National Science and Technology Council

1999 Annual Report

About the National Science and Technology Council

President Clinton established the National Science and Technology Council (NSTC) by Executive Order on November 23, 1993. This cabinet-level council is the principal means for the President to coordinate science, space and technology policies across the Federal Government. NSTC acts as a "virtual" agency for science and technology (S&T). The President chairs the NSTC. Membership consists of the Vice President, Assistant to the President for Science and Technology, Cabinet Secretaries and Agency Heads with significant S&T responsibilities, and other White House officials.

Through the NSTC, Federal departments and agencies work cooperatively to ensure that Federal science and technology investments support national goals. NSTC Committees prepare R&D strategies that are coordinated across the Federal government to form a comprehensive investment package.

Call 202-456-6100 to obtain additional information regarding the NSTC.

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization and Priorities Act of 1976. OSTP's responsibilities include advising the President in policy formulation and budget development on all questions in which S&T are important elements; articulating the President's S&T policies and programs; and fostering strong partnerships among Federal, state and local governments, and the scientific communities in industry and academe. The Director of OSTP also serves as Assistant to the President for Science and Technology and manages the NSTC for the President.

Call 202-395-7347 to obtain additional information regarding the OSTP, or see our web site at: http://www.whitehouse.gov/WH/EOP/OSTP/html/OSTP_Home.html

THE WHITE HOUSE

WASHINGTON

February 4, 2000

Dear Colleague:

I am pleased to transmit the *1999 National Science and Technology Council Annual Report*. President Clinton established the National Science and Technology Council (NSTC) in 1993 to coordinate the diverse parts of the Federal research and development enterprise, especially activities requiring resources from more than one Federal department or agency.

In its 6 years of operation, the NSTC has assumed a prominent role in developing and advancing the Administration's broad-based research and development investment portfolio. Our efforts helped to prepare President Clinton to reaffirm the Administration's strong commitment to science and technology with a major increase in the FY 2001 budget: "To accelerate the march of discovery across all these disciplines in science and technology, I ask you to support my recommendation of an unprecedented $3 billion increase in the 21st Century Research Fund, the largest increase in civilian research in a generation. We owe it to our future."

The NSTC is an outstanding example of the benefits that can accrue from changes in institutions. The NSTC prepares research and development strategies that are coordinated across Federal agencies to form an investment package aimed at accomplishing multiple national goals. As this report shows, the NSTC encourages cooperation among the public and private sectors, resulting in new research and technology payoffs that far exceed those either party might reasonably expect.

I look forward to many contributions from this interagency council as we navigate the 21st century.

Sincerely,

Neal Lane
Assistant to the President for
Science and Technology

National Science and Technology Council 1999 Annual Report

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EXECUTIVE SUMMARY

Today, thanks to wise investments made by government and the private sector over many years, the American people have before them the unexplored continent of cyberspace and the prospect of discovering what is in the black holes in outer space. Scientists and engineers all over the country have ideas for new technologies they need Federal help to explore, technologies that could transform our economy and our lives in the future, just as dramatically as the Internet is doing today.

-William Jefferson Clinton, December 1999

Sustaining U.S. leadership in science and technology (S&T) has been a cornerstone of President Clinton's economic and national security strategy. The outputs of S&T – both public and private – have driven economic growth and improvements in the quality of life in America for the last 200 years. They have generated new knowledge and new industries, created new jobs, ensured economic and national security, reduced pollution and increased energy efficiency, provided better and safer transportation, improved medical care, and increased living standards for the American people.

Investments in research and development (R&D) are among the highest payback investments a nation can make. Over the past 50 years, for example, according to a study by the Council of Economic Advisers, technological innovation has been responsible for as much as half of the nation's growth in productivity.

The President established the National Science and Technology Council (NSTC) in 1993 to ensure that the nation's investment in S&T is coordinated among the diverse parts of the Federal research and development enterprise. During 1999, the NSTC has worked closely with the Office of Management and Budget (OMB) to develop R&D budget guidance for the Federal departments and agencies so that our S&T investments are integrated into the overall national agenda.

An important objective of the NSTC is to guide individual agency budget priorities for R&D and to orient the S&T spending of each Federal mission agency toward achieving national goals. To meet this objective, the NSTC has established five goal-oriented committees, each of which is chaired jointly by a senior agency official and an Office of Science and Technology Policy Associate Director: Committee on Environment and Natural Resources; Committee on International Science, Engineering, and Technology; Committee on National Security; Committee on Science; and Committee on Technology

These standing committees, along with ad hoc working groups within the NSTC, provide an effective forum to resolve crosscutting issues. Their work ranges from complex policy issues such as the future role of the U.S. national laboratories, to information dissemination, such as providing a program guide to Federally funded environment and natural resources R&D.

National Science and Technology Goals

President Clinton made a commitment to the American people to integrate Federal agency R&D budgets to ensure that the nation's S&T investments served broad national goals, as well as agency missions. In 1999, the NSTC undertook activities related to the following broadly stated S&T goals: maintaining world leadership in science, mathematics, and engineering; promoting long-term economic growth; sustaining a healthy, educated citizenry; improving environmental quality; harnessing information technology; and enhancing national security and global stability

R&D Budget Guidance

Through the NSTC, Federal agencies and departments have identified a set of R&D areas that are important national efforts requiring coordinated investments across several agencies. As with all R&D investments, these interagency priority areas should reflect our objectives of maintaining excellence, maximizing effectiveness, and minimizing costs. This budget guidance, rather than providing an exhaustive list of all Administration R&D priorities, focuses on those activities that require a significant level of interagency coordination.

The Administration's approach to investments in S&T is guided by several fundamental principles. In general, Federal R&D investments should: a) sustain and nurture America's world-leading S&T enterprise, through pursuit of specific agency missions and through stewardship of critical research fields and scientific facilities; b) strengthen science, mathematics, and engineering education, ensure their broad availability, and contribute to preparing the next generation of scientists and engineers; c) focus on activities that require a Federal presence to attain national goals, including national security, environmental quality, economic growth and prosperity, and human health and well being; and/or d) promote international cooperation in S&T that would strengthen the advance of science and achievement of Administration priorities. These principles apply to all Federal R&D investments. They are particularly vital to the success of investments made through the 21st Century Research Fund, which promotes long-term stability and near-term growth for the highest priority research programs.

President's Committee of Advisors on Science and Technology

President Clinton established the President's Committee of Advisors on Science and Technology (PCAST) to advise him on matters involving S&T and to assist the NSTC in securing private sector involvement in its activities. The PCAST, which consists of distinguished individuals from industry, education and research institutions, and other non-governmental organizations, serves as the highest level private sector advisory group for the President and the NSTC. The direct link to the activities of the NSTC reflects the Administration's intention to incorporate advice from the private sector in developing the S&T budgets and policies of this Administration and to secure private sector advice on the implementation and evaluation of budgets and policies. Appendix B describes 1999 accomplishments of the PCAST.

NATIONAL SCIENCE AND TECHNOLOGY GOALS

The NSTC, through its Committees, focuses Federal R&D activities on the President's goals for science and technology. These goals include:

Maintaining World Leadership in Science, Mathematics, and Engineering

The Administration is unequivocally committed to maintaining leadership across the frontiers of scientific knowledge. The nation's prior investment has yielded science and engineering advances without peer, promoted science and engineering education, and contributed to technological innovation. This scientific strength is a treasure on which we must continue to build. Thus, even as the deficit reduction efforts constrained Federal funding, the Administration protected and increased the level of investment in basic science programs.

Promoting long-term Economic Growth

Technical progress is the single most important factor in generating sustained economic growth, estimated to account for as much as half of the nation's long-term growth over the past 50 years. Technology underpins our fastest growing industries and high-wage jobs, provides the tools needed to compete in every business today, and drives growth in every major industrialized nation.

Sustaining a Healthy, Educated Citizenry

Improving the health of our nation's citizens continues to be a major goal of our Federal investment in S&T. Starting in 1862 with financial support for our Land Grant institutions and State Agricultural Experiment Stations, and through the establishment in 1887 of the laboratory that became the National Institutes of Health (NIH), the United States has developed a system of intra- and extramural support for health-related research. We have more recently committed ourselves to similar efforts in science, engineering, and mathematics education. The degree to which our nation prospers in the 21st century will depend on our abilities to develop scientific and technical talent in our youth, to provide lifelong learning to a well-educated workforce able to embrace the rapid pace of technological change, and to raise the level of public scientific and technological literacy.

Improving Environmental Quality

Environmental issues are enormously complex, requiring scientific understanding that is both deep and broad in order to address them. The dramatic increases in world population and industrial activities during the last century are affecting the environment in profound and potentially irreversible ways. The future of the United States rests on our ability to sustain the bounty of natural resources our environment provides. Improving environmental quality requires supporting a broad and comprehensive research agenda, including observing, documenting, understanding, assessing, and

predicting environmental change and its consequences; using natural resources in a sustainable manner; understanding and preserving biodiversity; and developing analytical tools that integrate social, economic, and natural sciences to support policy formulation and decision making that prevents or mitigates adverse effects on public health or ecological systems.

Harnessing Information Technology

No technology promises to affect our world more profoundly than the rapid sweep of digital technology. Every sector of our economy – manufacturing and services, transportation, health care, education, and government – is being transformed by the power of information technologies to create new products and services and new ways to communicate, resulting in significant improvements in productivity and knowledge sharing.

Enhancing National Security and Global Stability

National security and global stability are critical areas where international S&T collaboration and interagency coordination are needed for progress. Collaboration and coordination are needed because the issues faced cannot be solved through the efforts of a single country or a single agency. Threats to human health and safety, such as diseases and natural disasters, do not recognize national borders and require international coordination and effective application of S&T. International S&T relations have become an integral part of the overall U.S. foreign policy and play a vital role in the nonproliferation of weapons of mass destruction, arms control, meeting the challenges of global threats, and strengthening economic security.

1999 Activities of NSTC Working Groups and Committees

The diversified Federal research portfolio serves the multiplicity of missions for which our Federal departments and agencies are responsible. This distributed system of research funding provides strong linkages between research and the core agency missions, but also places a premium on coordination of agency programs. The NSTC has coordinated working groups and committees to affect key S&T issues.

Aviation Safety and Security Working Group

In April 1998 the Administration announced the Safer Skies initiative in response to recommendations of the White House Commission on Aviation Safety and Security. This initiative, developed by Federal Aviation Administration (FAA) in cooperation with the National Aeronautics and Space Administration (NASA) and industry, embraced the commission's goal of reducing the fatal aviation accident rate by a factor of five within a decade.

In December 1999, the NSTC published the *National Research and Development Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility*. This

plan describes coordinated long-term research initiatives to bring about advances in aviation that will be required in the opening decades of the next century. It is in direct response to the White House Commission on Aviation Safety and Security and was developed under the 1998 Memorandum of Understanding (MOU) by FAA, NASA, and Department of Defense (DOD). The plan defines the national civil aviation goals and shows the roles and programs Federal agencies are accomplishing to achieve the goals. The plan lays out 25-year roadmaps showing the relationship between research and operational actions to improve civil aviation. It is a visionary plan presenting cooperative government research and operational solutions in key areas that otherwise would limit our nation's ability to meet the growing demand for air transportation. It is also a baseline for government and industry to build a consensus toward an integrated aviation system of the future.

