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Science and Technology Policy: Issues for the 109th Congress

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Summary

Science and technology have a pervasive influence over a wide range of issues confronting the nation. Decisions on how much federal funding to invest in research and development (R&D), and determining what programs have the highest priority, for example, may have implications for homeland security, new high technology industries, government/private sector cooperation in R&D, and myriad other areas.

This report indicates the sweep of science and technology in many public policy issues, although it cannot provide a comprehensive examination of every science or technology issue which may be of interest to Congress. In some areas, such as global climate change and stem cell research, the importance of science and technology is explicit and in the forefront of the policy debate. In others, such as patent protection and telecommunications reform, science and technology may not be as explicit, but are important drivers affecting how policy makers may make decisions. This report also addresses key issues that directly affect, or are affected by, science and technology. Other mechanisms which may indirectly impact science and technology — such as tax, antitrust, and trade policies — are outside the scope of this report.

The appropriate level of federal funding for research and development (R&D) is among the issues facing Congress. One consequence of President Bush's objective of constraining the growth of discretionary spending is that funding for federal R&D would increase only slightly in the FY2006 budget. If adjusted for inflation, it would decline for the first time since FY1996. Federal R&D funding spurs technological advancement, which contributes to economic growth, and plays a role in the education of future scientists and engineers. Members of congressional committees that oversee R&D have expressed concern about the possible repercussions of restraining R&D funding.

Science and technology also are important components of homeland security issues. Not only is Congress debating funding levels for R&D for counterterrorism, but issues concerning public access to scientific information, and technological and privacy aspects of "data mining" (a potential means to identity terrorist activities and track individual terrorists themselves). Congress is addressing a wide range of other science and technology policy issues, from tsunami forecasting and warning, to "telecom reform" (revising the Telecommunications Act of 1996), to cloning and stem cell research, to ocean policy and global climate change. Several energy issues are being debated, including President Bush's Hydrogen Fuel Initiative, and reprocessing of spent nuclear fuel. The "transformation" of the National Aeronautics and Space Administration (NASA) as it implements President Bush's "Vision for Space Exploration," is receiving close attention as the agency announces related job cuts and program changes, including sharp cutbacks in aeronautics R&D.

This report identifies other CRS reports that treat most of those issues in more depth. It is updated occasionally. Many of the CRS reports cited herein are updated more often, and should be consulted for timely information.

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Introduction

Science and technology are an underpinning of, and have a pervasive influence over, a wide range of issues confronting the nation. Decisions on how much federal funding to invest in basic and applied research and in research and development (R&D), and determining what programs have the highest priority, for example, could have implications for homeland security, new high technology industries, government/private sector cooperation in R&D, and myriad other areas.

Following are brief discussions of key science and technology issues being debated in the 109th Congress. Where available, additional CRS reports and issue briefs that discuss these topics in more detail are identified at the end of each section. Many of those reports are regularly updated, and should be consulted for timely information.

Research and Development Budget, Management, and Workforce

Federal Government Investment in R&D

The constrained fiscal environment is putting pressure on the full range of federal government spending, including funding for research and development (R&D). Debate is ongoing in the 109th Congress over how much to spend on various R&D activities (see next issue), but a more fundamental question is why the government invests in R&D at all rather than relying on the private sector, universities, and other non-profit groups.

Traditionally, the government's role in R&D funding is to meet the mission requirements of the federal departments and agencies. Included is support for basic research — that work undertaken to gain knowledge and understanding of the fundamental aspects of nature. The payoff for basic research is generally long in coming, the results may be unmarketable, and the rewards often diffused among many users, making private sector investment less likely. However, as stated in the *Analytical Perspectives* accompanying President Bush's FY2006 budget request, "R&D is critically important for keeping our nation economically competitive, and it will help solve the challenges we face in health, defense, energy, and the environment" (p. 61).

In the United States, while the development of new products, processes and services for the commercial marketplace is primarily a private sector activity, the government may get involved for certain limited purposes. Federal support is often provided for those efforts that typically have been determined to be necessary for the "national good" but which cannot, or will not, be financed by industry. Government also plays a role in structuring the environment in which business decisions are made and thereby influences private sector behavior. Direct federal funding, tax policies, and the existence of government markets for certain technologies, including defense, public health, and information technology-related goods, have helped influence resource allocations in the business community.

According to the National Science Foundation's S*cience and Engineering Indicators 2004* (p. 4-9), in 2002 (the latest year for which data are available) industry funds accounted for 66% of U.S. R&D, while the government financed 28% of the total spending, with the remaining 6% provided by universities, colleges, and other non-profit institutions. Industrial support for R&D is concentrated on development rather than on research activities. The government encourages private investment in R&D through direct measures such as the research and experimentation (R&E) tax credit (see CRS Report RL31181), and through indirect measures including ownership of intellectual property and cooperative R&D activities (discussed below under **Technology Development Issues**).

