of new research opportunities requires careful attention to funding priorities and wise choices by agency managers. As we have reiterated previously in these annual memos, agencies must vigorously evaluate existing programs and, wherever possible, consider them for modification, redirection, reduction or termination, in keeping with national needs and priorities. They must justify new programs with rigorous analysis demonstrating their merit, quality, importance, and consistency with national priorities. Agencies may propose new, high-priority activities, but these requests should identify potential offsets by elimination or reductions in less effective or lower priority programs or programs where Federal involvement is no longer needed or appropriate.

In general, the Administration favors Federal R&D investments that:

- enable potentially high-payoff activities that require a Federal presence to attain long-term national goals, including national security and energy independence;
- sustain specifically authorized agency missions and support the missions of other agencies through stewardship of user facilities;
- enhance the health of our Nation's people;
- strengthen science, mathematics and engineering education and accomplishments to enable continuation of superiority in math and science;
- support technological innovation to enhance economic competitiveness and new job growth;
- address the workforce needs of the Nation to ensure a scientifically literate population and a robust supply of qualified experts;
- advance fundamental discovery to improve future quality of life;
- enhance our understanding of the global environment;
- maximize efficiency and effectiveness of the R&D enterprise through means such as competitive, peer-reviewed award and review processes and phase-out of programs that are only marginally productive or are not important to an agency's mission; and
- strengthen international partnerships that foster advancement of scientific frontiers and accelerate the progress of science across borders.

Interagency R&D Priorities

This section lists interagency R&D efforts that should receive special focus in agency budget requests. Agencies that receive funding for the following activities should be prepared to participate in applicable interagency coordination groups to produce: 1) a clear and concise definition of program activities and priorities within the overall priority area; 2) an inventory of the programs in the baseline budget; 3) agency trade-offs that will provide the resources to help produce a coordinated, cross-agency program greater than that of the individual activities; and 4) an interagency implementation plan.

Homeland Security R&D

Winning the war on terror and securing the homeland continue to be the highest of national priorities. Agencies should pursue an R&D investment strategy that closes remaining vulnerabilities and minimizes the emergence of new ones, with emphasis on applied technologies to address our Nation's ability to prevent, detect, treat, remediate, and attribute acts of terrorism. Agencies should continue to invest in technologies to enable decontamination following biological, chemical, and radiological incidents; standoff detection and protection against high-explosives; design and development of inherently secure infrastructures; establishment of standards for homeland security technology; and advanced techniques for threat and vulnerability analysis. Fundamental R&D should be considered to address and counter new or novel threats. Research areas of increased priority include: enhancing prevention, detection, treatment, and remediation of nuclear, chemical and biological (particularly genetically modified) threats; planning for and initiating recapitalization efforts to ensure continuing state-of-the-art capability to test and evaluate next-generation medical countermeasures; enabling the development of a biosurveillance network integrating human, animal, plant and environmental surveillance and laboratory networks across federal, state and local systems; addressing shortfalls in the development of new drugs and vaccines against foreign animal disease threats; and pursuing social and behavioral studies to anticipate, counter, and diffuse threats to our homeland security.

Networking and Information Technology R&D

The Networking and Information Technology R&D (NITRD) program is a high Administration priority. While the importance of each of the NITRD program areas continues, high-end computing (supercomputing) and cyberinfrastructure R&D should be given higher relative priority due to the potential of each in furthering progress across a broad range of scientific and technological application areas. The recent report of the High-End Computing Revitalization Task Force (HECRTF) describes a coordinated R&D plan for core high-end computing technology, as well as multi-agency approaches for addressing high-end computing capability, capacity, and accessibility issues. Agency plans in high-end computing should be consistent with the HECRTF plan, emphasize coordination, leverage the efforts of all agencies and, where appropriate, provide explicit benefit to multiple agencies through coordinated multi-agency investments. Cyberinfrastructure R&D encompasses research on hardware and software tools that is aimed at strengthening the connections between new and existing computers (including supercomputers), databases, scientific instruments, researchers and facilities. By providing secure, reliable, distributed computing environments and tools that allow the science and engineering communities to produce, collect, store, communicate, analyze and quickly share huge amounts of information, improvements in cyberinfrastructure will accelerate discovery. Agency requests should reflect these two program priorities by reallocating funds from lower priority efforts.

National Nanotechnology Initiative

Nanotechnology offers great promise across many scientific fields and most sectors of the economy and is another top Administration priority. Continued federal investment in the agency programs that make up the National Nanotechnology Initiative (NNI) is key to facilitating future breakthroughs and to maintaining U.S. competitiveness. The NNI should support both fundamental and applied R&D in nanotechnology and nanoscience, develop nanoscale instrumentation and metrology, and disseminate new technical capabilities to industry. Because research at the nanoscale offers natural bridges to interdisciplinary collaboration, especially at the intersection of the life and physical sciences, the Administration encourages novel approaches to accelerating interdisciplinary and interagency collaborations. Activities such as joint programs utilizing shared resources, as well as support for interdisciplinary activities at centers and user facilities, are encouraged. In order to ensure that nanotechnology research leads to the responsible development of beneficial applications, agencies also should support research on the various societal implications of the nascent technology. In particular, agencies should place a high priority on research on human health and environmental issues related to nanotechnology and develop, where applicable, cross-agency approaches to the funding and execution of this research.