International Energy Initiative

On Sept. 14, 1999, the President directed Director of the Office of Science and Technology Policy (OSTP) to form a working group on international energy research, development, demonstration, and deployment under the NSTC. The group will help advance the Administration's goals for addressing energy-linked economic, environmental, and security challenges. The new working group will work on such issues as higher consumer costs, greater regional pollution, more pronounced climate disruption, and increasing risks to energy security. By November 1999, the NSTC held its first meeting of the working group.

Research Misconduct

A proposal to develop a common definition of research misconduct for Federally sponsored research was first developed by the Committee on Science's Research Integrity Panel in summer 1996. A policy has since been developed and after undergoing extensive revisions at all levels of the NSTC and its agencies; the proposed Federal Policy for Research Misconduct was published in the Federal Register on October 14, 1999. Interested parties have been provided with a 60-day comment period to respond to the proposed policy. The policy can be accessed at: http://www.whitehouse.gov/WH/EOP/OSTP/html/misconduct.html.

The report proposes a definition of research misconduct applicable to all research funded by the Federal government, universities and Federal facilities alike. It also provides guidelines for the conduct of fair and timely investigations. The proposed policy will be revised, as necessary, on the basis of public comment after which agencies will be directed to implement it. In 2000, an NSTC implementation working group will be established, and agencies will have up to one year to implement the new policy.

Reviewing and Renewing the Government/University Partnership

The long standing S&T partnership between the Federal government and universities aimed at advancing science and technology in the national interest, is a core element of

America's world-leading R&D enterprise. Stresses in the evolving partnership require attention. The Assistant to the President for Science and Technology initiated a review to (1) determine what might be the major stresses in the areas of research, education and administrative regulations; and (2) determine the best ways to address the issues raised in this examination. The products of the review were intended to assist in developing strategies that promote cost-effective, university-based research, allocate research costs fairly, strengthen the research-education linkage and maintain appropriate accountability for the expenditure of public funds.

The interagency task force charged with reviewing the government/university partnership produced a *Report on Renewing the Federal Government-University Research Partnership for the 21st Century*, which was released by the President in April 1999 at an East Room event honoring the Medal of Science and Medal of Technology winners. On that same day, a Presidential Memorandum was released directing the NSTC to implement the recommendations of the report. It called upon the NSTC to: issue a statement of principles based on the draft statement contained in the NSTC report and revised on the basis of public input; to develop and implement recommendations to more firmly tie government policies and practices to the integration of research and education; and, to implement a set of recommendations that will help make the partnership more effective and efficient. The NSTC has one year from the date of the release of the report to implement all these recommendations. The NSTC will also establish a standing committee to provide for continual review of the government-university research partnership.

As part of the public input process, the task force and the working group that supports it have arranged a series of regional hearings. The first such hearing was held in May 1999 in Washington, D.C. and was convened by the PCAST. Three more hearings were held in 1999, one in Atlanta in October, a second in Indianapolis in November, and third in San Francisco on December 1. Another hearing was held on January 27, 2000 in New York. Information about the hearings, the report, and background materials have been posted on the Office of Science and Technology Policy web site at: http://www.whitehouse.gov/WH/EOP/OSTP/html/rand/index.htm.

The interagency task force and associated working group will continue to act upon implementation of the report recommendations in 2000.

COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES

The purpose of the Committee on Environment and Natural Resources (CENR) is to foster and implement a coordinated multi-agency and interdisciplinary focus for Federal environmental R&D. CENR pursues the goals of maintaining biological diversity, protecting and improving air and water quality, reducing exposure to toxic substances, limiting losses from natural disasters, understanding climate change, and providing for sustainable use and management of natural resources. CENR accomplishes its goals largely through the work of its five Subcommittees – Global Change Research, Ecological Systems, Natural Disaster Reduction, Toxics and Risk, and Air Quality Research.

Global Change Research

The Subcommittee on Global Change Research (SGCR) coordinates the work of the U.S. Global Change Research Program (USGCRP). The USGCRP began as a Presidential Initiative, and the Global Change Research Act of 1990 codified the program.

The USGCRP seeks to increase understanding of the multiple issues presented by climatic and other changes in the Earth system and thus provide a sound scientific basis for national and international decision-making on global change issues. USGCRP program elements include research designed to increase understanding of the climate system (climate variability and change on all time scales), atmospheric interactions, key global cycles (carbon, water, and nitrogen), ecosystem impacts, and the human dimensions of global change.

In 1999, the USGCRP agencies strengthened coordination of research efforts and took steps to address issues of the adequacy of climate observing systems and of the capacity of U.S. climate modeling that were raised by National Research Council (NRC) reports commissioned by the USGCRP. A greatly improved predictive understanding of the climate system across time scales is being advanced through an unprecedented combination of modeling, observations, and process studies conducted within a coordinated international scientific framework. A major new USGCRP Carbon Cycle Science initiative is underway, and the research community has prepared a comprehensive U.S. Carbon Cycle Science Plan at the request of the USGCRP.

In 1999, the USGCRP also developed a draft Long Term Research Plan setting out goals, objectives, and key scientific research challenges and management perspectives for the program. The draft plan draws on the framework of key research challenges identified in a major NRC study commissioned by the USGCRP on global environmental change research pathways for the next decade. The web site for USGCRP is: http://www.usgcrp.gov/.

Progress continues on the U.S. National Assessment of the Potential Consequences of Climate Variability and Change. A National Assessment Synthesis Team, chartered

under the Federal Advisory Committee Act, provides leadership and oversight of the assessment process, and will author the National Assessment Synthesis Report. The team includes Federal agency, academic, and private sector participants. The report will define regional and sectoral vulnerabilities to climate change and will identify research and information needs for future assessments. More than 40 summary reports, technical reports, and journal articles and four books are currently planned to result from the assessment, including about 15 regional assessments and assessments of the water resources, human health, agriculture, forests, and coastal and marine sectors.

During FY 2000, strong support for basic global change research across the broad scope of the Earth system sciences will be maintained, with a continued emphasis on interdisciplinary collaborations and participation in international scientific projects and the globally-coordinated research efforts proceeding under the auspices of the International Geosphere-Biosphere Program, the World Climate Research Program, and the International Human Dimensions of Global Change Program.

Ecological Systems

The Subcommittee on Ecological Systems is working to build an improved foundation for conservation and sustainable use and management of ecological systems. An understanding of the relationships between environmental stresses and changes in ecosystem structure and function is essential to this effort and to meet societal needs in agriculture, forestry, fisheries, recreation, medicine, and quality of life. The focus of the subcommittee is to coordinate research efforts to document change, synthesize and assess information, understand processes and the effect of scale, predict change, and provide for management and restoration.

In 1999, the subcommittee continued to lead the development of a CENR-wide research initiative known as Integrated Science for Ecosystem Challenges (ISEC) to address environmental stresses to ecosystems with new technologies and approaches to ecological research. The Subcommittee developed an ISEC Implementation Plan for FY 2000 based upon the coordinated budget requests of eight Federal agencies. The FY 2000 plan focuses on four critical areas: (1) invasive species, biodiversity, and species decline; (2) harmful algal blooms, hypoxia, and eutrophication; (3) habitat conservation and ecosystem productivity; and (4) information management, monitoring and integrated assessment.

The subcommittee also held a workshop in 1999 to refine a long-term ISEC strategy. Topics identified for focus over the long term include social science, environmental monitoring and assessment, non-native invasive species and other introduced threats, ecological restoration, biological information, species discovery, landscapes and watersheds, hypoxia and harmful algal blooms, refugia science, extreme environmental events, and coral reef ecosystems.

The subcommittee's associated task teams also conducted significant activities in 1999. The Hypoxia Task Team continued to work on its assessment activities for

hypoxia science, documenting the state of knowledge of the extent, characteristics, causes, and effects (both ecological and economic) of hypoxia in the northern Gulf of Mexico. The team compiled existing information on nutrient sources, identified alternatives for reducing nutrient inputs, and examined the costs and benefits associated with reducing the nutrient loads to surface waters. The team wrote six interrelated technical reports examining key aspects of Gulf hypoxia and released the reports for public comment. A draft Integrated Assessment that draws upon these reports submitted for public review and is expected to be finalized in early 2000.

The Biodiversity and Ecosystem Informatics Task Team organized two major events to communicate the research agenda for bioinformatics (as developed in ISEC and by the PCAST) to the broader, non-Federal community. A national workshop on "metadiversity" addressed issues of biodiversity information networks, data standards, and linkages between the biological sciences and information sciences. A symposium at the 1999 AAAS annual meeting featured ISEC, PCAST, and the development of the "next generation" National Biological Information Infrastructure.

The Invasive Species Task Team developed a research strategy to support and accompany the implementation of the new Executive Order 13112 on Invasive Species (February 3, 1999). The team is also assisting in the identification of research needs and opportunities associated with a National Invasive Species Management Plan.

Natural Disaster Reduction

The Subcommittee on Natural Disaster Reduction (SNDR) is working to reduce the cost of natural disasters to the U.S. economy through support of a multidisciplinary, multi-agency research, application, and technology transfer program. Key aspects of this program include focusing R&D and emergency preparedness efforts on improving future risk assessment and risk management capabilities and improving analytical, modeling, forecasting, prevention, restoration, and information dissemination tools.

In 1999, SNDR sponsored the first two in a new series of interagency research reviews. The purpose of these reviews is to bring Federal researchers, managers, and policy-makers together to review the state-of-knowledge in specific areas related to SNDR activities, discuss ongoing research programs and management needs, and make recommendations for improved coordination and changes in research focus. The first review, organized by the National Institute of Standards and Technology and the Forest Service, focused on “Fire in Natural and Built Environments.” It brought together researchers and managers from the science, natural resource and defense agencies to discuss knowledge needs for fire management and protection in the wild land-urban interface and ways to better coordinate research on structural and wild land fires. The second review, organized by NASA and the National Oceanic and Atmospheric Administration (NOAA), focused on “Remote Sensing Applications for Risk and Vulnerability Assessment.”

The SNDR and the Institute for Business and Home Safety established the Public Private Partnership 2000 (PPP 2000) in 1998 to seek opportunities for government and nonprofit, private-sector organizations to work together to reduce vulnerability to natural hazards in U.S. communities. PPP 2000 held a series of forums to foster novel partnerships among government and private sector organizations to address natural disaster reduction issues, which was completed in 1999. Reports from the PPP 2000 Forums have contributed to the U.S. National Report to the United Nations (UN) for the close of the International Decade for National Disaster Reduction. Summary reports from the partnership can be found on the Internet at: http://www.usgs.gov/ppp2000/index.html.

SNDR's Working Group on Natural Disaster Information Systems produced the draft report *Effective Disaster Warnings*, which evaluates and recommends ways to integrate public and private resources with infrastructure. This ensures that the most accurate and timely technical information regarding natural disasters is instantly available to everyone who can take action to save lives, reduce damage, and speed response and recovery. The working group completed the report in spring 1999.

SNDR played a major role in the UN international meeting that took place in Geneva in July 1999. SNDR will continue to work with agencies across the Federal government to improve coordination of loss reduction activities, especially in the areas of real-time monitoring and warning systems. SNDR will also continue to encourage emerging public-private partnerships to develop an interoperable disaster information and warning system. The web site for SNDR is: http://www.usgs.gov/sndr/

Toxics and Risk

The Subcommittee on Toxics and Risks coordinates research on existing and emerging issues related to toxic substances and their effects on human and ecological health. The Subcommittee sponsors the development of multi-agency research strategies, state-of-knowledge assessments on toxic substance effects, and new initiatives to address important issues that cut across agency programs and interests.