The myriad effects of federal R&D spending highlight the importance of decisions regarding the amount and distribution of federal R&D funds. Choices made by the 109th Congress related to the financing of research and development may have immediate impacts on current programs as well as long term effects on the nation's technological progress.

For Further Information

CRS Issue Brief IB91132, *Industrial Competitiveness and Technological Advancement: Debate Over Government Policy*
CRS Report RL32799, *Federal Research and Development Funding: FY2006*
CRS Issue Brief IB10088, *Federal Research and Development: Budgeting and Priority-Setting Issues, 109th Congress*
CRS Report RL31181, *Research Tax Credit: Current Status, Legislative Proposals, and Policy Issues*

FY2006 R&D Budget

The Bush Administration has requested $132.2 billion in federal research and development (R&D) funding for FY2006. This sum represents a $505 million increase over the FY2005 estimated funding level of $131.7 billion. In real dollars (adjusted for inflation), however, total federal R&D would decline for the first time since FY1996. The proposed FY2006 R&D budget reflects the Administration's objective of constraining the growth of federal discretionary spending.

For the first time since FY1995, funding for defense R&D (the sum of the Department of Defense's (DOD) and the Department of Energy's (DOE) defense R&D programs) would be flat with a requested $74.9 billion. This is due primarily to

a proposed 21% reduction in DOD's science and technology programs. Funding for federal civilian R&D is proposed to increase $188 million to $57 billion, a 0.3% increase over the FY2005 estimated funding level. Most of this increase can be attributed to increases in the National Aeronautics and Space Administration (NASA) budget and the Department of Transportation. Based on current funding proposals, most of the civilian R&D agencies' budgets are proposed to decline, in real dollars, in FY2006.

Funding for total federal research (the sum of basic and applied research) would decline from $55.2 billion to $54.8, a 0.6% reduction. Total funding for basic research is proposed to decline from $26.9 billion in FY2005 to $26.6 billion in FY2006. Most of the decline in basic research support can be attributed to proposed reductions in DOD's basic research program, and NASA's basic research program. (NASA's basic research program accounts for 19% of the agency's total R&D budget.)

The Administration proposes to reduce funding for all three of its multi-agency initiatives. Funding for the National Nanotechnology Initiative would decline 2.5% to $1.1 billion, following four years of funding increases. The Networking and Information and Technology R&D initiative would decline 4.5% to $2.2 billion, while the Climate Change Science Program is proposed to decline 1.4% to $1.9 billion, primarily due to cuts in NASA's contributions to space-based observations of the environment.

The 109th Congress is facing difficult decisions for funding federal R&D. For the first time in a decade, total federal R&D funding is proposed to decline in real dollars. Since President Bush took office, defense R&D funding has increased 45%, in real dollars, while concomitantly civilian R&D has increased 23% in real dollars. However, if the doubling of National Institutes of Health budget, between FY1999 and FY2003, is subtracted from the total, civilian R&D declines in real dollars. Many scientists and engineers contend that this rapid growth in the funding for biomedical sciences has come at the expense of non-biomedical sciences including the physical sciences, environmental sciences, engineering, mathematics, and the social sciences.

Given the important role that federal civilian R&D plays in the education of future scientists and engineers, as well as the development of technological innovation, a variety of special interest groups are likely to call on Congress to restore funding for civilian R&D. If the President insists on holding the line on civilian discretionary spending, any increase for civilian R&D funding would have to be obtained at the expense of other federal programs.

The House has passed all 11 of its FY2006 appropriations bills, while the Senate has passed 5 of its 12 appropriations bills. Based on current House actions, CRS estimates that the House has approved an estimated $134.2 billion for R&D in FY2006, $2 billion above the President's request. All of that increase can be attributed to the House approving an additional $2.5 billion for DOD's science and technology programs. Most of the remaining House R&D funding actions tend to mirror the President's request.

For Further Information

CRS Report RL32799, *Federal Research and Development Funding: FY2006*
CRS Issue Brief IB10088, *Federal Research and Development: Budgeting and Priority-Setting Issues, 109th Congress*

Government Performance and Results Act (GPRA) and the President's Management Agenda

The Government Performance and Results Act of 1993 (GPRA), P.L. 103-62, is intended to produce greater efficiency, effectiveness, and accountability in federal spending and to ensure that an agency's programs and priorities meet its goals. It also requires agencies to use performance measures for management and, ultimately, for budgeting. Recent actions have required agencies to identify more precisely R&D goals and measures of R&D outcomes. As underscored in *The President's Management Agenda,* beginning in FY2001 and in each year thereafter, the Bush Administration has emphasized the importance of performance measurement, including for R&D. In a memorandum dated June 5, 2003, signed jointly by the Office of Science and Technology Policy (OSTP) Director and the Office of Management and Budget (OMB) Director regarding planning for the FY2005 R&D budget requests, the Administration announced that its effort to base budget decisions on program performance would continue and be expanded (OMB M-03-15). OMB referred to this memo again in the FY2006 and FY2007 R&D budget guidance, which reiterated the importance of performance assessment for R&D programs (respectively, OMB M-04-23 and OMB M-05-18.)

