

# The White House Office of Science and Technology Policy



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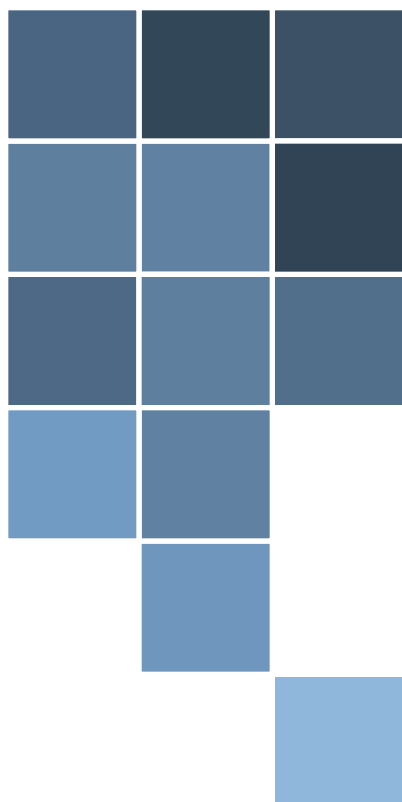


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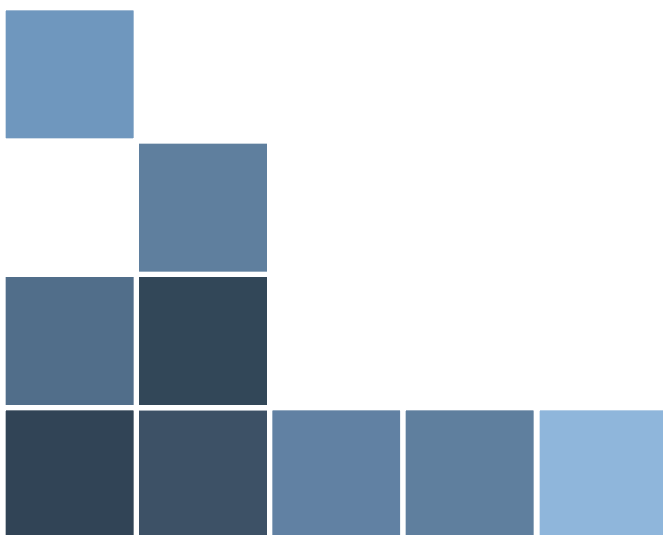
## CRITICAL UPGRADE

ENHANCED CAPACITY FOR  
WHITE HOUSE SCIENCE AND  
TECHNOLOGY POLICYMAKING:  
RECOMMENDATIONS FOR THE  
NEXT PRESIDENT

JUNE 2008

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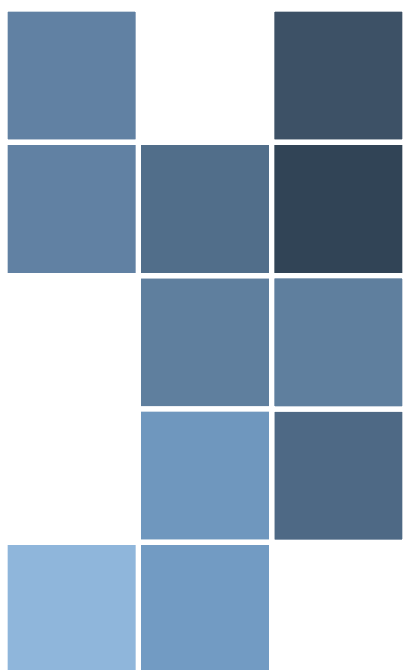




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*The opinions expressed in this report are those of the authors and do not necessarily reflect views of the Woodrow Wilson International Center for Scholars or the foundations that funded this report.*



# OSTP 2.0

## CRITICAL UPGRADE

### ENHANCED CAPACITY FOR WHITE HOUSE SCIENCE AND TECHNOLOGY POLICYMAKING: RECOMMENDATIONS FOR THE NEXT PRESIDENT

Science and technology pervade virtually all domestic and global issues. The defining policy issues facing our nation are directly related to our capabilities in science, technology, and innovation. Those issues span national security and economic competitiveness, energy security, environmental protection and natural resource conservation, public health, and quality of life.

In short, innovations will define our nation's future. The next President will need a superb Assistant for Science and Technology—not only to evaluate complex issues and develop sound policies but also to guide and oversee the federal investment in science and technology, which totaled some \$142 billion in fiscal year (FY) 2008.

The recommendations in this document draw on more than 60 interviews and discussions with leaders in the public and private sectors, as well as the history of more than 50 years of national science and technology (S&T) policy. Quotations from some interviewees, as well as citations from relevant speeches and documents, are scattered through the report. We present a series of non-partisan recommendations—the lessons learned about best practices—on how to enhance the effectiveness of the Assistant to the President for Science and Technology, who also serves as the Director of the Office of Science and Technology Policy (OSTP), and of S&T-related policy making in other White House offices.

*The authors and project team dedicate this report to the memory of William T. Golden and Joshua Lederberg—two great American visionaries and former co-chairs of the Carnegie Commission on Science, Technology, and Government.*

## ACRONYMS

AAAS	American Association for the Advancement of Science
EPA	Environmental Protection Agency
EPC	Economic Policy Council
FCCSET	Federal Coordinating Council for Science, Engineering, and Technology
FY	Fiscal Year
GDP	Gross Domestic Product
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
NSTC	National Science and Technology Council
OECD	Organisation for Economic Co-operation and Development
OSTP	[White House] Office of Science and Technology Policy
PCAST	President's Council of Advisors for Science and Technology
PSAC	President's Science Advisory Committee
STEM	Science, Technology, Engineering, and Mathematics
USAID	US Agency for International Development
USGCRP	US Global Change Research Program

Our overarching recommendations are as follows:

- **The President should appoint a nationally respected leader to be Assistant for Science and Technology. This individual should serve at the cabinet level. The appointment should be made early in the new Administration, along with the appointments of heads of cabinet-level agencies.**
- **OSTP must be funded adequately, staffed fully, and integrated closely with other policy-making bodies within the White House.**
- **Robust mechanisms to obtain advice must be established and maintained through the President's Council of Advisors for Science and Technology (PCAST), the President's Council on Innovation and Competitiveness, the National Science and Technology Council (NSTC), the National Academies, and a proposed new Federal-State Science and Technology Council.**

This report documents and explains these recommendations and puts them into the context of the entire federal government. Implementation of these recommendations, which cut across many programs and agencies, are vital to, and will have a strong impact on, our nation's future.

## OSTP Director and Associate Directors

The President should appoint an Assistant to the President for Science and Technology, who will also serve as Director of the Office of Science and Technology Policy. The appointment should be made at the same time as are other senior cabinet appointments. In addition to participating in cabinet-level activities, the OSTP Director should organize the National Science and Technology Council (NSTC) and participate fully in the activities of the National Security Council, National Economic Council, and other policy-making entities within the Executive Office of the President.

*In attracting the best scientists and engineers for leadership positions in the executive branch, the importance of presidential leadership cannot be overemphasized, even where cabinet secretaries and agency heads take the lead in identification and recruitment. The President must be perceived in the research community to value science and respect first-rate science personnel. The selection and role of the President's Assistant for S&T is crucial to this perception.*

**National Academies**  
*Science and Technology Leadership in  
 American Government, 1992*

The individual whom the President chooses for this key position should be a scientist or an engineer of significant national standing with advanced degrees in a science or engineering field. The individual must be trusted and respected by the President. The person should understand the U.S. innovation system, be familiar with issues of global cooperation and competition, and possess extensive networks in the S&T community. He or she must also have strong leadership and interpersonal skills.