The subcommittee's IWG on Endocrine Disruptors continues to lead national and international efforts to define the scope of the endocrine disruptor problem, identify areas of scientific uncertainty, and conduct research. In 1999, the group's focus centered on two main activities: coordination of a multi-agency research solicitation in the form of a Request for Applications (RFA); and discussion and outreach on the international level to develop research partnerships with other governments.

The IWG decided to pursue international activities by offering to develop joint research solicitations between U.S. funding agencies and the European Union (EU). The RFA effort was particularly successful in strengthening the portfolio of studies examining effects in wildlife populations exposed to endocrine disrupting chemicals, but additional efforts will be needed to encourage researchers to submit proposals to determine the nature and extent of effects in humans. Efforts are underway between National Institute

of Occupational Safety and Health and Environmental Protection Agency (EPA) to construct a FY 2000 RFA to address this need. It is hoped that other agencies will eventually join as partners for this effort, too.

The Endocrine Disruptor IWG also evaluated the NRC report entitled *Hormonally Active Agents in the Environment*, which was released in August 1999. The consensus of the IWG was that the report did not raise additional issues or present research recommendations that required an update of the U.S. Federal framework for research developed by the IWG in 1996, nor did it require revising the recommended research priorities identified in 1998.

The IWG on Mercury, established in late 1997, is helping to resolve scientific issues related to the assessment of human health effects of mercury, especially methylmercury. The results of a workshop that evaluated the strengths and weaknesses of the current studies on developmental effects in children exposed *in utero* via maternal consumption of fish and marine mammal meat, *Scientific Issues Relevant to Assessment of Health Effects from Exposure to Methylmercury*, was issued in June 1999. The report should help harmonize health guidance levels used by the three U.S. agencies (Agency for Toxic Substances and Disease Registry, the Food and Drug Administration, and EPA) and the World Health Organization.

In FY 2000, the subcommittee is considering a new IWG on Human Exposure. The near-term focus will be to delineate the highest priority areas for providing more reliable exposure data for assessment of actions to reduce or prevent injurious exposures to the U.S. population.

Air Quality Research

The Air Quality Research Subcommittee (AQRS) supports an array of research activities aimed at improving our understanding of atmospheric processes and the effect of human activities on the atmosphere. The overall aim of the AQRS is to enhance the effectiveness and productivity of U.S. air quality research to provide a better scientific basis for decision-making to improve air quality.

In 1999, the members of the AQRS prepared an inventory of research activities, current programs, and plans in each of its five focus areas (ozone, particulate matter, acid rain, air toxics, and indoor air quality) as an informal publication, *Federal Air Quality Research 1998-2000*. This document is an important resource for creating and maintaining a balanced, collaborative research program to address the information needs of sound policy formulation.

The subcommittee held a series of meetings with representatives of Federal agencies engaged in health-related particulate matter (PM) research to explore the establishment of a PM Research Working Group that would integrate health effects and atmospheric science research. A decision to establish this new working group was finalized in November 1999.

The subcommittee also fostered successful interagency cooperation on mercury. The AQRS provided a forum in which EPA and the U.S. Geological Survey (USGS) were able to better coordinate research strategies, including field research in the areas of fish surveys and watershed manipulation studies. The USGS – EPA collaboration also led to an integration of monitoring data from the state-supported Mercury Deposition Network of the National Atmospheric Deposition Program into agency research plans.

In 1999, the National Acid Precipitation Assessment Program issued its biennial report to Congress on the effectiveness of the first two years of the SO_2 and NOx reduction programs required by Title IV of the Clean Air Act. The findings of the assessment were that the Acid Rain Program achieved significant emission reductions at a much lower cost than was originally estimated.

Also in 1999, the AQRS published a report on the Nation's air quality monitoring networks entitled, *The Role of Monitoring Networks in the Management of the Nation's Air Quality*. The subcommittee is working to preserve and enhance these networks through better, less-costly designs; the promotion of improved data accessibility; and leveraged investments through the deployment of multi-purpose monitors.

Program Guide to Federally Funded Environment and Natural Resources R&D

In 1999, the CENR released the fourth edition of the *Program Guide to Federally Funded Environment and Natural Resources R&D*. This document serves as a reference for colleges, universities, and other research institutions. The program guide describes the competitive processes for merit review and evaluation, describes potential funding sources, and provides points of contact and web site information for all extramural agency funding programs.

COMMITTEE ON INTERNATIONAL SCIENCE, ENGINEERING, AND TECHNOLOGY

The Committee on International Science, Engineering and Technology (CISET) addresses international scientific cooperation as it relates to foreign policy and the nation's research and development agenda. CISET's mandate is not defined within any particular area of science and technology. Rather, CISET's role is to review the wide range of bilateral and multilateral international scientific programs carried out by the technical agencies in the U.S. government, and to identify opportunities for international cooperation and interagency coordination in response to new needs and opportunities. CISET's activities are directed towards three broad, complementary goals:

- to identify and coordinate international cooperation that can strengthen the domestic S&T enterprise and promote U.S. economic competitiveness and national security;
- to utilize American leadership in science and technology to address global issues, and to support the post-Cold War tenets of U.S. foreign policy – promoting democracy, maintaining peace, and fostering economic growth and sustainable development; and
- to coordinate the international aspects of Federal R&D funding across the Federal agencies.

CISET continued to support the following five ongoing working groups during 1999: the Emerging Infectious Diseases Task Force; the IWG on Japan; the IWG on China; the IWG on Russia; IWG on India; and the IWG on the Organization for Economic Cooperation and Development (OECD). Accomplishments of each of the working groups are described below.

This year also saw the implementation of the U.S.-EU S&T agreement and a public event to bring together U.S.- and EU-government officials responsible for funding research; and an ad hoc IWG on Egypt was established to reinvigorate the Technology Subcommittee of the Gore-Mubarak Commission with Egypt; and an ad hoc IWG on India was established to consider possibilities for expanded collaboration as well as the imposition of sanctions.

In the Fall of 1999, Dr. Neal Lane and Under Secretary of State for Global Affairs, Frank Loy, chaired a meeting of CISET principals to review accomplishments to date and to set directions for the future. In addition to the ongoing work of CISET, principals discussed emerging interagency concerns and directed CISET to assess the potential contributions that it might make to issues that included 1) partnerships with the State Department to better support issues related to science, technology, and international affairs; 2) the ecology of infectious diseases; 3) intellectual property protection in international S&T agreements; 4) global information systems and international disaster mitigation; 5) science and technology in international capacity building; and 6) strengthening public understanding of the value of international engagement in science and technology.

Emerging Infectious Disease Task Force

The goal of the Emerging Infectious Disease (EID) Task Force is to coordinate U.S. government activities on emerging infectious diseases, and to implement Presidential Decision Directive PDD/NSTC-7. The EID Task Force, in cooperation with the private sector and public health and medical communities, works to strengthen the domestic infectious disease surveillance and response system, both at the Federal, State and local levels and at ports of entry into the United States. Task force members have increased budgets for surveillance, response, research and outreach. The Center for Disease Control has expanded its Epidemiology and Laboratory Capacity (ELC) program to over 40 states and six major cities and counties. ELC accomplishments include a new electronic network to track deadly strains of E. coli and other infectious agents. In response to the increasing problem of antibiotic resistance, a special IWG on Antimicrobial Resistance is developing a national action plan, to be released in early 2000. The EID Task Force seeks to expand disease surveillance and response network onto the global scale. It strengthened the nation's research activities in the fields of diagnostics, treatment and prevention, and has expanded the nation's understanding of the biology of infectious disease agents. Additional information can be found at: http://www.state.gov/www/global/oes/health/task_force/

Internationally, the task force helped place EIDs on the agenda of the G-8 Summit in Cologne, the Asian Pacific Economic Cooperation Leaders Summit in New Zealand, and other major multi-national fora. To follow up on G-8 commitments to reduce the death rate from malaria and tuberculosis, task force members achieved significant budget increases for disease prevention, control and research.

Interagency Working Group on Japan

The purpose of the IWG on Japan is to develop a coordinated strategy that maximizes the value of science and technology cooperation, strengthens our relations in trade and security, and builds upon our contributions to international issues of common concern. Issues assessed by the IWG include the identification of priority areas of cooperative activity, support for Administration priorities and bilateral agreements in S&T, such as the Joint High Level Committee on S&T and the U.S.-Japan Common Agenda, and support for the re-negotiation/renewal of the umbrella S&T agreement.

In addition to overseeing the execution of collaborative activities described in the U.S.-Japan S&T cooperation strategy document developed in 1998, the IWG on Japan focused on two issues in 1999. The first was the negotiation of the renewal of the umbrella science and technology agreement. This 5-year agreement expired in June 1998 and was extended into the middle of 1999 to complete the negotiation over its renewal. Key issues in renewal included amending the approach to intellectual property protection and extending the scope of the agreement to recognize the broad links between our science and technology cooperation and other aspects of the bilateral relationship, including trade.

A second priority of this IWG was support for a bilateral advisory study of S&T in our societies as both nations look to the new millennium. As a result of the summit meeting between President Clinton and Prime Minister Obuchi, the leaders directed that both nations collaborate on an assessment of where S&T would most impact society, and on identifying the areas of greatest mutual opportunity or concern. The IWG is working with a group of non-governmental advisors to conduct this study, which will be delivered back to the leaders in the summer of 2000.

Interagency Working Group on China

The IWG on China seeks to develop and articulate a strategy for S&T cooperation with China, and to coordinate U.S. Government cooperation across the technical agencies. The goals are to:

- promote bilateral cooperation for mutual scientific and technological benefit;
- develop new market opportunities for U.S. firms; and
- support the Administration's goals of engagement with China, particularly in the area of energy, environment, water, and sustainable development.

The IWG on China continues to develop U.S. strategy for S&T cooperation with China, and supports the Joint Commission on Scientific and Technological Exchange, the Forum on Sustainable Development, and the Clean Energy and Environment Initiative, as well as other activities.

The IWG on China supported the development of U.S. positions in support of the Environment and Development Forum, which was chaired in April of 1999 by Vice President Al Gore and Premier Zhu Rongi. This was the second meeting of this forum, the goal of which is to strengthen the bilateral dialogue on issues that are key to sustainable economic development in both nations. The forum is divided into four working groups: energy, environment, commercial relations, and science for sustainability, with the CISET China IWG primarily supporting the latter.

Issues advanced in the discussions of the working group on science for sustainability include agricultural science and policy, food security, water resources, natural disasters, global environment and other research areas of critical importance to national goals.

In conjunction with the Environment and Development Forum, the working group supported the development of a U.S.-China Water Workshop that was held in Tuscon, Arizona in April 1999. The goal of this workshop was to discuss issues of common interest regarding water management and to identify areas of mutually beneficial collaboration. One of the initial outcomes of this meeting was agreement to conduct a number of workshops in the United States on aspects of water management such as water-saving irrigation, flood detention and flood insurance, river basin management, wastewater treatment and seawater desalinization, green chemistry and pollution prevention, and water investment policy.

The IWG on China also supported preparations for the third meeting of the forum January 2000. In addition to the issues continuing from the second forum, new issues are expected to include the first formal discussion of climate change science, land use management, community-level sustainable development and livability, and China's participation in the Global Disaster Information Network.