Section 5 of OMB's *Analytical Perspectives, Budget of the U.S. Government, FY2006,* discusses requirements for agencies to use OMB criteria to measure research outcomes, focusing on relevance, quality, and performance. R&D performed by industry is to meet additional criteria relating to the appropriateness of public investment, demonstrate a capability to measure benefits, and identify decision points to transition the activity to the private sector. The Administration assessed some R&D programs by use of the Program Assessment Rating Tool (PART) which uses the OMB R&D criteria and other measures. PART results for 84 R&D programs were used when making FY2006 budget decisions. OMB's *Analytical Perspectives* volume reports that 25 programs were judged effective, 31 were moderately effective, and at least 19 were ranked ineffective or results not demonstrated. Commentators point out that it is difficult to define priorities for most research and to measure the results quantitatively, since research outcomes cannot be defined well in advance and often take a long time to demonstrate. As a result some say they have little confidence that R&D performance measures can be used to recommend budget levels. Congress may increase attention to using R&D performance measures in authorizations and appropriations as discretionary spending becomes constrained.

Interest continues in monitoring the PART process, as well as in the Administration's budget and performance integration initiative and in implementation of GPRA. In the 109th Congress, the House Government Reform Committee has approved H.R. 185, to provide a statutory mandate for PART-like reviews; it is similar to H.R. 3826, which the committee reported favorably in the last Congress. Also in

the 109th Congress, the Administration has proposed to create a sunset commission, which would require performance reviews and automatic program termination unless programs were reauthorized. Bills reflecting the Administration's proposal have been introduced (S. 1399, H.R. 3276, H.R. 3277). There are also proposals in the 109th Congress to create accountability commissions (H.R. 2470 and S. 1155). Some congressional staff are not yet comfortable with using performance measurement data to make budget decisions and prefer to use traditionally formatted budget information, which focuses on inputs, rather than outputs, or political judgements to make budget decisions. (See Amelia Gruber, "Lawmakers Remain Skeptical of Linking Budget, Performance," *GovExec.com*, Jan. 13, 2004, and GAO, *Performance Budgeting: Observations on the Use of OMB's Program Assessment Rating Tool for the FY2004 Budget*, GAO-04-174, Jan. 2004).

For Further Information

CRS Report RL32164, *Performance Management and Budgeting in the Federal Government: Brief History and Recent Developments*
CRS Report RS22181: *A Sunset Commission for the Federal Government: Recent Developments*

Information Quality Act Implementation and Peer Review

The Information Quality Act (IQA), sometimes referred to as the Data Quality Act, was enacted in December 2000 as Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554). The act required OMB to issue guidance to federal agencies designed to ensure the "quality, objectivity, utility, and integrity" of information disseminated to the public. It also required agencies to issue their own information quality guidelines, and to establish administrative mechanisms that allow affected persons to seek correction of information maintained and disseminated by the agencies that they believe does not comply with OMB guidance. OMB's February 2002 final guidance notes that IQA applies to virtually all federal agencies and defines "information" as "any communication or representation of knowledge such as facts or data, in any medium or form." The guidelines define "dissemination" as any "agency initiated or sponsored distribution of information to the public." OMB indicated that "quality" encompasses elements of utility, objectivity, and integrity, and said agencies can generally presume that data are "objective" if they have been subject to an independent peer review process.

In April 2004, OMB provided Congress with a report on the implementation of IQA during FY2003. The report said the agencies received only about thirty-five substantive correction requests during the year, and said the correction requests came from all segments of society. However, OMB Watch (a public interest group) said OMB's report was "seriously flawed" in that it understated the number of correction requests and did not disclose that nearly three-quarters of the requests were from industry.

A major test of the IQA's effectiveness is whether agencies' denials of correction requests are subject to judicial review. In June and November 2004, two U.S. District Courts ruled that IQA does not permit judicial review regarding agencies' compliance

with its provisions. One district court decision was appealed by the U.S. Chamber of Commerce. In the Chamber's view, if the district court's decision is reversed on appeal, parties will be able to seek judicial review of an agency's final disposition of IQA petitions.