*Leadership skills are the key to being an effective Science Advisor to the President. We need a leader with impeccable credentials who has had a demonstrated impact on science policy in the United States. We need the right person supported by a strong staff.*

Gail Cassell

Eli Lilly and Company  
Interview, January 3 2008

The President should nominate for Senate confirmation the full complement of four Associate Directors authorized under legislation, and the Director of OSTP should assign one of the Associate Directors to serve a senior member of the National Security Council staff.

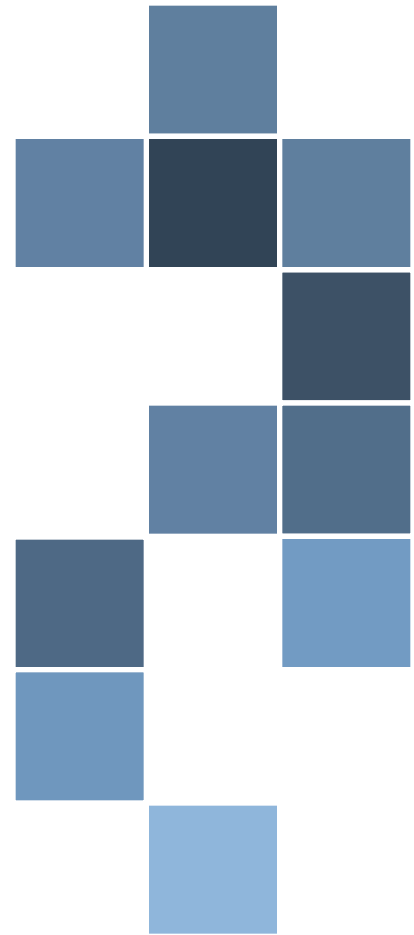
The main offices for the Assistant to the President and the OSTP Associate Directors should be housed in the Old Executive Office Building in order to enable them to interact readily with other senior White House officials.

The Director of the White House Personnel Office should seek the advice of the Assistant to the President for Science and Technology in filling the many (approximately 75) sub-cabinet and other senior agency positions (e.g., Assistant Secretary of Commerce for Technology Policy) that encompass major science and technology-related responsibilities in the federal government.

## OSTP Responsibilities and Activities

The Assistant to the President for Science and Technology should serve the President and the nation by:

- Promoting the development and maintenance of the best and most flexible science and technology capabilities in the world—including financial investments in fundamental science, the development of adequate numbers of highly qualified scientists and engineers, and an advanced infrastructure that usually must be linked with international collaborations
  - Providing objective advice—based on complete scientific and technical evidence—to bear on decisions confronting the White House and the nation.
  - Furthering the development and implementation of presidential initiatives.
- 







### SCIENCE, TECHNOLOGY, AND DIPLOMACY

*Technology daily outstrips the ability of our institutions to cope with its fruits. Our political imagination must catch up with our scientific vision.*

**Henry Kissinger**

Speech before the United Nations General Assembly  
September 24, 1973

*For some time it has become clear that advances in science and technology are outdistancing the capacity of existing international organizations to deal with them.*

**Cyrus Vance**

United Nations Association  
January 1975

These former Secretaries of State recognized the rising significance of science and technology for U.S. foreign policy. Today, circumstances are even more complex, and the stakes for U.S. vitality around the world even greater, than they were three decades ago. OSTP can play a central role, working with the S&T Advisor to the State Department in formulating effective actions.

- Developing and overseeing the implementation of sound S&T-based policies for missions such as space, education, health, defense, and homeland security aimed at contributing to American foreign policy and global problem solving.

*For the White House Science Advisor, President Clinton and I knew what we were looking for. We wanted someone who could analyze options and advise on the best course to lead the United States into a bold new technological future. We wanted someone with impeccable scientific credentials, who commanded the respect of the scientific community. But we also knew we didn't want a Science Advisor who was simply a cheerleader for more and bigger science—we wanted an Assistant to the President who knew the limits of technology as well as its power to improve the quality of life for the American people, present and future.*

**Former Vice President Al Gore**  
*This Gifted Age*, 1997

*Remember first principles. Remember who was elected President and who wasn't. It is important for the Science Advisor to understand the President's big priorities and how science can advance them.*

**John McTague**  
Interview, November 13 2007

### OSTP should:

- Ensure the highest standards and integrity of scientific facts and interpretations underlying the Administration's policies and ensure the independence of S&T advisory bodies in the federal government.
- Strengthen the nation's capacity to evaluate and take bold action on S&T issues from a long-term, strategic basis and articulate a vision for science and technology in the United States.
- Contribute to the development of U.S. foreign policy and participate actively in international activities related to science and technology. OSTP should collaborate with the Department of State and the U.S. Agency for International Development (USAID) in developing and negotiating global policies, understanding foreign S&T capabilities, and charting strategies for U.S. allies as well as with failed and failing states.



*One of the more notable successes of U.S. science policy during the post-WWII era was the research excellence that resulted from the high priority placed on federal support for basic scientific research, especially in universities. This was not the kind of R&D that industry could justify, but the long-term benefits to the United States were immense. However, the last two decades have seen a decline in that priority, replaced instead by more emphasis upon applied research and technology. The benefits of that change in priority are difficult to discern, but the negative effects upon basic research in universities are clearer. This is an important area where the Science Advisor's role is unique.*

**G A Keyworth**

Former Science Advisor to the President  
Note, March 2008

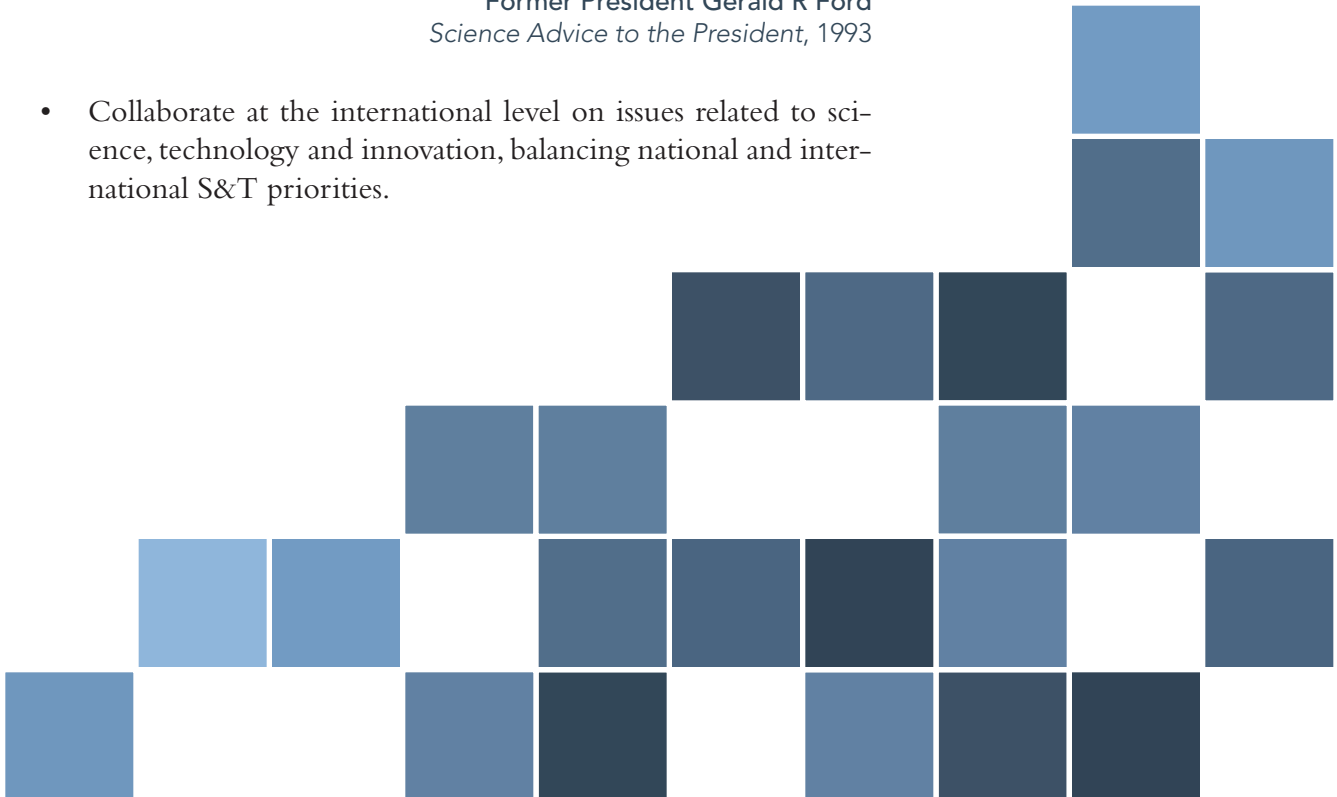
- Seek opportunities for discussions with members and staff of the U.S. Congress, and pursue regular exchanges with the staff of congressional committees on all major S&T topics.