CISET also assisted in developing U.S. positions for the meeting of the Joint Commission on Science and Technology in January 2000. Some of the key issues expected for discussion include agricultural science and technology, health research and the treatment of biological data and samples, S&T information and the importance of electronic databases and the Internet, and disaster mitigation related to oceanic, climatic, and earthquake science.

Interagency Working Group on Russia

The IWG on Russia seeks to develop and articulate a strategy for science and technology cooperation with Russia, and to coordinate U.S. Government cooperation across the technical agencies in order to:

- promote bilateral cooperation for mutual scientific and technological benefit;
- reduce barriers to scientific cooperation; and
- support the Administration's strategic goals of non-proliferation and sustainable development.

The working group continues to develop a cohesive U.S. strategy for S&T cooperation with Russia and supports the U.S.-Russia Commission on Economic and Technological Cooperation.

The U.S.-Russia Commission on Economic and Technological Cooperation has been the driving force behind the IWG on Russia this year. The General Problems Working Group/ has been re-established under the Science and Technology Committee and will hold a working-level meeting in Moscow in early 2000 to discuss problems related to customs, taxes and intellectual property rights. The IWG finalized a MOU between Russia and the USGS on observational seismology, and one on cooperation between the Department of Energy (DOE) and the Russian Academy of Sciences. The IWG also established two new areas of cooperation – biochip technology and infectious diseases – and will hold workshops in those fields in Moscow in the spring.

The IWG also expanded cooperation with the Russians in telecommunications. The new Moscow supercomputing center was officially established in September under the auspices of the U.S.-Russia Commission, and National Science Foundation (NSF) helped Russia establish a direct Internet link between scientists in the U.S. and Russia.

Interagency Working Group on Organization for Economic Cooperation and Development

The IWG on the OECD works to develop and articulate a strategy for science and technology cooperation with OECD, and to coordinate U.S. Government cooperation across the technical agencies. Goals include:

- promoting ongoing streamlining and priority-setting acitivities that encourage activities and working mechanisms to support U.S. science and technology interests;
- developing a new program and approach for engaging OECD member states in S&T at the beginning of the 21st century; and
- supporting the Administration's interest in fostering new mechanisms for international cooperation through participation in the OECD Megascience Forum.

CISET supported the development of the U.S. positions for the Science and Technology Minister's Meeting of the OECD. This ministerial, which was held in June 1999, reviewed the breadth of cooperative opportunities undertaken under this multilateral forum and endorsed several new initiatives. These new initiatives included the establishment of a Global Biodiversity Information Facility, the transition of the Megascience Forum to the World Science Forum, and the mediation of radio frequency spectrum allocation concerns arising between radiofrequency astronomy and communications satellites.

COMMITTEE ON NATIONAL SECURITY

The Committee on National Security (CNS) is chartered to facilitate coordination of Federal efforts in R&D in areas of national security. The committee identifies relevant priorities, programs and plans across Federal agencies with a view toward advising the NSTC about the vigor and appropriateness of Federal investments in R&D that underpin a sound national security posture. Committee activities facilitate coordination and integration of national security science and technology programs, increased operational collaboration among Federal agencies, and the identification of national security science and technology priorities. As appropriate, the committee identifies gaps and overlaps in programs with an emphasis on improving investment selections and coordination. Strengths and successes are identified with a view toward optimizing performance, increasing collaboration, leveraging investments and employing economies of scale.

The committee supported three working groups during 1999: the Nonproliferation and Arms Control Technology Working Group (NPAC TWG), the International Technology Transfer Issues and Policy Working Group, and the Critical Infrastructure Protection Research and Development Interagency Working Group.

Nonproliferation and Arms Control Technology Working Group

Since its formation in 1994 as the result of a Presidential Decision Directive, the NPAC TWG has evolved into a highly credible and respected vehicle for coordinating a key element of our national security science and technology strategy. The NPAC TWG is composed of 13, inter-agency, subject-specific focus groups and a Technology Needs Subcommittee. Throughout the year, approximately 100 R&D program managers representing 60 organizations conduct numerous program reviews in their respective focus groups. The NPAC TWG reports to the President through both the CNS and the National Security Council. The NPAC TWG is chartered to: exchange information and coordinate NPAC R&D; review NPAC R&D programs, identifying gaps and unnecessary overlaps; advise agencies on NPAC R&D priorities; frame interagency issues and differences for decisions by adjudicating bodies; and make recommendations to the CNS on the coordination of all nonproliferation and arms control-related R&D programs in the President's annual budget.

During 1999, the NPAC TWG coordinated nearly 300 R&D programs and projects representing approximately $700 million in Federal investment. The key thrust in NPAC TWG 1999 activities was to promote a shared interagency understanding of the evolving dynamics of effective R&D coordination in an era of constrained resources and expanding needs for national security technologies. In particular, the Spectral Sensing and Chemical Warfare Focus Groups were rejuvenated. These groups will assist in interagency coordination and encourage additional R&D activities in these important and topical areas.

In 2000, the NPAC TWG will build on the results and strengthened relationships of 1999 to continue formalizing the processes for identifying and validating needs and translating them into adjudicable technology options for existing IWGs and agency resource managers. The NPAC TWG will consider approaches that include a forum for agencies to review R&D issues developed by the NPAC TWG Technology Needs Subcommittee and present scenarios that support their missions where technology may be needed. Such a forum could help task the NPAC TWG focus groups to propose programmatic options for resolving technology-needs issues, establish possible system requirements and applicable technologies, and develop notional investment strategies and mechanisms to pursue responsive R&D programs. The NPAC TWG expects to continue its integration of R&D more fully into the budget process by highlighting successful interagency approaches for assigning resources to national needs, encouraging stable and supportive leadership in the R&D community, and ensuring existing and planned efforts have coordinated policy-level justification. Additional information can be found at: http://www.dtic.mil/npac/

International Technology Transfer Working Group

The International Technology Transfer Working Group was established in December 1996 to identify ways to improve national policy procedures governing international technology interactions and execution mechanisms for technology transfer and control.

In 1999, the International Technology Transfer Working Group continued to focus on the study of specific cases. Following CNS direction, the group examined policies and procedures for managing international technology transfer at the Federal laboratories and to identify best practices through a comparison of laboratory approaches. The assessment initially focused on international participation in R&D partnerships and licensing and included both domestic programs and international agreements. The working group examined management processes for assessing international participation, criteria used in such assessments, and approaches to evaluating key issues, such as reciprocity of access, partner country intellectual property protection, and export control review. As a result of the review, the group recommended that an executive order be drafted to guide policy in the area of Federal laboratory technology transfer. With the concurrence of CNS, the group has begun drafting the executive order. In addition, in the area of Federal laboratory international technology transfer the group is:

- developing key parameters for agency checklists for technology transfer;
- developing clearer guidance on agency responsibilities regarding export controls, intellectual property rights, and reciprocity;
- developing criteria that would trigger an interagency review; and
- defining procedures for an interagency review.

The group has continued to study other areas and cases in order to codify lessons learned and to establish best practice recommendations for the Federal sector. Specifically, the group is examining the internationalization of SEMATECH, export control issues associated with rocket motor hot section components and technology, and M109 howitzer technology transfer.

For 2000 the International Technology Transfer Working Group plans to complete a draft of an Executive Order on Federal laboratory international technology transfer and provide it to the CNS for comment and concurrence. The group expects to complete the examination of all ongoing case studies and provide individual case-study reports to the CNS with specific delineation of best practices identified, weaknesses exposed, and recommendations for future action and process.

Critical Infrastructure Protection Research and Development Interagency Working Group

The Critical Infrastructure Protection (CIP) Research and Development Interagency Working Group is the newest CNS working group. The purpose of the IWG is to satisfy the needs of the Federal government for protecting critical infrastructures through coordination of multi-department, multi-agency R&D in CIP technologies and the acceleration of development and deployment of advanced CIP technologies.

The IWG undertook several tasks in order to fulfill its mission, including:

- comparing infrastructure protection R&D needs to current R&D programs and identifying gaps;
- identifying programs to meet needs, including the augmentation of existing programs when deemed necessary;
- prioritizing, sequencing, and recommending specific R&D programs to address critical needs;
- determining funding needed to execute the overall R&D program; and
- identifying Federal investment levels for ongoing critical infrastructure protection R&D.

The IWG organized its activities into seven subgroups, the first five of which correspond to critical infrastructure sectors:

- banking and finance,
- information and communications,
- energy,
- vital human services,
- transportation,
- interdependencies, and
- partnership/outreach.

During 1999, the group developed the Federal CIP R&D Agenda for FY2001. The working group first refined its baseline of ongoing critical infrastructure protection and related R&D programs for FY1999 and FY2000. Using inputs from government, industry, and academia, the working group developed a comprehensive list of vulnerabilities and R&D shortfalls. The programs in the FY2001 R&D agenda directly address known vulnerabilities and technology shortfalls. The working group sought and incorporated comments on the agenda from industry and academia to ensure that the agenda complemented and did not duplicate ongoing private sector or university

programs. The working group also helped plan workshops on intrusion detection, malicious computer code detection, the insider threat, and infrastructure interdependencies.

In 2000, the working group will continue its outreach to the private sector and academia; update the R&D agenda for FY2002 to reflect the evolution of technology, threats, and vulnerabilities; review and monitor ongoing technology programs and issues; and coordinate with the PCAST security panel. The working group will continue with its series of workshops with the private sector and academia to refine further the Federal government's critical infrastructure protection R&D agenda.

COMMITTEE ON SCIENCE

The purpose of the Committee on Science (CS) is to advise and assist the NSTC, with emphasis on those Federally supported efforts that develop new knowledge in the sciences, mathematics, and engineering, whatever its application. The CS addresses significant national policy matters that cut across agency boundaries and provides a formal mechanism for interagency science policy development, coordination, and information exchange.

Aquaculture

The CS Subcommittee on Aquaculture serves as a Federal interagency coordinating group to increase the overall effectiveness and productivity of Federal aquaculture research, technology transfer, and assistance programs. Information regarding the subcommittee, activities undertaken by it and output generated as a result of interagency coordination can be accessed at: http://ag.ansc.purdue.edu/aquanic/jsa/index.htm.

The subcommittee is in the final stages of revising the National Aquaculture Development Plan, which identifies high priority Federal government actions necessary to support a sustainable, internationally competitive U.S. aquaculture industry in the next 3-5 years, and to lay out a realistic, achievable strategy for undertaking these actions. The subcommittee expects to release the final version of this revised plan during 2000.

In 1999, the subcommittee completed development of an interagency strategy to address exotic shrimp virus issues in wild and farm-raised shrimp. Reports discussing peer review and risk management of non-indigenous pathogenic shrimp viruses have been released and a workshop on risk management of shrimp viruses was held. A report from this workshop will be released in early 2000.

The subcommittee recently established the "Aquaculture Effluents Study Task Force" to provide a national forum to address issues associated with effluents and diverse aquaculture facilities in the U.S. The task force will prepare an expert peer-reviewed report with contributions by different technical subgroups for use by government agencies, trade associations, academia, non-government organizations and the public. The task force will meet in February 2000.