In December 2004, OMB published a final bulletin on "Peer Review and Information Quality" that sought to establish a peer review process for all "influential scientific information," which was defined as including any scientific information that the agency "reasonably can determine will have or does have a clear and substantial impact on important public policies or private sector decisions." Other, more specific requirements were placed on "highly influential scientific assessments" (i.e., influential scientific information that involved an evaluation of a body of knowledge that could have a $500 million impact on decision-making or was precedent setting, novel, complex, or involved significant interagency interest). The final bulletin requires agencies to disclose the names of peer reviewers and requires agencies to report annually on their peer review activities. Both OMB and the agencies have a significant amount of discretion in the administration of the peer review bulletin (e.g., deciding when peer review is required, the selection of peer reviewers, whether to use alternative procedures), so its impact on information quality, consistency of peer review practices, and rulemaking will become clear only through its administration.

Congressional interest in both OMB's peer review bulletin and IQA during the 109th Congress is expected to center on how the agencies and OMB are carrying out their responsibilities, the effect of the bulletin and the act on the pace of rulemaking, and whether Congress should amend the IQA and provide for judicial review.

For Further Information

CRS Report RL32532, *The Information Quality Act: OMB's Guidance and Initial Implementation*
CRS Report RL32680, *Peer Review: OMB's Proposed and Revised Bulletins*

Science and Technology Education

An important aspect of U.S. efforts to maintain and improve economic competitiveness is the existence of a capable scientific and technological workforce. A January 2004 report of the National Science Foundation (NSF), *Science and Engineering Indicators 2004*, states that between the years 2000 and 2010, employment in science and engineering fields will increase at more than three times the rate for all other occupations. In addition, approximately 86% of the increase in science and engineering will be in computer-related positions. Simultaneous with predictions of the future scientific workforce are data reporting a decline in the number of students seeking degrees in certain fields. While 33% of the undergraduate degrees awarded are in science and engineering, the portion of degrees earned in the physical sciences, mathematics, computer science, and engineering has been static or declining. Disciplines that have witnessed an increase in degrees earned have been primarily psychology and the biological sciences. There is growing concern by many in the scientific community, industry, research-driven federal agencies, and Congress about the production of the nation's science, mathematics, engineering, and technical personnel.

The demographics of the science and engineering workforce have been the subject of debate. The demographics of the nation have been changing, with more than 25% of the U.S. population composed of certain minorities — blacks, Hispanics, and Native Americans. As a group, these minorities have traditionally been underrepresented in the science and engineering disciplines compared to their proportion of the total population. Another underrepresented group in the sciences is women, a group that comprises 50.8% of the population. Together, these groups comprise what some may call a "new majority." While minorities have increased their share of degrees awarded in the past 10 years, poor preparation in science and mathematics is said to be a major factor limiting the appeal of science and engineering to many in these groups. In addition, a large number of blacks, Hispanics, and Native Americans lack access to many of the more rigorous college preparatory course offerings. John Brooks Slaughter, president and chief executive officer of the National Action Council for Minorities in Engineering, states that "Improving minority participation at all levels of higher education, especially in scientific and engineering disciplines, is critical for America." [http://www.aaas.org/news/releases/2004/1004diversity.shtml].

Congress has held a number of hearings in recent years to examine the decline in the nation's scientific and technical workforce, to seek further solutions for improving aspects of undergraduate science and mathematics education, and the aging of the science and engineering workforce, especially at the National Aeronautics and Space Administration. The FY2005 DOD authorization act (P.L. 108-375) established a program of financial assistance for undergraduate degrees in science and technology. The disciplines that would receive support are those that are critical to national security.

On April 14, 2005, winners of the 2004 Presidential Awards for Excellence in Mathematics and Science Teaching testified before the House Committee on Science on the need to improve science and mathematics education at the precollege level. All five of the winners discussed the importance of expanding federal efforts directed at the professional development of teachers, including both pre-service and in-service training. They discussed also the need to encourage more students to enter the scientific disciplines and to make the teaching profession more attractive as a career. Introduced in April 2005, H.R. 1547/S. 765, the Math and Science Incentive Act of 2005, is designed to respond to those needs. The bill, among other things, provides loan forgiveness for undergraduates pursuing careers in science, mathematics, engineering, and technology or teaching those subjects at the precollege level. It is anticipated that the 109th Congress will continue to examine issues important to science and mathematics education, including those of the preparation and performance of U.S. students at the precollege level, the diversity of the scientific and technical workforce, and the impact of visa regulations on foreign students in graduate science and engineering programs (see next issue).

For Further Information

CRS Report 98-871 STM, *Science, Engineering, and Mathematics Education: Status and Issues*

Foreign Science and Engineering Presence in U.S. Institutions and the Labor Force

The increased presence of foreign students in U.S. graduate science and engineering programs continues to be of concern. Enrollment of U.S. citizens in graduate science and engineering programs has not kept pace with that of foreign students in those programs. In many institutions, foreign graduate students on temporary visas comprise 40% to 50% of some science and engineering programs. In addition to the number of foreign students, a significant number of university faculty in the scientific disciplines are foreign, and foreign-born doctorates are employed in large numbers by industry.