*On the more immediate topic of the structure of the White House scientific advisory apparatus, there was no doubt in my mind when I came to the Presidency that it should be restored, ... Still I wanted to give the White House science advisory structure a firmer base than it formerly had. This could only be done through legislation which would emerge from the well-tested techniques used by the Congress of hearings on the many differing ideas which were then being proposed. Having spent a lifetime of service in the Legislative branch, I believed greatly in its strengths."*

**Former President Gerald R Ford**

Science Advice to the President, 1993

- Collaborate at the international level on issues related to science, technology and innovation, balancing national and international S&T priorities.





*Revolutionary advances in physics have led to diverse applications in weapons, energy, materials, and medicine, with extraordinary impacts on the quality of life and on economic and political relationships among countries. ... These powers of the physical and engineering sciences have been joined by equally revolutionary advances in the life sciences and by new frontiers for the environmental sciences.*

*These advances exemplify the ways in which science and technology transform foreign relations and usher in new choices, risks, and benefits that societies around the world must confront individually and in common. Greenhouse gases, the AIDS virus, agricultural biotechnology, advanced energy systems, new pharmaceuticals, information technologies, and a host of other scientific and technological trends shape global competition and cooperation.*

*The Assistant to the President for Science and Technology will necessarily play a key role on facilitating Presidential decisions and orchestrating discussions with the Congress about policies at the intersection of science and technology with international relations.*

**William T Golden and Joshua Lederberg**

*Science and Technology in U.S. International Affairs, 1992*

- Contribute to White House communications efforts on issues related to science and technology and promote public understanding of science and technology. To achieve this objective, OSTP should have its own press staff. This staff should work with the White House Communications Office to ensure the accuracy of public statements and promote the Administration's S&T initiatives in presidential addresses.
- Promote competition among all S&T agencies for support of only the best scientific and technical ideas and of open debate of scientific issues, while discouraging congressional earmarks for scientific and engineering projects.
- Meet regularly with the leaders of the various technical agencies of the federal government to better understand their issues, problems, and opportunities. This can be done on an informal basis as well as in the context of the NSTC.
- Play a leadership role in the development and implementation of national space and oceans policies—including the future of our Earth observatories—and provide guidance to the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, and other federal agencies.

*Recent scientific advances have not only made international cooperation desirable, but they have made it essential. The ocean, the atmosphere, outer space belong not only to one nation or ideology, but to all mankind, and as science carries out its tasks ahead, it must enlist all its own disciplines, all nations prepared for the scientific quest, and all men capable of sympathizing with the scientific impulse.*

**Former President John F Kennedy**

Address to members of the U.S. National Academy of Sciences

- Recognize the role of the states in the development and implementation of national policies, and develop activities to engage with leaders at the regional and state levels.
- Interact with industry, promote U.S. leadership in S&T innovation in both the public and private sectors, and foster government-university-industry collaboration.

*The importance of having industry members on the President's Science Advisory Committee (PSAC) and the President's Council of Advisors on Science and Technology (PCAST) is not to represent industry but to give them a chance to share their insights on new developments coming from the industry side in terms of new technologies and patents and what the likely impact will be. It is key for them to be recognized leaders in the technology field. It is also important to have academic leaders.*

**Edward E David Jr**

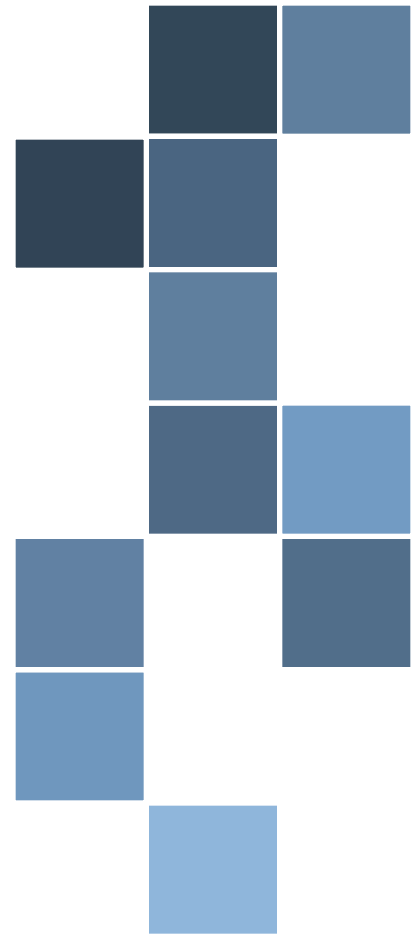
Former Science Advisor to the President  
Interview, December 12 2007

- Ensure that the most modern decision-making tools and techniques, including simulation modeling and supercomputer power, are brought to bear on national and international problems and issues.

*Two immense forces have emerged in recent decades to transform the way all science is performed, just as they have altered the conditions of our daily lives: access to powerful computing, and the technology of instrumentation which provides inexpensive means of sensing and analyzing our environment. These have opened entirely new horizons in every field of science from particle physics to medicine. Nanotechnology, for example, the ability to manipulate matter at the atomic and molecular level, and molecular medicine, the ability to tailor life essential substances atom by atom, both owe their capabilities to advances in computing and instrumentation.*

**John H Marburger III**

Director, White House Office of Science and Technology Policy  
2001



## PAST ADVISERS TO THE PRESIDENT: CONTINUING GOALS DEMAND THE HIGHEST QUALITY ANALYSIS AND ACCESS

*(A) broad range of scientific and technical questions confront the modern president; questions ranging from the domestic issues of basic research, science, education and the use of technology to stimulate economic growth to those of great international import affecting the nation's safety: military research projects, new weapons, space research and exploration, disarmament systems, technology in foreign aid and international scientific cooperation.*