The publication *Guide to Federal Aquaculture Programs and Services* was updated and published in electronic format as an informational resource on aquaculture programs and services within the Federal government. The document can be accessed directly at: http://ag.ansc.purdue.edu/aquanic/jsa/federal_guide/index.htm

In 2000, in addition to those activities described above, the subcommittee expects to: complete revision of the publication "Guide to Drug, Vaccine and Pesticide Use in Aquaculture"; form an Aquatic Animal Health Task Force to address issues pertaining to aquatic animal health policies, regulations and services; and organize and convene a

Special Session at the national Aquaculture America 2000 conference to highlight subcommittee activities and Federal programs related to aquaculture.

Biotechnology

The CS Subcommittee on Biotechnology addresses research opportunities in aspects of biotechnology, resources and infrastructure needed for biotechnology research, and international aspects of biotechnology.

Under the leadership of the *Bioremediation Task Group,* a subgroup of the Subcommittee on Biotechnology, three interagency competitions focussing upon the bioavailability of chemicals for bioremediation processes in complex situations under field situations have been held in the last four years, resulting in interagency investments of over $12M. A second awardee conference is scheduled for early 2000, to continue assessment of the contributions enabled by these investments. The task group is currently planning a new interagency competition focussing upon the use of plants in bioremediation.

The subcommittee's *Metabolic Engineering Task Group* held the third annual workshop on metabolic engineering. Metabolic engineering is defined as the targeted and purposeful alteration of metabolic pathways found in an organism in order to better understand and utilize cellular pathways for chemical transformation, energy transduction, and supramolecular assembly. In 1999, the second interagency competition on "Opportunities in Metabolic Engineering" was held. The seven agencies participating in the competition will invest approximately $3M in awardee research projects. In addition, the National Institutes of Health ran a parallel funding effort.

The subcommittee's *Microbial Genomics Task Group* recently completed a draft of the *Interagency Report on the Federal Investment in Microbial Genomics*. It is expected that this report will be released in 2000. The report indicates that although past research investments have focussed on sequencing the genomes of human pathogens and on microbes related to energy production or environmental cleanup, major gaps in knowledge of microbes that make up much of the biosphere remain. The report notes that in microbial genomics, there are many emerging areas in which agencies can work together to build a knowledge base for new applications.

The subcommittee's *Marine Biotechnology Task Group* was recently established and a 5-year work plan developed. The work plan highlights interagency communication and coordination of ongoing efforts, and indicates intent to explore research topics for possible joint funding activities.

In 1999, the subcommittee issued a report entitled, *Bioinformatics in the 21st Century*. The report indicates that achievements in biology and medicine in the 21st century will require a substantial investment in bioinformatics; that bioinformatics projects must be driven by user needs; that alternative funding and review mechanisms are needed for support of bioinformatics infrastructure and enabling technologies; and that mechanisms

are needed for interfacing funding agencies with professional societies to help set priorities for supporting bioinformatics research and infrastructure. Three broad areas worthy of support were identified: basic research into bioinformatics and its applications; bioinformatics infrastructure (e.g. databases) and other user resources; and education and training in bioinformatics. The report can be viewed at: http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/bioinformaticsreport.html.

Human Subjects Research

The Human Subjects Research Subcommittee coordinates the implementation of the "Federal Policy for the Protection of Human Subjects", otherwise known as the Common Rule.

In 1999, the subcommittee continued its efforts to coordinate implementation of the President's memorandum dated March 27, 1997, concerning strengthened protection for human subjects involved in classified research. The subcommittee completed an Interim Final Rule in 1999, and is pursuing agency clearances for this document.

The subcommittee has continued to work closely with the National Bioethics Advisory Commission (NBAC) in 1999. In response to the NBAC Report, *Research Involving Persons with Mental Disorders that May Affect Decisionmaking Capacity* (http://bioethics.gov/capacity/TOC.htm), the subcommittee is currently developing a set of core principles common to member agencies, and will formulate a set of possible policy options. In addition, the subcommittee will continue to provide assistance to NBAC in its review of Federal agency implementation of the Common Rule.

In June 1999, in collaboration with the DOE, the subcommittee sponsored a two-day symposium on "Workers as Research Subjects: A Vulnerable Population".

Plant Genomes

The goal of the CS IWG on Plant Genomes is to develop a comprehensive Federal effort aimed at expanding our knowledge of plant genomes, specifically focussing upon those plants which contribute significantly to the nation's agricultural sector. In early 1998, the working group published a 6-goal strategy designed to enable the National Plant Genome Initiative (NPGI). The NPGI can be viewed at: http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/npgireport.html.

Working group efforts in 1998 and 1999 have resulted in progress toward realizing the goals discussed in this document. The working group published a progress report on the NPGI in 1999.

The NPGI has supported the sequencing of the genomes of model organisms. *Arabidopsis thaliana*, a small mustard-like plant, will be the first flowering plant genome to be completely sequenced. It is expected that the *Arabidopsis* genome will be completely sequenced by the end of the year 2000. The working group has also

participated in an international effort to fully sequence the rice genome. Since most grasses have common sets of genes, what is learned from the study of the rice genome will be immediately applicable to other grasses such as barley, corn, sorghum, sugarcane and wheat. Conservative estimates indicate that the rice sequence will be complete by 2008, however rapid advances in sequencing technologies may in fact enable complete sequencing of the rice genome by 2004.

As a result of working group coordination, biological research resources have been developed to enable the elucidation of the structure and organization of complex plant genomes. Collaborative structural genomics research projects have provided the research community with genetic maps, physical maps, expressed sequence tags, DNA clone libraries and mutant populations with specific genes tagged for many widely grown plants such as barley, corn, cotton and rice. These resources have changed the way individual laboratories conduct research, allowing them to pursue biology-based research in a cost-efficient manner.

Functional genomics activities will become the increasing focus of working group activities in the future. Functional genomics activities target genes important to plant production and productivity, such as those coding for disease and stress resistance, seed development, grain-quality traits, carbon allocation, flowering time, biomass production and synthesis of valuable fuels and chemicals.

Technologies and methods specifically designed to advance plant genomics are also being developed as a result of the NPGI. The working group will continue to encourage the community to develop new technologies and methods to push the frontier of plant genomics further.

All sequence data from the NPGI are deposited rapidly in GenBank, the international repository for sequence data, and in turn, are made widely available to the scientific research community. In 2000 and beyond, the NPGI will support community-driven development of standardized nomenclature, the development of minimum common principles for database design, and the development of software tools designed to facilitate query across multiple databases.

In 2000, it is anticipated that working group member agencies will continue to encourage, participate in and actively support education and training activities relevant to plant genome activities, at the undergraduate, graduate and postdoctoral fellow level, as well as public outreach activities.

Food Safety Research

The CS IWG on Food Safety Research was founded to conduct an in-depth review of Federal research related to microbiological aspects of food safety as well as research investments in food-associated toxins and antibiotic resistance. During the 1990s, the safety of the food supply for the American people has become an increasingly visible public health issue and a national priority for the Federal government.

The IWG on Food Safety Research recently completed its review and in July 1999, published a report entitled *Federal Food Safety Research: Current Programs and Future Priorities*. The report can be viewed at: http://www.whitehouse.gov/WH/EOP/OSTP/html/foodsafe.html.

The Joint Institute for Food Safety Research created under the auspices of the President's Council on Food Safety will use this report as a basis upon which to coordinate food safety research among U.S. Department of Agriculture, Department of Health and Human Services, EPA and other Federal agencies.

Its work done, the IWG on Food Safety Research was discharged in late 1999.

The Children's Initiative

The CS IWG on the Children's Initiative was established to address recommendations articulated in a 1997 report entitled *Investing In Our Future: A National Research Initiative for America's Children for the 21st Century*. This report described recommendations to advance research opportunities on children and adolescents and to develop mechanisms to enhance linkages between research and policy and between government entities, researchers, private organizations and communities. The working group is particularly focussed on developing multi-agency priorities aimed at understanding relationships between children's health and behavior, to determine how serious and chronic health problems that emerge later in life can be better prevented.

In 1999, the working group has focussed on developing a comprehensive, interdisciplinary research portfolio focussed on policy research in child health behaviors. This effort is aimed at furthering the science base and its connection to policymaking, on how positive and negative behaviors develop with respect to the physical and mental health of children and youth.

The U.S. Science and Technology Workforce of the Future

The IWG on the U.S. Science and Technology Workforce of the Future seeks to define and recommend the future Federal role in developing the U.S. S&T workforce of the future. The goal of the working group is to ensure that the workforce in the next century represents the best science and technology talent available, with special emphasis placed on developing effective legal approaches to increase the participation of women and underrepresented groups in the science and technology workforce. The working group has considered the effect of demographic and socioeconomic changes on workforce development; the potential contributions that could be lost when elements of the population do not participate fully in the S&T enterprise; and the current policies and programs of Federal agencies that might influence participation rates, particularly of women and minorities.

In 1999, the working group released the proceedings of a 1998 workshop on the "U.S. Science, Engineering and Technology Workforce of the Future: National Strategy, National Portfolio, National Resource Base." The working group will release a new report in 2000 entitled *Ensuring the 21st Century U.S. Scientific, Technical and Engineering Workforce* which discusses important human resource development strategies that will help prepare a 21st century workforce equipped to meet the demands of an increasingly technological society.

COMMITTEE ON TECHNOLOGY

The Committee on Technology (CT) was created in 1998 to advise and assist the NSTC to increase the overall effectiveness and productivity of Federal R&D efforts. The Committee addresses significant national policy matters that cut across agency boundaries and provides a formal mechanism for interagency policy coordination and development of Federal technology activities. This includes developing balanced and comprehensive R&D programs, establishing structures that improve the way the Federal government plans and coordinates R&D, and advising the OSTP and OMB Directors on R&D budget crosscuts and priorities.

National Summit on Innovation

On November 30 and December 1, 1999, the NSTC CT in association with several key national stakeholder organizations convened over 230 public- and private-sector leaders at the George Washington University for the *Summit on Innovation: Federal Policy for the New Millennium*. The findings of the Summit will instruct the NSTC on developing and implementing a Federal role for the next millennium that creates opportunities, not barriers, within our National Innovation System. C-SPAN covered the morning keynote addresses by PCAST co-chair John Young, Council of Economic Advisors Chairman Martin Baily, and Procter & Gamble's CTO, Gordon Brunner.

The national and international business-leaders, policy makers, and technical experts in attendance generated many useful recommendations concerning issues affecting innovation, including globalization; capital markets; trade policy; priority setting in support of R&D; talent pool for innovation; and using the Internet to foster innovation. The NSTC will draw on these suggestions to develop a short-term, non-budgetary innovation policy action, suitable for announcement early in 2000. The NSTC will also develop a longer range "agenda for action" that could provide the framework for a more broadly defined innovation initiative that the President could announce in September 2000.

Partnership for a New Generation of Vehicles

On September 29, 1993, the Federal government and the U.S. automobile industry forged an unprecedented alliance under the leadership of President Clinton and Vice President Gore. The partnership includes seven Federal agencies, 19 Federal laboratories, and more than 300 automotive suppliers and universities and the United States Council for Automotive Research, the pre-competitive research arm of DaimlerChrysler, Ford, and General Motors.

The Partnership for a New Generation of Vehicles (PNGV) supports research and development of technologies to achieve the program's three research goals: 1) to significantly improve national competitiveness in automotive manufacturing by upgrading manufacturing technology; 2) to apply commercially viable innovations resulting from ongoing research to conventional vehicles, especially technologies that

improve fuel efficiency and reduce emissions; and 3) to develop advanced technologies for mid-sized vehicles that deliver up to triple the fuel efficiency of today's cars (equivalent to 80 miles per gallon), without sacrificing affordability, performance, or safety. The research plan is peer-reviewed annually by the National Research Council.