Many in the scientific and engineering communities maintain that in order to compete with countries that are rapidly expanding their scientific and technological capabilities, the United States needs to bring in those whose skills will benefit society and will enable us to compete in the new-technology-based global economy. Individuals supporting this position believe instead of limiting the number of foreign students, the conditions under which foreign talent enters U.S. colleges and universities and the labor force should be more carefully scrutinized and controlled to address any security concerns. Furthermore, there are those who contend that the underlying concern of foreign students in graduate science and engineering programs is not necessarily that there are too many foreign-born students, but that there are not enough U.S. students entering the disciplines.

The debate on the presence of foreign students in graduate science and engineering programs and the workforce has intensified as a result of the terrorist attacks of September 11, 2001. Concerns have been expressed about certain foreign students receiving education and training in sensitive areas. In addition, there has been increased discussion about the access of foreign scientists and engineers to R&D related to chemical and biological weapons. In May 2004, several higher education organizations released a combined statement on the impact of the new visa policies on higher education and the scientific enterprise. They maintain that the new procedures have made the visa system inefficient and that the tighter visa restrictions are a major deterrent to foreign students and scholars considering working and studying in this country. During the 108th Congress, several hearings were held to examine the visa system for foreign students. Discussions focused on the increased scrutiny of foreign students from countries that sponsor terrorism, and the restrictions placed on the participation of foreign students and scientists in military-sponsored projects and other types of R&D.

On February 15, 2005, the State Department announced that progress has been made in reducing the clearance time for the Visas Mantis process. Currently, the process averages 15 days. In addition to reducing the clearance process, the State Department has revised the clearance procedures by reducing the restrictions placed on students and scholars and extending the validity of the clearances (lengthening the time for each clearance). The Government Accountability Office (GAO) released a report detailing the efforts and the improvements that have been made in the visa processing. The February 2005 report (GAO-05-198), *Border Security: Streamlined Visas Mantis Program Has Lowered Burden on Foreign Science Students and*

Scholars, but Further Refinements Needed, details the efforts and the improvements that have been made in the visa processing.

A May 10, 2005 report of the National Academies, *Policy Implications of International Graduate Students and Postdoctoral Scholars in the United States*, notes the importance of international students to U.S. society not only academically and economically, but in terms of global and cultural knowledge and understanding. However, NSF data reveal that the number of non-U.S. citizens enrolling in U.S. colleges and universities has slowed since the September 11, 2001 terrorist attacks because of the tightening of U.S. visa policies, increased global competition for graduates in scientific and technical disciplines, and reports that foreign students may encounter an "inhospitable environment."

In the 109th Congress, legislation has been introduced to reform the visa application process for foreign students — S. 455, the American Competitiveness Through International Openness Act of 2005. It is anticipated that the 109th Congress will continue to monitor the participation of foreign students in graduate science and engineering programs and the processing of visas for foreign science students and scholars. In addition, there may be further debate regarding the increased scrutiny of foreign students from countries that sponsor terrorism, and the restrictions placed on the participation of foreign students and scientists in certain types of R&D. There are questions as to whether or not a continued reduction in the immigration of foreign scientists may impact negatively on the competitiveness of U.S. industry.

For Further Information

CRS Report 97-746, *Foreign Science and Engineering Presence in U.S. Institutions and the Laborforce*

Homeland Security Issues

Counterterrorism R&D

Since the terrorist attacks in 2001, additional federal funding has been devoted to counterterrorism R&D, and new planning and coordination mechanisms have been established both in individual agencies and in the White House. The Homeland Security Act of 2002 (P.L. 107-296) consolidated some R&D activities and coordination responsibilities in the new Department of Homeland Security (DHS), especially in its Directorate of Science and Technology (S&T). During the 108th Congress, oversight focused on the establishment of the S&T Directorate. In the 109th Congress, policy issues include the coordination of programs and priorities, both between agencies and within DHS; the use of performance goals and metrics to monitor S&T program accomplishments; DHS's use of the Homeland Security S&T Advisory Committee; the adequacy of R&D resources for topics of particular congressional interest, such as cybersecurity; and the integration of threat assessment information into R&D priority setting and coordination.

Coordination of federal counterterrorism R&D is a particular challenge because relevant programs exist in many different agencies and accurate information about their activities can be difficult to obtain. The R&D programs of DHS account for only about one-third of total expenditures for homeland security R&D, which are estimated at about $4.0 billion, or about $4.6 billion if facilities are included. This excludes funding for R&D on combating terrorism overseas. Other agencies with large counterterrorism R&D responsibilities include the National Institutes of Health (focused on bioterrorism) and the defense and intelligence agencies. Also involved are the Departments of Justice, Commerce, Energy, and Agriculture, the National Science Foundation, the Environmental Protection Agency, and others. Under the Homeland Security Act, DHS has some authority to coordinate and help set priorities for other federal homeland security R&D, including human health-related R&D. What that authority means in practice remains to be seen. The heads of other agencies have no formal role in DHS's R&D priority-setting and coordination, and conversely, the role of the DHS Secretary in setting priorities for those agencies is undetermined. DHS's effectiveness in planning and coordinating R&D may depend upon the Secretary's ability to influence other agencies through his interactions with existing counterterrorism coordination mechanisms in OSTP, NSTC, and interagency committees.