**Jerome Wiesner**

*Where Science and Politics Meet, 1965*

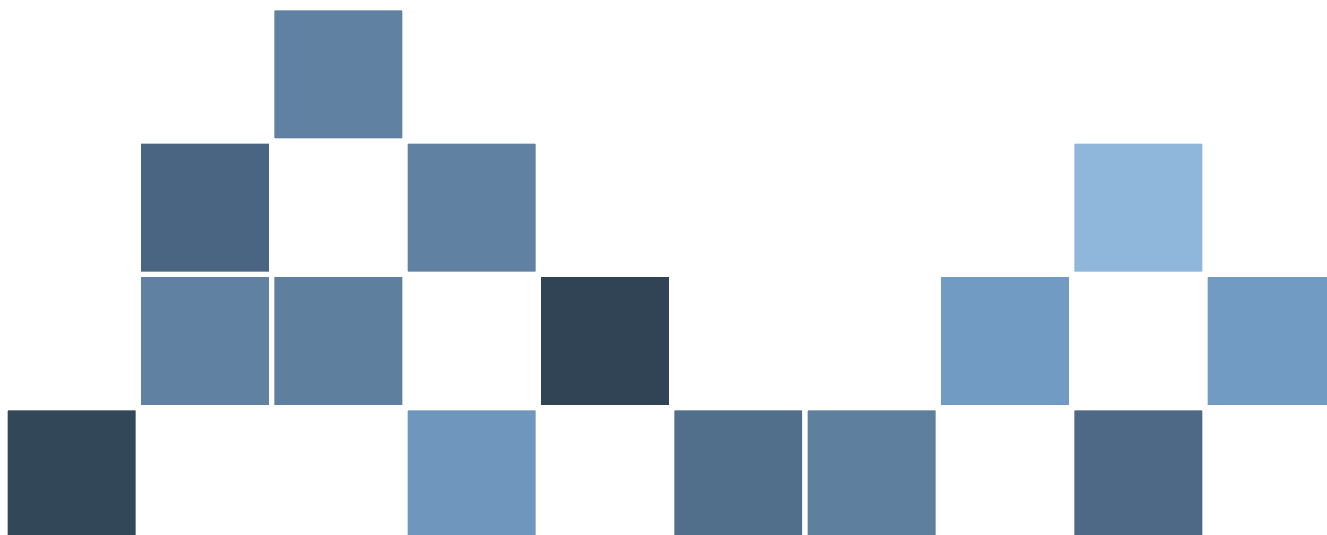
*Dr Wiesner's sketch of the scope of the job, although written more than 40 years ago, remains startlingly apt. His close and trusted relationship with President Kennedy, whom he served as Science Advisor from 1961 until 1963, and with President Johnson, whom he served in the same capacity between 1963 and 1964, set a high standard for the position and for the role of the White House S&T staff.*

*... (There is) a sense of direct involvement at the highest level of government that comes from personal participation with the President of the United States in meetings of (an) advisory group.*

**D Allan Bromley**

*Former Science Advisor to the President  
The President's Scientists, 1994*

Between 1989 and 1993, Dr. Bromley's leadership of OSTP and of PCAST fulfilled the goal of giving the President current assessments of the most critical issues. Part of the reason for his success was his ease of access to the President, exemplified by an unprecedented meeting hosted by President George H.W. Bush with PCAST. During the meeting, which was held at Camp David, the President "spent more than four hours in active, enthusiastic conversation with the group." (ibid, pg. 94). To enable vigorous backup for the activity, Dr Bromley worked closely with the Office of Management and Budget (OMB) and as the Director of OSTP, arranged for "five President-appointed, Senate-confirmed senior members of OSTP staff to bring a remarkable range of professional expertise, experience and background." (pg. 41)



## External Councils

The President should carefully select and appoint nationally known leaders from the public and private sectors in the fields of science and engineering, including social science as well as law, to the President's Council of Advisors on Science and Technology (PCAST). The President should then regularly consult with this group to clarify trends, sharpen his assessment of options and consequences, and thus help formulate policies on S&T, innovation, competitiveness, and regulatory concerns. The PCAST should comprise individuals from the university, corporate, and non-governmental organization sectors. The Assistant to the President for Science and Technology and a PCAST member should co-chair the Council. Consideration should be given to staggering appointment terms.

The Assistant to the President for Science and Technology should ensure that PCAST's activities are funded and staffed more fully than they have been at some times in the past

On behalf of the President, the Assistant to the President for Science and Technology should chair the President's Council on Innovation and Competitiveness, as called for in the America COMPETES Act of 2007. OSTP should take a leadership role in establishing and managing the Council and in guiding the implementation of the Act. For maximum effectiveness, this body might be combined with PCAST.

*The prosperity and security of all Americans now and in the foreseeable future depend increasingly on our nations enduring and evolving capacity to learn, inspire, create, and innovate. Innovation is the only sustainable driver for U.S. productivity growth and high standard of living for future generations.*

**F Duane Ackerman**

*Innovate America!*, Council on Competitiveness, 2005

*Global leadership has come to be accepted by many Americans as our country's birthright. However, we would be wise to keep in mind that in the 16th century, it was Spain that was the dominant nation; in the 17th century, it was France; in the 19th century, it was England; and in the 20th century, it was the United States. The book hasn't been written yet on the 21st century, but it is clear that no nation has an entitlement to the future.*

*The United States is entering a global era in which Americans will have to compete for jobs in a global marketplace—not only with their neighbors down the street but with highly motivated, highly capable, increasingly well-educated individuals from around the world.*

**Norman R Augustine**

*Is America Falling Off the Flat Earth?*, 2007



### THE AMERICA COMPETES ACT OF 2007

The America Creating Opportunities To Meaningfully Promote Excellence In Technology, Education, and Science Act (America COMPETES Act) was signed into law by President George W. Bush on August 7, 2007. The bipartisan legislation came in response to recommendations contained in the National Academies' "Rising Above the Gathering Storm" report and the Council on Competitiveness' "Innovate America" report and had support from many leaders from industry and academia.

The Act calls for a wide range of actions to keep America the most innovative nation in the world by strengthening our scientific education and research, improving our technological enterprise, attracting the world's best and brightest workers, and providing 21st-century job training. It estab-

(cont'd)

lishes a President's Council on Innovation and Competitiveness (akin to the President's Council on Science and Technology) to develop a comprehensive agenda to promote innovation and competitiveness in the public and private sectors; requires prioritization of planning for major research facilities and instrumentation nationwide through the NSTC; and expresses a sense of Congress that each federal research agency should support and promote innovation through funding for high-risk, high-reward research.

OSTP should proactively provide the leadership called for in the Act by organizing the first President's Council on Innovation and Competitiveness—either as an independent council or in conjunction with an expanded PCAST. OSTP should also work with the President and the Congress to obtain funding for the various programs called for in the act.

Other cabinet members and senior politically appointees should seek the advice of the Assistant to the President for Science and Technology and the Presidential Personnel Office when establishing and staffing their agencies' external advisory panels involving S&T activities.

The National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council are invaluable resources on S&T matters. OSTP should regularly seek the advice of the National Academies and should establish a streamlined, fully funded, contractual mechanism to allow ready access to expertise.

## OSTP Budget and Staff

The Assistant to the President for Science and Technology should appoint a number of permanent professional staff members to ensure continuity of expertise across Administrations. This would assist ongoing S&T activities and sub-cabinet S&T agencies with coordination and oversight. Such critical ongoing S&T activities include federal research and development (R&D) budgets and evaluation, national security policy, innovation and competitiveness issues, regulatory evaluation, coordination and orchestration of interagency activities through the NSTC, and acquisition of advice through PCAST and the National Academies.