During the past six years, PNGV has made extraordinary progress towards achieving its aggressive technical goals. In 1999, PNGV continued its robust research and development work and moved closer to achieving its second key milestone: the unveiling of 2000 Concept Cars. Selecting from the technologies developed under this historic partnership, each of the U.S. automakers – DaimlerChrysler, Ford and General Motors – is developing a unique concept car. The PNGV research program will achieve its final milestone in 2004 as the participating automakers complete the development of pre-production prototype cars.

Information Technology

In 1999, the NSTC coordinated the Federal government's information technology (IT) R&D investments through the Computing, Information, and Communications (CIC) R&D programs.

CIC R&D work was organized into five areas: High End Computing and Computation (HECC); Large Scale Networking (LSN); High Confidence Systems (HCS); Human Centered Systems (HuCS); and Education, Training, and Human Resources (ETHR), plus the Federal Information Services and Applications Council (FISAC).

Accomplishments of the CIC R&D programs in 1999 are described in *Information Technology Frontiers for a New Millennium*, a Supplement to the President's FY 2000 Budget (http://www.ccic.gov/pubs/blue99/). Additionally, the NSTC sponsored the following CIC-related events during 1999:

- PetaFLOPS II Conference, February 1999
- Global Observation Information Network Workshop, March 1999
- Large Scale Networking Workshop, June 1999
- "Bridging the Gap," a High Performance Networking Applications Team/Networking Research Team Workshop, August 1999
- IEEE/ACM SC99 CIC R&D Research Exhibit and Information Technology/Next Generation Internet Demonstrations, November 1999

Next Generation Internet

The multi-agency Next Generation Internet (NGI) initiative is a key component of the CIC R&D's LSN research. The initiative, which entered its third year in October 1999, is developing advanced networking technologies and revolutionary applications and demonstrating these capabilities on testbeds that are 100 to 1,000 times faster end-to-end than today's Internet.

In 1999, more than 300 organizations in the Internet research and product development community adopted, developed, and released the National Institute of Standards and Technology Quality of Service (QOS) testing tools. In addition, Defense Advanced Research Projects Agency (DARPA) contributed R&D in multi-gigabit broadband access technologies, assured service mechanisms, integrated network management, and QOS to the NGI. At IEEE/ACM SC99, a national high performance networking and computing conference held in November 1999, ten NGI demonstrations were exhibited as part of the CIC R&D research exhibit.

Several agencies granted NGI awards in FY1999. Networking research testbeds and applications where funded by DARPA and NSF, including 150 awards for high performance connections to vBNS and other high performance networking testbeds made through NSF's Connections Program. During 1999, Federal agencies completed deployment of multicasting in the backbone links of the 100x testbed. Other agencies, such as NASA and NIH, concentrated their funding in research for advanced applications.

President's Information Technology Advisory Committee

The President's Information Technology Advisory Committee (PITAC) was established via Executive Order 13035 in February 1997 to provide the NSTC with guidance and advice on all areas of high performance computing, communications, and information technologies. A February 1999 amendment to Executive Order 13035 extended the PITAC's term to February 2001.

In February 1999, the PITAC issued a landmark report, *Information Technology Research: Investing in Our Future,* which proposed a bold agenda for ensuring America's leadership in the Information Age by expanding government investments in long-term R&D for IT. The PITAC highlighted the critical role that Federal research has played in developing modern computing, the Internet, and other Information Age technologies. Citing inadequate levels of current R&D investments by both government and industry, the PITAC argued for sharply increased support for basic research, giving highest priority to research on computer software. They also stressed the importance of social and economic research on the impacts of information technology to inform key policy decisions.

The PITAC report's recommendation to double the Federal IT R&D budget over a period of five years was the basis for the Administration's FY2000 budget initiative known as IT^2 (Information Technology for the Twenty-First Century). The recommendation also spurred complementary congressional proposals for increased Federal IT R&D investments, including the Networking and Information Technology Research and Development (NITRD) Act. These proposals were instrumental in gaining increased FY2000 appropriations of more than $230 million for several CIC R&D agencies, including the NSF and the Department of Defense.

The PITAC was very active in gaining congressional support for the proposed new investments. PITAC co-chair Ken Kennedy testified before the U.S. House of Representatives Committee on Science, Subcommittee on Basic Research on March 16, 1999, outlining the findings of the PITAC report. On June 29, 1999, the PITAC sent a letter to The Honorable F. James Sensenbrenner, Jr. enthusiastically supporting his draft NITRD legislation. In another letter to Congress dated September 1, 1999, the PITAC expressed its concern over pending budget cuts in IT R&D and urged the Congress to ensure full funding for proposed increases in information technology R&D.

In accordance with the Next Generation Internet Research Act of 1998, the PITAC conducted a review of the NGI program and transmitted their findings to the President and the Congress on April 28, 1999. The PITAC recommended continued funding at the proposed level, and endorsed funding and implementation of follow-on activities proposed as part of the Administration's IT^2 initiative. In preparation for its FY2000 review of the NGI Program, due to the Congress in April 2000, the NGI Review Subcommittee met with representatives of the six NGI agencies in October 1999 for a briefing on the status of the agencies' NGI programs.

The PITAC also reviewed the Administration's proposed IT^2 initiative and its Implementation Plan. The PITAC found that the research agenda and agencies' plans proposed for the IT^2 initiative responded directly to the findings and recommendations of the PITAC as stated in their February report. Consequently they expressed their strong support for the initiative in a letter sent to the President on September 8, 1999.

On October 19, 1999, the Joint Center for Political and Economic Studies in association with the PITAC and the Woodrow Wilson International Center for Scholars co-sponsored "Resolving the Digital Divide: Information, Access, and Opportunity." This was a public policy forum to develop a national action plan to ensure that all Americans have access to information technology and the Internet.

The PITAC held a panel discussion on November 16, 1999, at the IEEE/ACM SC99 Conference. Five PITAC members discussed their report, Congressional reaction to it, and future plans for the committee.

Information Technology for the Twenty-First Century (IT^2) Initiative

During his June 1998 commencement address at the Massachusetts Institute of Technology, the President asked Dr. Neal Lane, his Assistant for Science and Technology, to prepare a detailed plan on computing and communications research. Dr. Lane drew upon CIC R&D expertise to establish an NSTC interagency working group that was charged with carrying out the President's request, drawing heavily on findings outlined in the PITAC's interim report, released in August 1998.

The resulting budget proposal, a new $366 million, multi-agency initiative known as Information Technology for the Twenty-First Century, or IT^2, was announced by the Vice President in January 1999. The first publication outlining the objectives of the initiative,

Information Technology for the Twenty-First Century: A Bold Investment in America's Future, was published on January 24, 1999 as a working draft. IT^2 extended the existing CIC R&D programs, with special emphasis on increased support for fundamental computing research. The subsequent release of the final PITAC report in February 1999 underscored the importance of the initiative as a vital first step in increasing support for long-term information technology R&D.

On May 19, 1999, an IT^2 Expo was held in Washington, DC. IT^2 demonstrations were presented by the proposed participating agencies — DARPA, DOE, NASA, NIST, NOAA, and NSF—to members of Congress and their staff.

The IT^2 Working Group worked closely with the Subcommittee on CIC R&D and the PITAC during FY1999 to develop its implementation plans and build congressional support. The Subcommittee met jointly with the IT^2 Working Group throughout 1999 to assure a smooth transition to integrated coordination of all multi-agency IT programs in FY2000. Integration of the management structures of the CIC R&D and IT^2 programs was completed in November 1999. Beginning in 2000, all CIC R&D and IT^2 activities will be coordinated through a separate Interagency Working Group for Information Technology R&D which has emerged from the combined management structures. The IWG will report directly to the Assistant to the President for Science and Technology and a special group of NSTC agency principals. In 2000, the IWG will continue programmatic objectives established under CIC R&D and IT^2, while seeking a second year of increased Federal investment for the interagency IT R&D programs, as recommended by the PITAC.

Construction and Building

The Subcommittee on Construction and Building (C&B) supported two important Administration initiatives in 1999: the Partnership for Advancing Technologies in Housing (PATH) and the Partnership for Advancing Infrastructure and its Renewal. C&B also achieved a number of objectives, including streamlining the building regulatory system, benchmarking the National Construction Goals, initiating a forum on building mechanical and electrical systems and supporting a project on the relationship between the building environment and worker productivity and health. Accomplishments for the C&B are described in *Construction and Building - Interagency Program for Technical Advancement in Construction and Building* (http://www.bfrl.nist.gov/860/c_b/pubs/NSTC_99_Report.pdf).

The $10 million public-private Partnership for Advancing Technologies in Housing (PATH) is managed by HUD. PATH has 10 Federal agency partners. Private sector partners include homebuilders, developers, remodelers, product manufacturers, code organizations, financial institutions, academic institutions, realtors and produce retailers. PATH goals are to lower construction costs; reduce energy use and environmental impact; improve durability; reduce loss of life, injury, and property destruction from natural hazards; and reduce construction illness and injury. In 1999, PATH established a web site that described more than 150 technologies. Research programs on durability and

home fire safety have been started, and a NSF housing research program has been announced. A government/industry cooperative R&D program has been initiated. Five National Pilot community projects and 10 demonstration developments are underway.

The concept of a Partnership for Advancing Infrastructure and its Renewal has been well received by the Construction Industry Round Table. The Subcommittee is seeking wider support by industry. It will continue to support these efforts and focus on buildings other than residential, recalculating Federal construction R&D and establishing better contacts with the private sector.

Materials Technology

The Materials Technology Subcommittee (MatTec) promotes interagency communication and cooperation through working and communication groups with interests in metals, ceramics, non-destructive evaluation, composites, electronic materials, and environmental issues. The non-destructive evaluation and structural ceramics groups met in 1999 to exchange information on Federal research in these areas. A planning group to assess opportunities in the field of environmentally benign materials organized workshops to identify needs and opportunities in this field and initiated development of a strategic plan for research. The importance of unique National facilities to materials research has prompted a similar review of issues pertinent to materials research and development.

The ability to develop and implement new technologies as well as the ability to implement improvements to current technologies is dependent upon the availability of appropriate materials. A 1999 MatTec survey of Federal programs found that all Federal agencies and departments were supporting materials science and engineering R&D, estimating a total Federal investment of $1.7 billion for FY 1998. The myriad of programs support applications that range from defense systems to medical care and range from fundamental studies to development of materials with improved or unique properties. These R&D programs are conducted in academic institutions, industry, and government laboratories, often in a collaboration mode.

Transportation Research and Development

The purpose of the Transportation R&D Subcommittee is to conduct strategic planning for Federal transportation R&D in order to bring innovation to the transportation sector, ensuring that the United States has fast, safe, secure, efficient, accessible and global transport of people, goods and freight to meet its vital economic and security interests and to enhance the quality of life of the American people. Innovation is essential in achieving these near- and long-term transportation goals. The Transportation R&D Subcommittee seeks to achieve its goals through a peer-reviewed, government-wide strategic planning and management process.

In FY 1999, the subcommittee released the following four documents: *Transportation Technology Plan*, December 1998; *National Transportation S&T Strategy*, May 1999; *Transportation Strategic Research Plan*, May 1999; and *Public/Private Partnerships: Implications for Innovation in Transportation*, January 1999. These documents aim to focus Federal R&D on national transportation goals; forge technology-based private-public partnerships to achieve the goals; foster strategic Federal transportation research; and, accelerate the process of moving technology into the marketplace.