Internal coordination and priority-setting within DHS are also of congressional interest. The FY2004 homeland security appropriations conference report (H.Rept. 108-280) expressed concern about the potential for duplication, waste, and inadequate management oversight, and directed DHS to "consolidate all Departmental research and development funding within the science and technology programs in the FY2005 budget request." DHS did propose consolidating the Coast Guard RDT&E program and some smaller programs into the Science and Technology Directorate in FY2005, but Congress rejected the move of the Coast Guard program. For FY2006, DHS has again proposed consolidating the Coast Guard program, along with the R&D activities of the Transportation Security Administration (which is the largest DHS R&D activity outside the Science and Technology Directorate) and some additional smaller programs. This consolidation is an issue for congressional oversight in the 109th Congress, as are questions about how DHS sets priorities among its various R&D programs and how it utilizes the R&D capabilities of the national laboratories.

Federal funding for counterterrorism R&D has increased significantly since the terrorist attacks in 2001, despite the constrained budget environment. In FY2004, the government-wide total exceeded $3.5 billion, compared with less than $600 million in FY2001. For FY2006, the Administration's total request for homeland security R&D, including facilities construction, is an estimated $4.6 billion. (Only $1.4 billion of this is in DHS.) The Administration has made homeland security a budget priority for interagency R&D planning, but continuing growth may pose challenges as the 109th Congress balances competing needs in a tight budget.

For Further Information

CRS Report RS21270, *Homeland Security and Counterterrorism Research and Development: Funding, Organization, and Oversight*

CRS Report RL31914, *Research and Development in the Department of Homeland Security*

CRS Report RL32481, *Homeland Security Research and Development Funding and Activities in Federal Agencies: A Preliminary Inventory*
CRS Report RL32482, *Federal Homeland Security Research and Development Funding: Issues of Data Quality*

Chemical, Biological, Radiological, and Nuclear Terrorism Countermeasures R&D

Federal chemical, biological, radiological, and nuclear (CBRN) terrorism countermeasures research and development is concentrated in three departments: the Department of Health and Human Services (HHS), the Department of Homeland Security (DHS), and the Department of Defense (DOD). HHS, largely through the National Institutes of Health (NIH), has traditionally focused on basic research to support the development of countermeasures. Increasingly, HHS supports the development of new countermeasures by grants to fund advanced development and clinical trials. DHS CBRN research and development programs focus on threat awareness and characterization (including material threat determinations for Project BioShield), agent surveillance and detection, forensics, and post-event response and restoration. DOD has a significant countermeasures research and development program which focuses on protecting warfighters from CBRN weapons and tends to emphasize prophylaxis.

The three departments' programs have the potential for either synergy or redundancy. Strong executive branch management and congressional oversight may be crucial for maximizing synergy and avoiding redundancy. In the 109th Congress, committees in both chambers have held hearings related to interagency coordination of CBRN defense efforts. Congress appears poised to continue this attention.

Enactment of the Project BioShield Act of 2002 (P.L. 108-276), a ten-year $5.6 billion biomedical countermeasures acquisition program, removed some of the barriers that had discouraged pharmaceutical and biotechnology companies from developing countermeasures. Both chambers have held hearings during the 109th Congress on the implementation of this program. Congressional concerns include the perceived slow rate that the program acquires countermeasures and the decision process for choosing countermeasures. This scrutiny is likely to continue with additional oversight hearings.

Congress is considering several bills which add to or modify the Project BioShield Act of 2002. Additional legislation is likely to be introduced. Some of the issues likely to receive congressional consideration are provisions removing some of the remaining barriers discouraging private-sector countermeasures development, such as limiting tort liability and streamlining the Food and Drug Administration drug approval process. Additional financial incentives for companies developing countermeasures, including tax credits and patent extensions, are also likely to receive congressional consideration.

For Further Information

CRS Report RS21507, *Project BioShield*

CRS Report RS21270, *Homeland Security and Counterterrorism Research and Development: Funding, Organization, and Oversight*

Bioagent Lab Registration and Security

A program to track organisms that could potentially be used for bioterrorism — the Select Agent program — was first established in the Antiterrorism and Effective Death Penalty Act of 1996 (P.L. 104-132). The law required the Secretary of HHS to regulate the transfer (though not the possession) of so-called *select agents*, which are viruses, bacteria, fungi, and toxins that may pose a severe threat to public health and safety. The initial regulation administered by the Centers for Disease Control and Prevention (CDC), required the registration of any laboratory shipping or receiving the agents, and documentation of these transfers. Information and application materials for the CDC program are available at [http://www.cdc.gov/od/sap].