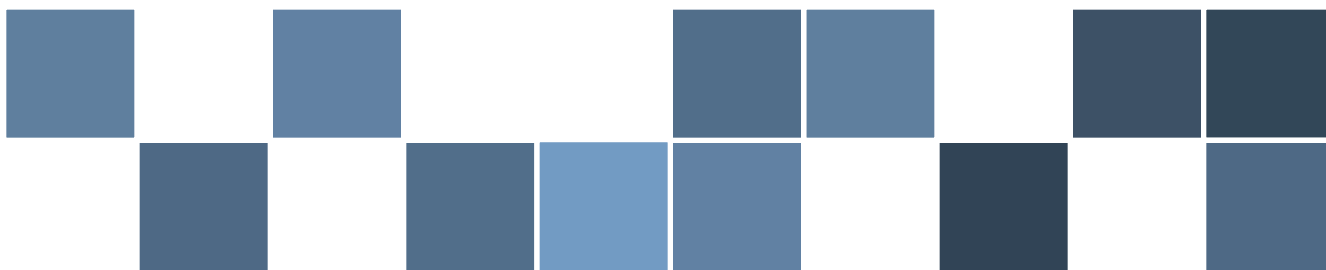
*Look back about 25 years and think about what was not going on. There was no World Wide Web. Cell phones and wireless communication were in the embryonic stage. The big challenge was the inability of the American manufacturing sector to compete in world markets; Japan was about to bury us economically. The human genome had not been sequenced. There were no carbon nanotubes. Buckminsterfullerenes had been around for about five years. We hadn't even begun to inflate the dot-com bubble, let alone watch it burst. And terrorism was something that happened in other parts of the world. The world is changing remarkably fast, and leadership in science and engineering will drive it. Where will this leadership come from? China? India? The United States? That choice is ours to make. Choosing to compete means that the United States must lead in brain power, organization and innovation.*

**Charles Vest**

President, National Academy of Engineering  
Thrive, Council on Competitiveness, 2008

To supplement its core staff of perhaps 50 individuals, OSTP should temporarily draw on expertise in federal agencies through detailee arrangements. OSTP should work with the White House Personnel Office to place White House Fellows, Military Fellows, Presidential Management Interns, and other capable professionals at OSTP. OSTP should work with the American Association for the Advancement of





## OSTP AND THE FEDERAL BUDGET IN A NATIONAL CONTEXT

The Assistant to the President for Science and Technology, who also serves as Director of the Office of Science and Technology Policy, has no direct responsibility for the federal government's expenditures for R&D. The funds are requested by, and the programs carried out through, the individual departments and agencies. Yet the influence of OSTP, especially acting in concert with the Director of OMB, can be substantial on this \$142 billion-per-year effort.

For example, OSTP can orchestrate cross-agency initiatives, catalyzing new efforts and modifying others. AAAS reports that for FY 2008, the approximately \$142 billion federal R&D investment includes about \$77.8 billion for the Department of Defense, \$28.7 billion for the National Institutes of Health, \$12.2 billion for the NASA, \$9.7 billion for the Department of Energy, \$4.5 billion for NSF, and \$2.3 billion for the Department of Agriculture. OSTP has the opportunity to assist OMB and the President in shaping trends in the agencies across fields of science and engineering, as well as across topics such as nanotechnology, biotechnology, and other multidisciplinary or transformative fields or in new needs in research facilities. Early in each year's federal budget cycle, OSTP and OMB should issue a joint memorandum with guidance on the President's priorities.

Looking across the world at the competitors of the United States, many countries have a stated goal of spending 2.5% to 3.0% of their gross domestic product (GDP) on R&D; many industrial countries are at or above this level. The United States' current spending for R&D is 2.6% of GDP. China and India currently have lower ratios, but are increasing their R&D efforts at about 10% per year, while the U.S. rate has remained flat. OSTP should analyze such trends and then advise the President and the Congress about emerging imperatives for R&D investment.

PCAST, whose members include leaders from industry and the academic world, can work closely with the President and OSTP to alert the policy debates to global opportunities and potential dangers related to U.S. S&T capacity. This is precisely what PCAST did in the past with respect to national security threats, technology policies, and a score of other critical issues ranging from intelligence to the environment, from science education to space. All such assessments have budgetary implications. This process led in 2007 to the America COMPETES Act (see sidebar on page 9-10).

By staying in close touch with the private sector, which supports about 65% of the total U.S. R&D effort (the federal share is around 28%) OSTP can both tap the best advice and stimulate added efforts, as appropriate, on frontier fields.





*The United States takes deserved pride in the vitality of its economy, which forms the foundation of our high quality of life, our national security, and our hope that our children and grandchildren will inherit ever-greater opportunities. That vitality is derived in large part from the productivity of well-trained people and the steady stream of scientific and technical innovations they produce. Without high-quality, knowledge-intensive jobs and the innovative enterprises that lead to discovery and new technology, our economy will suffer and our people will face a lower standard of living. Economic studies conducted even before the information-technology revolution have shown that as much as 85% of measured growth in U.S. income per capita was due to technological change.*

*Today, Americans are feeling the gradual and subtle effects of globalization that challenge the economic and strategic leadership that the United States has enjoyed since World War II. A substantial portion of our workforce finds itself in direct competition for jobs with lower-wage workers around the globe, and leading-edge scientific and engineering work is being accomplished in many parts of the world. Thanks to globalization, driven by modern communications, and other advances, workers in virtually every sector must now face competitors who live just a mouse click away in Ireland, Finland, China, India, or dozens of other nations whose economies are growing. This has been aptly referred to as "the Death of Distance."*

**Committee on Prospering in the Global Economy of the 21st Century**  
*Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future, 2007*

Sciences (AAAS) and other professional societies to provide science fellows and interns to complement the OSTP workforce.

It is essential that OSTP have adequate discretionary funding to conduct internal, or to commission external, special analyses of emerging science and technology policy issues.

## OSTP and the Office of Management and Budget

The President should direct the OMB and the OSTP to work together closely to ensure that the President's policies and priorities with respect to science and technology are reflected in agency programs.

The Directors of OMB and OSTP should:

- Develop a joint memorandum early in the annual budget process that provides policy and budget guidance to the agencies and helps ensure that the President's policies and priorities are reflected in agency budgets.
- Work together on an ongoing basis to ensure that the President's S&T policies and programs are being implemented effectively by all agencies. The President should direct OSTP to review the S&T-related elements of federal agency budgets and provide OMB advice throughout the budget process. OSTP should work with agencies in developing the S&T-related elements of their budgets for submission to OMB and in responding to pass-back guidance.

*Being the Director of the Office of Science and Technology Policy is like being the captain of a large ship. You can steer it, but you need to know where the controls are and most of them are hidden. Working closely with OMB and the White House Councils' staffs are important activities.*

**William R Graham Jr**

Former Science Advisor to the President  
 Interview, December 28 2007

- Collaborate in the analysis and development of regulations that have S&T components. OSTP should dedicate staff to work closely with OMB's Office of Information and Regulatory Affairs in the analysis and review of the scientific components of proposed regulations.
- During the initial weeks of the new Administration, cooperate to ensure that the President's first budget adequately supports any high-profile S&T and innovation initiatives deemed essential for FY 2009 and beyond.
- Jointly establish criteria for evaluating the major agencies' S&T programs and for assessing R&D progress and new opportunities.

## OSTP and Other White House Policy Bodies

OSTP should establish a close working relationship with other major White House policy-making entities.

*Science, by itself, provides no panacea for individual, social, and economic ills. It can be effective in the national welfare only as a member of a team, whether the conditions be peace or war. But without scientific progress no amount of achievement in other directions can insure our health, prosperity, and security as a nation in the modern world.*

Vannevar Bush  
1945

### Economic Policy Council

An increasingly greater portion of economic growth in the United States and throughout the globe is based on innovation. OSTP and the Economic Policy Council (EPC) should work together to promote an innovation-friendly environment that will enhance trade and job creation. Particular attention should be directed, for example, to energy and environmental policy, as well as to nanotechnology and biotechnology.