The subcommittee has also moved forward aggressively to implement the public-private partnerships identified in the strategy through the NSTC Transportation Technology Plan and extensive outreach. These partnerships include Federal, state, local and tribal governments, academia, industry, state departments of transportation, transportation users and operators and others representing the diverse constituencies in the transportation community and aim to address the nation's transportation challenges of the 21st century, such as improving transportation safety and security while reducing vehicle energy consumption and environmental emissions.

In addition, the subcommittee published focused assessments and planning documents, including: *Total Terminal Security: Intermodal Cargo Transportation Industry Best Security Practices*, May 1999; *Surface Transportation R&D Assessment*, June 1999; *National Research Agenda for Transportation and Sustainable Communities*, September 1999; and *Comparison of International Transportation R&D Expenditures and Priorities*, September 1999. These documents have influenced the Federal and national transportation R&D agenda. The Total Terminal Security document, for example, has already been distributed by the National Cargo Security Council to the entire cargo industry to improve security across the nation.

The subcommittee sponsored a NRC and Transportation Research Board Workshop on Enabling Research with government, industry and academia. Opportunities for long-term research were identified in areas such as human centered transportation system research, advanced materials/nanotechnology; computing, information and communications systems, and energy, propulsion and environmental engineering. It also sponsored a government-university-industry procurement workshop with the Civil Engineering Research Foundation to identify ways to eliminate the barriers to innovation in the transportation infrastructure sector and to accelerate the process of moving new technologies, concepts and ideas into the market place faster and more affordably through procurement reform.

The subcommittee was also active internationally, supporting the implementation of the "Initial 5 -Year Plan for Increased Cooperation in the Field of North America Transportation Technology," which was signed by the United States, Canada and Mexico in June 1998. In FY1999, efforts focused on developing a NAFTA webpage and implementing "A Guiding Principles for Dedicated Short Range Communications" that will harmonize North American electronic toll collection and vehicle-to-highway communications, enhancing safety, security and mobility.

The subcommittee sponsored a NRC/Transportation Research Board Committee on the Federal Transportation R&D Strategic Planning Process that conducted a peer review of two of the public-private partnerships in the National Transportation S&T Strategy -- Next Generation of Transportation Vehicles and Monitoring, Maintenance and Rapid Renewal of Physical Infrastructure. The review identified ways to forge closer public-private cooperation on U.S. medium and heavy-duty vehicles R&D (e.g., trucks, buses) and to bring innovation to the transportation infrastructure sector.

Additional information concerning these activities can be obtained by accessing the new National Transportation Science and Technology Homepage at: http://scitech.dot.gov.

The Homepage also provides an online capability for those individuals or organizations that wish to participate in the transportation R&D strategic planning process.

Nano Science, Engineering, and Technology

The Interagency Working Group on Nano Science, Engineering and Technology (IWGN) was established on September 23, 1998. Its goals have been to develop a vision for Federal support of nano science, engineering and technology and to identify challenges and provide a framework for establishing Federal R&D priorities and budget guidance. The participating agencies are DOC, DOD, DOE, DOT, NASA, NIH and NSF. The main 1999 activities included: prioritizing R&D themes, planning for a balanced R&D infrastructure, developing a recommendation for FY 2001 budget, and proposing an investment strategy.

The IWGN's most significant accomplishment has been the development of a five-year National Nanotechnology Initiative (NNI), incorporating input from industry, academe and government representatives. This new funding program identifies major research priorities, outstanding needs for infrastructure and education and training, and an interagency collaborative plan. Funding for FY 2001 is presented around six themes: fundamental research, grand challenges, centers of excellence, research infrastructure, education and training, and SBIR/STTR.

In 1999, the IWGN published four reports:

- *National Nanotechnology Initiative*, an internal report submitted to PCAST Nanotechnology Panel in August 1999 for review and guidance;
- *Nanostructure Science and Technology*, a report of worldwide status and research trends published in August 1999 (http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/iwgn/IWGN.Worldwide.Study/toc.htm);
- *IWGN Workshop Report: Nanotechnology Research Directions*, a report published in October 1999 that addresses with input from 150 leading nanotechnology experts representing academic, private sector and government communities how the greater S&T community can begin to work together on nanotechnology R&D activities with

a CD-ROM that contains the latter three reports in color (http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/iwgn/IWGN.Research.Directions/toc.htmand);

- *Nanotechnology - Shaping the World Atom by Atom*, a color brochure for the public published in September 1999. (http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/iwgn/IWGN.Public.Brochure/welcome.htm).

In addition, fifteen other supporting publications and proceedings were prepared by different agencies on specific topics such as modeling, self-assembling, macromolecules, several technology issues such as synthesis, processing, and nano fabrication, as well as several areas of relevance such as energy, space, and biomedicine, biotech, chemicals.

On May 12, 1999, the IWGN coordinated a Congressional hearing called by the Senate Subcommittee on Science, Technology, and Space, on Emerging Technologies of the Third Millennium. On June 22, 1999, IWGN assisted with preparation of a second hearing hosted by the House Subcommittee on Basic Research of the Committee on Science.

The IWGN expects to complete the following objectives in year 2000: preparation of an interagency management plan for the NNI that would include research priorities, collaborative activities, and an external evaluation plan; promotion of greater interaction with industry and relevant trade associations; continuation of outreach to the science and technology communities; and preparation of a public relation plan.

APPENDICES

Appendix A - FY 2001 Interagency Research and Development Priorities (Lane/Lew Memorandum)

The President is a strong supporter of science and technology investments. He has consistently proposed growth in high priority research and development (R&D) budgets – all the while emphasizing the importance of a balanced portfolio of Federal investments. Through the National Science and Technology Council (NSTC), the President has also encouraged the Federal agencies and departments to identify a set of R&D areas that are important national efforts requiring coordinated investments across several agencies. These interagency priority areas reflect our objectives of maintaining excellence, maximizing effectiveness, and minimizing costs.

This (Lane/Lew) memorandum serves three primary purposes. First, it reiterates the investment principles that apply to all Federal R&D programs, especially those programs in the 21st Century Research Fund. Second, it identifies a set of activities that require a significant level of interagency coordination and on which our offices will focus for the FY 2001 budget cycle. Finally, it describes the R&D performance measures and accountability standards departments and agencies will be expected to observe.

You and your staff have assisted us in the preparation of this memorandum. We anticipate that you will give these Administration priorities full consideration in development of your FY 2001 budget requests. Staff-level coordination will continue throughout this Spring and Summer, and these issues will be on the table during department and agency budget hearings this Fall. We expect that the NSTC will convene in September to review the S&T investment portfolio and help ensure the strongest possible R&D budget proposal for FY 2001.

Investment Principles

The Administration's approach to investments in science and technology is guided by several fundamental principles. In general, Federal R&D investments should: a) sustain and nurture America's world-leading science and technology enterprise, through pursuit of specific agency missions and through stewardship of critical research fields and scientific facilities; b) strengthen science, mathematics, and engineering education, ensure their broad availability, and contribute to preparing the next generation of scientists and engineers; c) focus on activities that require a Federal presence to attain national goals, including national security, environmental quality, economic growth and prosperity, and human health and well being; and/or d) promote international cooperation in S&T that would strengthen the advance of science and achievement of Administration priorities. These principles apply to all Federal R&D investments. They are particularly vital to the success of investments made through the 21st Century Research Fund, which provides long-term stability and near-term growth for the highest priority research programs.

More specifically, in making investment decisions on Federal R&D, the Administration will:

- Favor investments that focus on long-term, potentially high-payoff activities and outcomes that would not occur without Federal support, such as activities in the 21st Century Research Fund.
- Ensure that the government-wide portfolio of R&D investments establishes a desirable balance among fields of science.
- Maximize the efficiency and effectiveness of Federal R&D investments, for example by:
  - Favoring activities that employ competitive, peer-reviewed processes.
  - Encouraging collaboration among agencies, industry, academia, and the states when such efforts further the goals of the research.
  - Encouraging strategic collaboration with key international counterparts that will address fundamental science priorities as well as global energy, environment, security, and health challenges.
  - Improving, phasing down, or eliminating programs that are not resulting in substantial benefits or are not important to an agency's mission.
- Encourage agencies to fund program proposals within FY 2001 budget guidance, rather than requesting additional funding, in keeping with the Administration's continuing effort to maintain a balanced Federal budget. The Administration encourages agencies to fund new, high-priority activities by substituting them for lower-priority or recently completed activities. Funding above guidance levels will require a compelling rationale that the activity is important, that the agency is the best one to conduct the activity, and that funds from lower priority or recently completed programs cannot be substituted within the agency's guidance.

Interagency Priorities for Research and Development Budgets

Among the high-priority Federal investments in science and technology, NSTC coordinates a small number of selected interagency science and technology investment priorities. During preparation for FY 2001, NSTC expects to focus on 11 activities listed below. The more mature, congressionally mandated programs (the U.S. Global Change Research Program and Information Technology R&D) are managed as formal interagency crosscuts (defined below). Management of the other nine priority programs listed below includes three requirements that, as the programs mature, may be phased in by NSTC working groups that have developed the programs: 1) a clear and concise definition of program activities and priorities; 2) an inventory of the programs in the baseline budget; and 3) an implementation plan.

Departments and agencies involved in this set of NSTC activities will participate in working groups that integrate development and planning of programs, including full exchange of budget information. OMB and OSTP staff will participate in the working groups as appropriate. In the Fall, OSTP will attend agency-specific OMB budget hearings related to R&D, during which OMB and OSTP staff may engage each agency in a discussion of the listed interagency programs as appropriate.

This is not a comprehensive list of all Administration S&T priorities, e.g., it does not include priorities that fall within the purview of a single agency. The NSTC also is actively involved in a number of interagency R&D issues that, unlike the issues described below, do not require near-term Administration policy or budget decisions. Some of these issues may emerge as priorities for FY 2001 over the next few months. One such area we wish to highlight is research on asthma and other types of research related to children's environmental health. The Administration may also reorder some of our existing priorities to accommodate new needs. We will keep you informed of developments as they occur.

NSTC FY 2001 Priorities

The following are NSTC priority programs for FY 2001. Agency budget requests in any of these areas should be within guidance.

1) Information Technology R&D: By August 1999, integrate the Information Technology for the Twenty-first Century (IT^2) initiative, High Performance Computing and Communications (HPCC) (including the Next Generation Internet initiative, and both formal and informal program components), and elements of the Energy Department's Accelerated Strategic Computing Initiative into a single cross-cut. The integrated program will stimulate information technology innovations -- including digital government, tele-health, universal access, crisis management, real-time environmental monitoring using networked sensors, the development of a "Digital Earth," and advanced manufacturing -- and serve a broad range of scientific and engineering needs. Agencies must justify investment levels based on commitments made in 1999 interagency planning documents, such the IT^2 and HPCC implementation plans. The NSTC should engage the President's Information Technology Advisory Committee to conduct an external assessment of the integrated IT^2 and HPCC program plan by September 1999.

2) U.S. Global Change Research Program (USGCRP): By August 1, 1999, complete a long-term research plan that will serve as the basis for the FY2001 budget and will take into account the redefinition of USGCRP programs. The USGCRP will implement the carbon cycle initiative begun in FY 2000 and will examine and sharpen the focus of climate observing and modeling programs.