The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (P.L. 107-188) expanded the scope of the Select Agent program by requiring all facilities possessing select agents, not just those shipping or receiving them, to register with CDC. In addition, P.L. 107-188 instructed the HHS Secretary, in consultation with the Attorney General, to establish safety and security requirements for registered laboratories "commensurate with the level of risk to public health and safety," and to conduct background screening for all persons seeking access to select agents. Congress authorized the program through 2007 with an indefinite appropriation.

P.L. 107-188 gave the Department of Agriculture (USDA) similar authority to develop a list of biological agents and toxins that may pose a severe threat to crops and livestock and to regulate facilities that possess, use, or transfer those agents and toxins. The law instructed HHS and USDA to coordinate their activities regarding so-called *overlap agents*, those agents that affect both human and animal health and that therefore appear on both agencies' lists. Both P.L. 107-188 and the USA PATRIOT Act (P.L. 107-56) prohibit certain groups of individuals — based on criminal history, immigration status, and other factors — from having access to select agents.

In December 2002, HHS and USDA issued interim final regulations to implement the expanded program. Both departments issued final rules, with only minor changes, in March 2005. The HHS regulation is codified at 42 CFR 73.0, and the USDA regulation at 7 CFR 331 and 9 CFR 121. In addition to the provisions discussed above, all labs possessing select agents were required to submit detailed security, training, and record-keeping plans in order to be registered.

Institutions were to be in full compliance by November 12, 2003. The FBI was unable to complete all the security background checks, and HHS and USDA were unable to finish reviewing all the applications, in time to meet the deadline. Thus, on November 3, 2003, in order to avoid a disruption of ongoing research, CDC and USDA issued revised regulations allowing labs and researchers to obtain provisional certification, provided they had submitted all the appropriate paperwork. Subsequently it is reported that the agencies have processed backlogged applications and granted certification to those facilities and individuals that met the requirements.

Congress expanded the Select Agent program in response to concerns that the anthrax used in the 2001 mail attacks may have been obtained from a U.S. research facility. Lawmakers sought to improve lab security without unduly impeding vital biomedical and biodefense research. While some academic and industry scientists have praised the government for striking an appropriate balance between science and security, others have been critical, saying that the regulations are burdensome and costly, and will not substantially improve security. Some scientists have discontinued research on select agents because of the security requirements and out of fear that breaking the new law, even inadvertently, could result in stiff criminal penalties. As the anthrax attacks were unfolding in the fall of 2001, officials at the Iowa State University destroyed their research collection of anthrax strains, collected over decades, fearing they would not have the resources to properly safeguard the collection in the new security climate.

In March 2005, a laboratory certification organization inadvertently sent a sample of a highly pathogenic influenza strain to thousands of laboratories around the world. While no one became ill as a result, policymakers asked why such an error had occurred despite heightened controls. In fact, the Select Agent rule did not apply in this situation: human influenza strains are not included on the list of HHS select agents. Highly pathogenic strains of avian influenza ("bird flu") are included on the USDA list, however. Some have questioned whether human influenza strains should be included, or whether some other measure might have prevented this incident.

Public Access to Scientific Information

Policies to provide access to scientific and technical information that protect the nation against terrorist attacks require balancing issues of national security, scientific communication, and constitutional and statutory protections that permit public access to information used for accountability and oversight. Historically, the U.S. government has used classification procedures to protect scientific and technical information that might compromise national security. Fundamental scientific information whose release does not compromise security is to remain unclassified pursuant to Executive Order 12958 and National Security Decision Directive 189. After the 2001 terrorist attacks, the government widened controls on access to information and scientific components. Policies are being implemented to deny access to federally owned information labeled "sensitive but unclassified" (SBU) or "sensitive homeland security information" (SHSI). This includes information that agencies previously posted on websites or made available upon request. Consideration is being given to preventing publication of some non-federally owned scientific and technical information.

Some critics say that criteria for identifying SBU information have not been defined clearly, causing inconsistency among agencies and complicating the design and implementation of policies to access and safeguard such information. White House directives and federal agencies have used the term SBU in various ways to label and control information. Some agencies refer to definitions for controlled information, such as for "sensitive," found in the Computer Security Act, or to information exempt from disclosure through the Freedom of Information Act (FOIA) or the Privacy Act. Those laws gave agencies some discretion and permitted use of risk analysis to identify information to be safeguarded. Pursuant to the Federal

Information Security Management Act of 2002 (FISMA), the National Institute of Standards and Technology (NIST) has developed guidance for agencies to identify and use risk-based criteria to control access to unclassified, including sensitive, information and information systems. These will become mandatory in December 2005.