*Improved national economic performance requires sustained growth in productivity. The development and diffusion of new technology and its underlying science have been a major source of such growth. ... Within the Office of the President, the Science Advisor, operating with the support of the OSTP, is THE (emphasis added) key to improved performance in the development and coordination of new technology policies.*

Concluding Report of the Carnegie Commission on Science,  
Technology, and Government  
April 1993

*How will America compete in this rough and tumble global environment that is approaching faster than many had expected? The answer appears to be, "not very well"—unless we do a number of things differently from the way we have been doing them in the past.*

Norman R Augustine  
2005

The EPC should seek the advice of OSTP on the S&T-related elements of economic issues and engage OSTP in planning for international economic summits.





### PCAST AND INTERNATIONAL AFFAIRS

In recognition that international scientific collaboration is essential, especially for large-scale and globally distributed projects and that international partners should be involved at the beginning planning stages of a project, D. Allan Bromley established a PCAST Committee on Megaprojects to prepare recommendations on how to best organize planning and funding for such large-scale projects.

In the fall of 1991, committee members met with prominent scientists and engineers from the European Union to discuss and agree on recommendations for the upcoming OECD Science Ministerial in 1992. This resulted in the adoption of general principles for science cooperation and the establishment of a Megascience Forum at OECD that helps garner international funding ahead of time for large-scale science projects.

In 1999, the mandate of the Megascience Forum was expanded and its name changed  
(cont'd)

## Council on Environmental Quality

*What's changed is that everything is "green." The OSTP must have strong competence at the intersection of energy and the environment.*

—Joshua Lederberg  
Interview, November 21 2007

OSTP and the Council on Environmental Quality (CEQ) should collaborate in the development and implementation by various agencies of the S&T elements of environmental policy, including climate change, energy, water, human health, and biodiversity.

OSTP and CEQ should also collaborate in the development and implementation of the S&T elements of international policies and programs.

CEQ should seek the advice of OSTP in the S&T elements associated with the implementation of the National Environmental Policy Act.

*Energy independence is not feasible because the challenges are interdependent and global. What must be fostered is energy security, which recognizes the interlinked effects of global business, global competition, global energy supply chains, vulnerability to supply disruptions and cost within a global marketplace. For the foreseeable future there will likely be a mix of solutions that includes innovative extractive and transportation technologies for fossil fuels, innovative conservation technologies and innovative alternative fuel technologies across a broad front, including nuclear. We must advance discovery and innovation.*

Shirley Ann Jackson  
Define, Council on Competitiveness, 2008

## Domestic Policy Council

OSTP should work with the Domestic Policy Council to ensure that S&T and innovation capabilities are part of the policy discussions in areas such as health care, education, aging population, and public safety.



## National Security Council and Homeland Security Council

The S&T Advisor should participate on the National Security Council, and OSTP and NSC should share staff, to ensure that appropriate S&T expertise is brought to bear on foreign policy and on matters pertaining to national security.

*During the Cold War, the role played by numerous Science Advisors in forming and refining presidential policy on issues such as space exploration, space surveillance, missile defense, and arms control gained the respect of other members of the White House staff for the Science Advisor's office. An important aspect of that role was the Science Advisor's independence from other governmental agencies or departments.*

*The long-term threat of terrorism raises equally complex technical questions. Many of those questions, one being nuclear proliferation, challenge conventional thinking. Just as the Science Advisor often played an important role in Cold War-era policy, so can the Science Advisor be a knowledgeable and independent source of advice in the ongoing War on Terror.*

**G A Keyworth**

Former Science Advisor to the President  
Note, March 2008

*The world had been torn by wars on virtually every continent in recent decades. We raised our children amidst the foreboding of a nuclear holocaust. Concern about food grips the majority of the world's population. We have witnessed recent decades of economic and political turmoil. A constant that remains is the dedication of scientists to understanding the universe, the world, and humankind. We do not face the question of cooperating in science, rather, in the shadow of the dangerous forces about us and the opportunities for doing good, we must cooperate.*

**Frank Press**

"International Cooperation in Science: A New Agenda"  
Worldwide Science and Technology Advice, 1991

OSTP should collaborate with the Office of Homeland Security and have membership in the Homeland Security Council. OSTP should participate actively in long-term strategic policy and planning activities related to homeland security and should ensure that the broader S&T community is fully engaged in efforts to protect the nation.

## OSTP and International Activities

OSTP should:

- Take a leadership role in S&T international policy and activities of organizations such as Organization for Economic Cooperation and Development (OECD), the United Nations Educa-

to the Global Science Forum. Its scope of responsibility was broadened to encompass issues that did not relate to large-scale projects. Over the years it has been effective, particularly in providing smaller member countries with opportunities to be involved in international science projects.

It has a number of important accomplishments, including planning for and launching a spin-off organization, the Global Bio Informatics Forum, to coordinate bioinformatics work in biodiversity. The Global Science Forum, a venue for inter-governmental consultations among scientists and policy makers. Recent activities include a report on the major challenges of nuclear physics and a global road map of national and regional facilities, the identification of Best Practices for Ensuring Scientific Integrity and Preventing Misconduct, a proposal to create a global earthquake-risk map, and a workshop on policy issues related to major scientific collections.



### EFFECTIVE INTERAGENCY COORDINATION: THE U.S. GLOBAL CHANGE RESEARCH PROGRAM

Coordination of R&D programs across multiple federal agencies is particularly challenging because each agency develops its budget based on its mission, the priorities of its senior managers, policy from the Executive Office of the President, mandates and guidance from the U.S. Congress, the desires of numerous constituencies, and other considerations. The U.S. Global Change Research Program (USGCRP) was one of the most successful interagency efforts, largely because of leadership from OMB and OSTP, as well as recognition within the agencies of the value of an integrated federal research effort directed to well-articulated strategic goals.

The USGCRP was initiated by the OSTP under the auspices of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) in the 1980s and spanned numerous administrations. At one point the program involved 18 departments and agencies and had an annual budget of \$1.8 billion. The USGCRP is often pointed to as an example of the value of interagency initiatives and of the importance of strong leadership within the Executive Office in promoting and sustaining these programs.

tion, Scientific, and Cultural Organization, the G-8, the World Bank, and all major bilateral and multilateral S&T initiatives.

- Collaborate with the Department of State and USAID, through the Science and Technology Advisor to the Secretary of State and the various bureaus for which S&T and innovation can be key contributing elements, to ensure that S&T is a central component of foreign policy.
- Ensure that interagency contributions to international initiatives are effectively coordinated.
- Interact regularly with counterparts in other nations. The OSTP Director should be considered the de facto minister of science of the United States when interacting with the ministers of science of other nations.
- Participate in off-the-record meetings of the Carnegie Group (G-8) with other presidential-level science ministers and advisors.

*The Carnegie Group was very useful and is a legacy of the foresight and legacy of Bill Golden. Members held off-the-record international meetings of the G-7 and G-8 science advisors twice a year to discuss issues candidly and without staff or formal records. The meetings made it possible to develop collaboration and work out differences—even later outside the meetings—on tricky issues such as climate change, stem cell research, and the human genome because of the relationships built up at the meetings. They enabled frank discussions so that participants better understood each other and their views. It was also essential to be able to build real relationships and not just formal acquaintances.*

Neal F Lane

Former Science Advisor to the President  
Interview, November 26 2007

- Assume a leadership role in promoting international partnerships, collaboration, and competition. OSTP should strive to ensure that U.S. scientists are able to interact with their foreign counterparts and that they have access to S&T information from other countries. OSTP should help reduce barriers that prevent foreign students and visiting scientists from participating in education and research activities in the United States.
- Work in concert with the USAID, multinational organizations such as the World Bank, and regional development banks to ensure that science and technology are key elements of development strategies and to create strategies to assist countries under conflict and coming out of conflict.
- Communicate with members of Congress and their staff to advance access to S&T advice and analysis about global S&T trends, U.S. competitiveness in innovation, and the potential costs and benefits of international cooperation.