3) Climate Change Technology Initiative: Promote and coordinate research aimed at technologies capable of achieving reductions in U.S. carbon emissions at the lowest possible cost. Technologies include products and production methods that reduce greenhouse gas emissions and increase the efficiency of energy and materials used in transportation, buildings, and manufacturing while lowering the cost and improving the quality of the goods and services delivered and technologies which provide cost-effective renewable alternatives to fossil fuels. These include technologies managed under the Partnership for a New Generation of Vehicles, the Partnership for Advancing Technology in Housing, and technologies that use biological materials as

substitutes for fossil-fuel feedstocks and which substitute bioprocessing techniques for conventional chemical processes, and agroforestry technologies that will help to sequester carbon.

4) Emerging Infectious Diseases (EID): Enter the next phase in the interagency effort to address emerging infectious diseases, pursuant to PDD/NSTC-7. Program priorities include Hepatitis C, antimicrobial resistance, emerging viral infections**,** pandemic influenza, and the effort to address global emerging infectious disease challenges. Activities will address technologies and methodologies for surveillance and response, factors associated with emergence and reemergence, research, training, and capacity building. Agency budget requests should be based on the EID Task Force plan for this phase, which will be completed by July 1, 1999.

5) Protecting Against 21st Century Threats: Promote and coordinate research to reduce vulnerabilities in our nation's critical infrastructures; promote the research and development of technologies that will detect, contain, and mitigate attacks against or other failures in these infrastructures. Agency budget requests in critical infrastructure protection R&D should be based on PDD-63 and the specific recommendations of the Critical Infrastructure Protection R&D Interagency Working Group, which will be drafted by May 1999. Promote and coordinate research to enhance our ability to detect, respond to, and heal the effects of possible terrorist attacks using chemical, biological, radiological, and related weapons. Program priorities should include improving our medical response capabilities, developing detection, protection, and decontamination technologies, and conducting modeling and simulation efforts. Agency budget requests in weapons of mass destruction prevention (WMDP) R&D should be based on PDD-62 and the specific recommendations of the WMDP R&D Interagency Subgroup, which will be drafted by May 1999.

6) Aviation Safety, Security, Efficiency, and Environmental Technologies: Support research and development aimed at (a) reducing the aviation fatal accident rate by eighty percent by 2007; (b) strengthening the security of our aviation system; (c) continuously improving our national airspace system and airports to increase their capacity and efficiency of operations; and (d) fostering the environmental compatibility of our aviation system. These activities encompass the recommendations of the White House Commission on Aviation Safety and Security.

7) Plant Genome: Promote the coordinated development of plant genomic information, new technologies, and resources that will improve our understanding of plant biology and be applied to the enhancement of economically important plants. Agency budget requests should be based on existing coordinated interagency plans that address the program priorities contained in the 1998 NSTC report, *National Plant Genome Initiative*. In addition, by August 31, 1999, agencies will be expected to provide plans to OSTP on engaging the private sector and international partners.

8) Food Safety: Promote food safety research that provides a scientific foundation for sound food safety policy and regulation, innovations in food production to increase safety, consumer education to improve food safety practices, and global monitoring (surveillance) and response to outbreaks of food-borne illnesses. Agency budget requests should be based on the inventory of current research activities and interagency priorities established by the NSTC Interagency Working Group on Food Safety Research and the Joint Institute for Food Safety Research. The inventory and priorities list will be finalized by July 30, 1999. Specifically, priorities must reflect the President's Food Safety Initiative and be based on an assessment of the existing research portfolio. Agencies are expected to provide to OSTP and OMB a coordinated budget plan prior to or simultaneous with agency budget submissions to OMB.

9) Integrated Science for Ecosystem Challenges: Develop the knowledge base, information infrastructure, and modeling framework to help resource managers predict/assess environmental and economic impacts of stress on vulnerable ecosystems, with particular focus on invasive species, water and air pollution, changes in weather and climate, and land and resource use. Agency budget requests should be based on an implementation plan, to be completed no later than August 1999, by the NSTC's Ecological System Subcommittee. The implementation plan will reflect priorities recommended by the President's Committee of Advisors on Science and Technology (PCAST) and the NRC and will emphasize the importance of fundamental research on which all priority areas depend.

10) Education Research Initiative: Support research to strengthen understanding of the learning process and to apply that understanding to the development and evaluation -- particularly through large scale, long-term, and experimental studies -- of educational systems, technologies, and other approaches aimed at improving educational and training outcomes. Agency budget requests should reflect a coordinated, five-year interagency plan, prepared by the Interagency Education Research Initiative. The plan will be completed by July 30, 1999, and address previously-identified priorities, including recommendations contained in the report from the PCAST on the *Use of Technology to Strengthen K-12 Education in the United States.*

11) Nanotechnology: Promote and coordinate a long-term nanoscale R&D agenda that could lead to the following potential applications: nanoparticles for improved drug delivery, miniature sensors for earlier detection of ovarian cancer, computer chips capable of storing trillions of bits of information on a pin-head, advanced materials that are much stronger than steel, and artificial photosynthesis for clean energy. The NSTC Committee on Technology Nanotechnology Interagency Working Group will be establishing R&D priorities and the Agency budget requests for FY 2001 in a coordinated interagency plan that will be presented to the Committee on Technology in June 1999. This interagency plan will be reviewed by experts in nanotechnology who represent industry and academia, as well as the Federal agencies.

Formal NSTC Crosscuts

The FY 2001 budget includes two formal NSTC interagency R&D crosscuts: Information Technology R&D and USGCRP. OMB's Circular A-11, a revised version of which will be available in the early summer 1999, outlines the definitions of these crosscuts and how agencies must submit data to OMB.

To promote more uniform management and accounting, each crosscut must include the following:

1. Concise program performance goals and measures, finalized in time to be sent to OMB as part of the FY 2001 Budget submission. Goals and measures should be quantitative if possible, but may be qualitative where appropriate.

2. A program implementation plan for the FY 2001 budget outlining specific agency activities and budgets, and the linkages between them. Agency activities contributing to the crosscut should be tied clearly to overall crosscut goals and performance measures. Agency budget information should include estimates for FY 2000-2005. Funding for the crosscut activities should be within OMB budget guidance. Activities whose funding cannot be accommodated with the budget guidance should be clearly delineated. Agencies should provide such information in a timely fashion if they plan to participate in the interagency program; late submittals may not be accepted. Implementation plans should be finalized no later than September 1999.

3. Written assurance, incorporated in the crosscut implementation plan, by each participating agency that all agencies involved in the crosscut have reviewed each others' projects, and that these projects directly contribute to the goals and objectives of the crosscut and are well coordinated.

4. Budget hearing with OSTP and OMB staff in September 1999.

5. Supplement to the President's budget, to be released to the public no later than end of March 2000.

This schedule emphasizes the requirement for agencies to coordinate and share information on development of the FY 2001 budget as part of each interagency program.

R&D Performance Measures

We encourage agencies to include the following R&D goals and measures in their agency performance plans. The Government Wide Performance Plan that accompanied the President's FY 2000 budget included similar measures for Function 250 activities.

Federally funded research will be of the highest quality.

- We encourage each agency to establish a goal for the percent (by amount of funds) of its research project portfolio that will be allocated through a merit-based competitive process. The goal should reflect a thoughtful balance between those mission driven research programs that are managed by other processes, and research for which the merit-based competitive process is most appropriate. (In the President's FY 2000 budget, the goal is 80 percent or greater for Function 250 activities).

- We encourage agencies to ensure that independent assessments of their research programs evaluate both the quality and the progress of the agencies' research toward stated goals. The goal will be to achieve a "satisfactory" rating from such assessments, consistent with the format provided in the Government Performance and Results Act. Existing advisory committees, groups within the National Academy of Sciences, or other outside groups could conduct the assessment.

Major scientific facilities will be built and operated efficiently.

- As established by law in the Federal Acquisition Streamlining Act, agencies will keep the development and upgrade of facilities on schedule and within budget, not to exceed 110 percent of estimates. In operating R&D user facilities, agencies will establish a goal for unscheduled down time as a percent of total scheduled possible operating time. (In the President's FY 2000 budget, the goal is less than 10 percent unscheduled down time.)

Appendix B - Activities of the President's Committee of Advisors on Science and Technology

President Clinton established the PCAST to advise the President on matters involving S&T and to assist the NSTC in securing private sector involvement in its activities. PCAST, composed of distinguished individuals form industry, education, and research institutions, and other non-governmental organizations, serves as the high-level private sector advisory group for the President and the NSTC. In 1999 PCAST issued the following report:

Powerful Partnerships: The Federal Role in International Cooperation on Energy Innovation (June 1999)

It is in our fundamental national interest to greatly strengthen international cooperation in energy innovation. The PCAST concluded that continuing our current energy trajectory would be "problem plagued and potentially disastrous." Unless innovation to increase energy end-use efficiency and to improve energy supply technologies is both rapid and global, world energy demand is likely to soar in the next century to four times today's level, entailing higher consumer costs for energy, greater oil import dependence, worse local and regional air pollution, more pronounced climate disruption from greenhouse gases, and bigger nuclear energy risks than today. And if the United States abdicates leadership in international cooperation on energy technology while others forge ahead, it will cost U.S. firms dearly in their share of the multi-hundred-billion-dollar –per-year global market in energy-supply technologies, most of which is and will remain overseas. As the world heads into the next millennium, however, there is a window of opportunity – open now, but closing fast – to move the world off this troublesome path. The choices the United States makes today will influence the evolution of the global energy system for many decades to come. The United States has strong stakes in the future economic, national security, and environmental course of world energy development.

PCAST also advised the President on the following topics:

Establishment of a Laboratory for National Information Infrastructure Protection. (December 98)

Review of Proposed National Nanotechnology Initiative (November 99)

Review of the NSB Report on Environmental Science and Engineering for the 21st Century (December 99)

Letter to the President regarding FY2001 Budget Priorities (December 99)

Review of the Proposed National Nanotechnology Initiative (December 99)

Appendix C – NSTC Reports

- *Bioinformatics in the 21st Century* (January 99)
- *Research Involving Persons with Mental Disorders That May Affect Decisionmaking Capacity* (March 99)
- *The Role of Monitoring Networks in the Management of the Nation's Air Quality* (March 99)
- *The Role of Monitoring Networks in the Management of the Nation's Air Quality* (March 99)
- *Renewing the Federal Government-University Research Partnership for the 21st Century* (April 99)
- *Transportation Strategic Research Plan* (May 99)
- *Transportation Science and Technology Strategy* (May 99)
- *National Transportation Science and Technology Strategy* (May 99)
- *Program Guide to Federally Funded Environment and Natural Resources R&D* (May 99)
- *Our Changing Planet* (June 99)
- *Improving Federal Laboratories to Meet the Challenges of the 21st Century (*July 99*)*
- *Federal Food Safety Research: Current Programs and Future Priorities* (July 99)
- *Nanostructure Science and Technology, A Worldwide Study* (August 99)
- *Comparison of International Transportation R&D Expenditures and Priorities* (September 99)
- *Accessibility for Aging and Transportation-Disadvantaged Populations* (September 99)
- *Nanotechnology Research Directions: IWGN Workshop Report* (September 99)
- *Nanotechnology: Shaping the World Atom by Atom* (September 99)
- *National R&D Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility* (November 99)

NSTC Publications and Testimony Web page:
http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/nstc_pubs.html