Priorities of the Physical Sciences

Investments in the physical sciences likely to lead to or enable new discoveries about nature or strengthen national economic competitiveness continue to be important. Priority will be given to research that aims to close significant gaps in the fundamental physical understanding of phenomena that promise significant new technologies with broad societal impact. High-temperature and organic superconductors, molecular electronics, wide band-gap and photonic materials, thin magnetic films, and quantum condensates are examples of novel atomic and molecular-level systems with such gaps where coherent control holds great potential.

In addition, the development or enhancement of instruments and facilities can extend our scientific reach in ways that often have broad impact. The range of such investments is large, from bench-top devices such as the scanning tunneling microscope to the national-scale synchrotron and neutron user facilities. Priority will be given to those instrument- or facility-related investments with the greatest promise for the broadest scientific impact. Of particular interest are investments leading to the development of next-generation light sources. In their budget submissions, agencies should seek to coordinate their investments in instrumentation, upgrades, and user programs at national scientific user facilities.

Within discovery-oriented physical sciences investments, priority will be given to those projects and programs that are demonstrably well coordinated with related programs in other agencies or other countries. Examples of well coordinated, inter-agency investments in the discovery-oriented sciences are described in the interagency working group report, *A 21st Century Frontier for Discovery: The Physics of the Universe*.

Biology of Complex Systems

The application of DNA sequence and other data allows the development of new biotechnological tools, such as microarrays to decipher the functional implications of gene expression, which are helping to unravel longstanding questions in biology. Agencies should target investments toward the development of a deeper understanding of complex biological systems through collaborations among physical, computational, behavioral, social, and biological researchers and engineers. These collaborations will yield new ways of collecting and analyzing data allowing for the exploration of the living world across all levels of biological organization, both spatially and temporally. Scientific and technological breakthroughs are expected in diverse areas ranging from elucidating processes operating at the sub-molecular level, to preventing and treating infectious disease (plant, animal and human), to addressing inherently complex areas such as obesity, environmental management, and the neural basis of behavior. Federal agencies should continue to invest in obtaining additional sequence data and in the development of genomics tools and resources. A firm, broad foundation of biological knowledge in normal and disease states is a necessary underpinning for the scientific advances that will improve the health of the Nation. The NSTC coordination process (such as efforts by the Subcommittee on Biotechnology and Interagency Working Groups on Plant Genomes and on Domestic Animal Genomics) will assist in identifying R&D opportunities and needs to most effectively utilize Federal resources consistent with individual agency mission and stewardship responsibilities.

Climate, Water, and Hydrogen R&D

The Administration's energy and environment research initiatives are critical for achieving sustained economic growth while ensuring national energy security and a healthy environment.

Investments in global climate change science and technology continue to improve our understanding of climate variability and change, provide the basis for sound long-term climate policy decision-making, and further the development of energy efficient technologies. Agencies should implement the 2003 "Strategic Plan for the U.S. Climate Change Science Program" and focus on the topics described in the 2003 "U.S. Climate Change Technology Program: Research and Current Activities."

The highly successful intergovernmental Earth Observation Summit in July 2003 resulted in the commitment to develop a coordinated 10-year plan for global Earth observations. Agencies should continue to support the NSTC-coordinated development and implementation of a 10-year U.S. plan for a comprehensive and sustained global Earth observation system, identifying key areas for implementing solutions that will minimize data gaps and maximize the utility of the data.

The ability to measure, monitor, and forecast the U.S. and global supplies of fresh water is another high-priority concern. Agencies, through the NSTC, should develop a coordinated, multi-year plan to improve research to understand the processes that control water availability and quality, and to collect and make available the data needed to ensure an adequate water supply for the Nation's future.

Finally, agencies should continue research efforts in support of the President's Hydrogen Fuel Initiative; this includes research outside of the subset of activities currently counted as part of the Initiative. Agency efforts should address the critical technology barriers of on-board hydrogen storage density, hydrogen production cost, and fuel cell cost, as well as distributed production and delivery systems. R&D should focus on novel materials for fuel cells and hydrogen storage (including nanostructured materials), durable and inexpensive catalysts, and hydrogen production from renewable energy, nuclear energy, biological and electrochemical processes, and fossil fuels with carbon sequestration.

Research and Development Investment Criteria

The President's Management Agenda directs agencies to use the R&D investment criteria to improve investment decisions for and management of their R&D programs. Under this initiative, three primary criteria apply to all R&D programs:

1. Relevance;
2. Quality; and
3. Performance.

Industry-relevant applied R&D must meet additional criteria. The details of the R&D investment criteria are located in last year's version of this memorandum, which is available at:

<http://www.whitehouse.gov/omb/memoranda/m03-15.pdf>

The R&D criteria have benefited from three years of working with agencies, other stakeholders, and experts in assessment, to build on the best of existing R&D planning and assessment practices. The R&D investment criteria complement use of the Program Assessment Rating Tool (PART) that has been tailored for R&D programs. Agencies should use the criteria as broad guidelines that apply at all levels of federally funded R&D efforts, and they should use the PART as the instrument to periodically evaluate compliance with the criteria at the program level.

The R&D investment criteria continue to:

- Provide tools for programs, agencies, and policy makers to select, plan, and manage R&D programs effectively, to increase the productivity of the federal R&D portfolio and the return on taxpayer investment;
- Help convey the Administration's expectations for proper program management;
- Set standards for information to be monitored and provided in program plans and budget justifications; and
- Ultimately improve public understanding of the potential benefits and effectiveness of the federal investment in R&D.