## EDUCATION IS A KEY TO THE FUTURE

*The National Science Board (has) continuing and growing concern with the condition of US pre-college education in science, technology, engineering, and mathematics (STEM). It is absolutely essential for our nation's long-term prosperity and security that we remain a world leader in science and technology. Pre-college STEM education is the foundation of that leadership – it must receive our highest priority as a Nation. ... We cannot wait for a new Sputnik episode to energize our population to rise to this challenge.*

Warren Washington  
January 2006

*America's high schools are obsolete. By obsolete I don't just mean that our high schools are broken, flawed, and under-funded – though a case could be made for every one of those points. By obsolete, I mean that our high schools – even when they're working exactly as designed – cannot teach our kids what they need to know today. ... This isn't an accident or a flaw in the system; it is the system.*

Bill Gates  
Microsoft, 2005

The United States has experienced “a colossal failure to implement” (the phrase comes from Nobel physics prize winner Leon Lederman) the recommendations for STEM reform offered by various groups over recent decades. The situation is now urgent.

Accordingly, the Assistant to the President for Science and Technology can play a central role in formulating and pursuing the new national strategy that will be essential for meeting the daunting goals that are rapidly soaring in importance as the nation's likely economic competitors, such as China and India, and Europe, give STEM greater priority.

## OSTP and Other Federal Agencies

- The President should update the Executive Order to establish and chair a strong NSTC. OSTP should ensure that the NSTC is adequately staffed and that its policies are implemented. The NSTC should include senior-level executives of agencies, as well as of OMB, and comprise political appointees and highly capable senior technical staff. NSTC should coordinate and oversee the S&T-related activities of federal agencies, including budgets, as well as the development and implementation of interagency initiatives. To ensure its effectiveness, the NSTC should be given continuity and status through presidential attention, active agency participation, and adequate OSTP and OMB staffing.
- The Director of OSTP should meet regularly with heads of federal agencies, particularly technical agencies, to establish and maintain good relations, to better understand agency challenges, and to identify opportunities to improve effectiveness.





### STATES INNOVATION AND ECONOMIC DEVELOPMENT

Many states are developing their own S&T and educational policies with the understanding that science, technology, innovation, and education have a direct impact on their economic development. California is investing in its own stem cell research fund. Arizona has established a state science foundation. Massachusetts and Michigan are encouraging high-technology and innovation clusters as part of their economic development strategies. The National Governors' Association has designated innovation and education as top priorities. Numerous states are developing policies to reduce greenhouse gas emissions.

- OSTP should not micromanage agency S&T-related programs, but should provide policy guidance and oversight.
- OSTP could establish an expert information network to facilitate the timely identification of technical expertise within the federal agencies on particular topics.

### OSTP, the S&T Community, the States, and the Private Sector

- OSTP should consult with leaders in the private sector, including universities, non-governmental organizations, and corporations, to explore novel public-private collaborative opportunities serving national and international interests related to S&T.
- The OSTP Director should meet periodically on an informal basis with the presidents of the National Academies, the chair of the National Science Board, the chair of the Defense Science Board, the president of the American Association for the Advancement of Science, the president of the American Association of Universities, and the leaders of other major professional societies.
- OSTP should use its convening power to bring together representatives of the nation's S&T communities and others to discuss and evaluate challenges facing the nation and to devise innovative solutions to address them.
- OSTP should examine ways to engage the public in dialogues on important S&T topics as a way to promote public awareness, understanding, and involvement.

*If you can't explain what you're doing and why you're doing it to any intelligent layman, that really means that you don't understand it yourself.*

**D Allan Bromley**

Former Science Advisor to the President

- OSTP should consider establishing and chairing a Federal-State Science and Technology Council whose members would meet semi-annually to share views on issues of common concern and provide examples of innovative solutions.

*OSTP could collaborate with states to help address science and math education challenges by initiating innovative programs. For example, a "millennium challenge" could be posed to engineers and scientists to foster the design of an affordable, prefabricated, permanent laboratory that could be added to every school.*

**Rita Colwell**

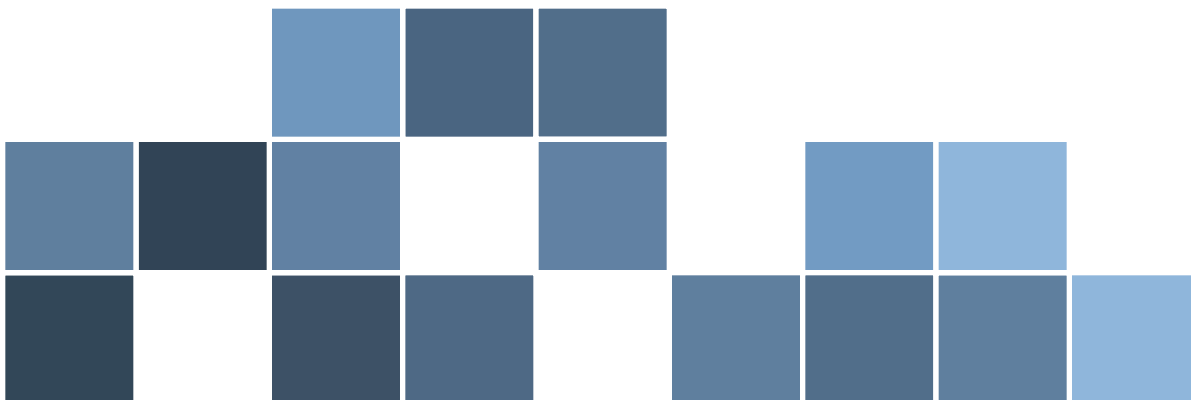
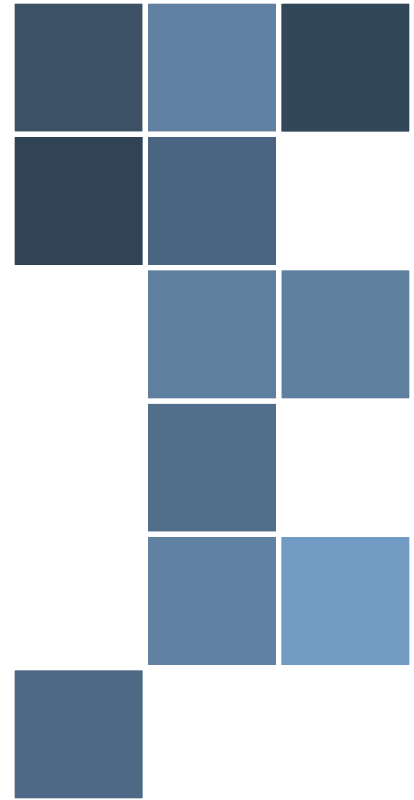
Meeting, March 17 2008



## Key Issues Facing the OSTP

Although science and technology can have an impact on many federal programs, in order to be most effective, OSTP should select a relatively small set of important issues to emphasize and then develop both a long-term and a short-term approach to these issues. Otherwise, OSTP likely will be swept up in the endlessly changing urgencies and issues of the day. The following areas—not in priority order—have been identified as important for OSTP to provide leadership and guidance.

1. Environmental and energy challenges such as global climate change; technologies to increase the supply of cost-effective energy sources; the trusteeship of natural resources, especially water; and the advancement of innovative practices to respond rapidly to environmental crises and natural disasters.
2. Enhancing U.S. global leadership in innovation, including the advancement of investments in basic research and transformative technology development, commercialization, and diffusion.
3. Responding to national security challenges, including terrorism, failing states, nuclear nonproliferation, and pandemic disease outbreaks.
4. Assuring that the United States has access to the best and brightest S&T talent in adequate numbers through improved S&T education at all levels and encouraging top students, scientists, and engineers to come to the United States to help overcome workforce shortages stemming from inadequate training and retraining programs.
5. Improving health and health care delivery on a foundation of world-class biomedical research, prudent and efficient safety reviews of new drugs and devices, and the application of information technology.
6. Finding means of ensuring greater public understanding of scientific issues and advances as well as technological opportunities.



*Any new policy should adhere to three principles. ... First, it should reflect our understanding of the process of creativity and innovation. Second, it should articulate the public's interest in supporting science—the goals and values the public should expect of the scientific enterprise. Finally, a new science policy should point towards decision-making tools for better investment choices.*

**Congressman George Brown**  
1998

*The fates have conspired to place many of the tools my predecessors wished for at my disposal. I work for a President who committed to a premier role for science and technology in national affairs when he nominated his Science Adviser simultaneously with his Cabinet Secretaries. There is Congressional support for a fully operational Office of Science and Technology Policy (OSTP) in the Executive Office of the President to help realize the President's goals for science and technology.... I cannot imagine completing the marathon ahead without this running start...and the benefits of my experiences at the Congressional Office of Technology Assessment.*

**John H Gibbons**  
Former Science Advisor to the President  
"Science and Technology in President Clinton's First  
100 Days," *Science Advice to the President*, 1993

*Society's attitude has changed in our lifetime towards science and technology. Right now there is a reasonably benign and appreciative attitude, although there are some strong anti-science and anti-technology foci. If the Science Advisors in the future can continue a record of service to their Administration and an even-handed approach to the many different science and technology factions over which they look, if the science community itself can be supportive and cooperative and understanding of the Science Advisor and his staff, if the science and technology communities in themselves can continue to be positive forces in our society, I have no basic worry about the long-term importance and recognized position of science in the White House.*

**H Guyford Stever**  
"Science Advice—Out of and Back Into the White House"  
*Science Advice to the President*, 1993



*Americans have prospered for more than two centuries because we are explorers and seekers of new knowledge. Science is the bedrock upon which U.S. economic growth has rested since the nation's leadership responded to the 1957 launch of Sputnik with a substantial investment in research and education. Federally supported basic research was the basis for an extraordinary array of technological advances, from the Internet and global positioning systems to MRIs and MP3 players. New investments are likely to produce the next-generation Internet, alternative energy sources, and inventions we can now barely imagine.*

*Moreover, in the U.S. system, the training of the next generation of scientists is a critical byproduct of this research. And improving science and math education at all levels can ensure that a generation of Americans has the skills to compete and flourish amid globalization rather than pine for jobs that are not coming back.*

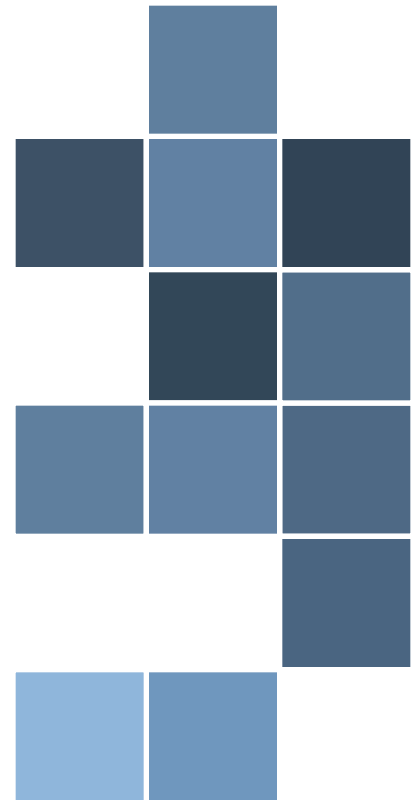
*Realizing that the government's commitment to science had become seriously weakened, the president and congressional leaders promised early in 2007 to double key research budgets, making long-term investments that could produce extraordinary breakthroughs.*

*However, when December came, science funding was clearly expendable, despite the enthusiastic support of clear majorities in both parties for the increases. One can only conclude that what is lacking is a sense of commitment, resolve and passion across the federal government that the investments we make in science today will create the opportunity for a better life for every American.*

*Working with coalitions of scientific organizations, businesses, colleges and universities, and labor organizations, we will continue to reach out to the current administration and Congress, but we also are looking to the presidential candidates. The next president - Democrat or Republican - will be able to shape an agenda that either supports or subverts science, technology and innovation.*

**Chad Holliday Jr and Graham B Spanier**

*"Science Education and Research Need a Boost  
From US," Philadelphia Inquirer, April 11 2008*





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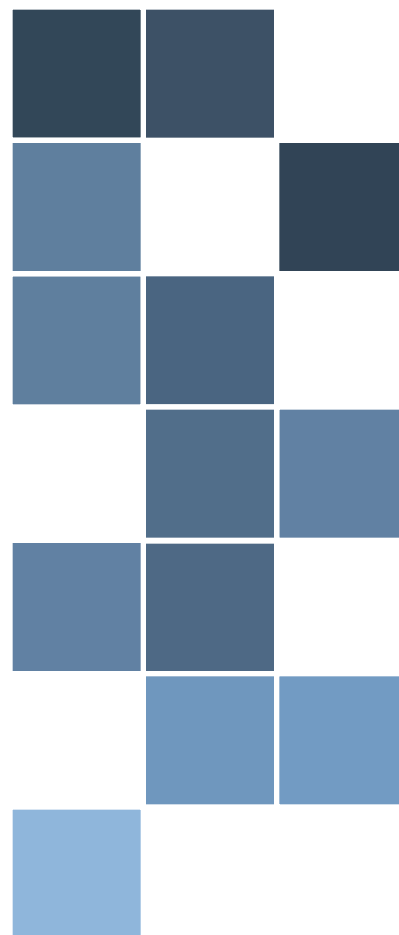
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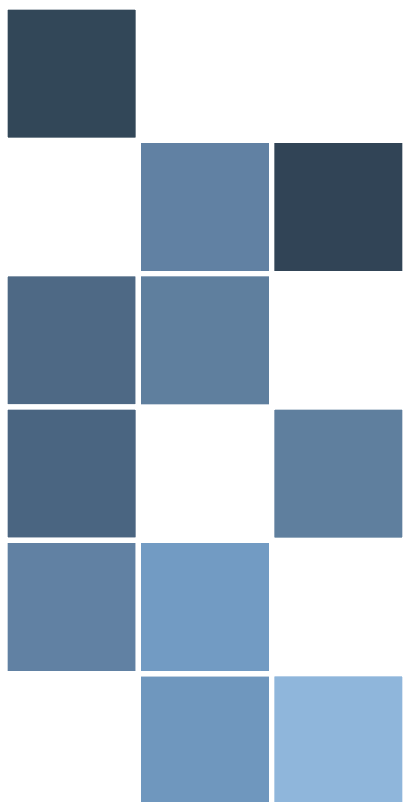
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Please Note: The above recommendations generally reflect the views of those interviewed; however, this is not a consensus document.





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