P.L. 107-296, the Homeland Security Act, requires the President to prescribe and implement procedures for agencies to identify and safeguard sensitive but unclassified homeland security information (Secs. 891 and 892). OMB had planned to issue related guidance in 2003; on July 29, 2003, in Executive Order 13311, the President delegated his responsibility for this function to the DHS secretary, who has not yet issued guidance. In 2004, DHS promulgated rules for safeguarding its own sensitive unclassified information and that provided to it by other agencies and nongovernmental entities. Issues of possible interest to Congress include whether agencies, which have some discretion to identify SBU, are using uniform criteria to identify such information, to control it, and to permit access to it while protecting information that should be withheld; design of an appeals process since the information is not classified; assessment of the pros and cons of wider SBU controls in relation to accountability; and possible classification of federally-owned basic research information, since heads of some agencies performing basic research were given original classification authority.

The federal government has traditionally supported the open publication of federally funded, extramural research results conducted by nongovernmental scientists. In cases where release of fundamental research results might compromise national security (e.g. atomic energy and cryptography research), federal policy prescribes the use of classification to limit dissemination. A series of research publications have increased concern whether publication of some federally funded extramural research results could threaten national security. As a result, some have suggested that such research results should be reviewed for security implications before publication, while others say that such review would damage scientific progress and productivity. Most scientists and publishers have begun to implement voluntary self-regulatory measures regarding publication of potentially sensitive manuscripts, but these efforts may not be considered stringent enough. The Department of Health and Human Services, following select recommendations presented by the National Academies report, *Biotechnology Research in an Age of Terrorism*, established the National Science Advisory Board for Biosecurity to provide guidance for the identification of research that may require special security attention. The controls designed by professional groups undoubtedly will be guided by federal policy as it develops.

For Further Information

CRS Report RL31695, *Balancing Scientific Publication and National Security Concerns: Issues for Congress*

CRS Report RL31845, *'Sensitive But Unclassified' and Other Federal Security Controls on Scientific and Technical Information: History and Current Controversy*

Information Technology Management for the Department of Homeland Security

One of the biggest challenges facing the Department of Homeland Security (DHS) is the ongoing effort to consolidate the computer and communications systems of the 22 agencies that comprise the Department. In many respects, DHS functions as a virtual department, connecting new and existing agencies into a network that capitalizes on their knowledge assets to facilitate information sharing and enhanced communication. Organizationally, this involves breaking down the "stovepipes" that have previously separated the agencies and developing an encompassing organizational culture that promotes cooperation and information sharing. Technologically, this involves integrating existing systems and infrastructures while simultaneously infusing new technologies as they are become available. Rigorous oversight of these activities is continuing in the 109th Congress.

A critical variable that will contribute to the success or failure of these objectives is the development and implementation of an enterprise architecture for the Department. An enterprise architecture serves as a blueprint of the business operations of an organization, and the technologies needed to carry out these functions. It is designed to be comprehensive and scalable, to account for future growth needs.

As the Department moves forward with its enterprise architecture plans, it will encounter several issues. Its enterprise architecture is being used to identify common functions and eliminate redundancies among its component agencies. This requires making choices between competing systems and reallocating resources and staff accordingly. In doing so, DHS may need to improve the interoperability of its systems as well, by selecting common data formats, equipment, and processes. This, in turn, would enable DHS to carry out its information sharing responsibilities, as described in the Homeland Security Act and the National Intelligence Reform Act of 2004. Since some of these information sharing initiatives involve agencies and organizations at the federal, state, and local levels, as well as agencies within the Department, additional coordination with these external partners is necessary to ensure the smooth flow of information and compliance with security procedures. Other oversight issues Congress is considering include funding, information security, outsourcing, and technology development. In addition, given the interrelationships between DHS and other departments, the impact of the DHS enterprise architecture on related e-government initiatives currently underway has also attracted interest.

Data Mining

Data mining has emerged as one of the key features of many homeland security initiatives, and an issue that is attracting strong congressional oversight. Data mining involves the use of data analysis tools to discover previously unknown, valid patterns and relationships in large data sets. In the context of homeland security, data mining is often viewed as a potential means to identify terrorist activities, such as money transfers and communications, and to identify and track individual terrorists themselves, such as through travel and immigration records.

Data mining is carried out in both the private and public sectors. Some common uses include detecting fraud, assessing risk, and measuring and improving program performance. While data mining represents a substantial advance in the type of analytical tools currently available, some of the homeland security data mining applications represent a significant expansion in the quantity and scope of data to be analyzed. Two efforts that attracted a high level of congressional interest are the Total Information Awareness (TIA) project, which now has been discontinued, and the proposed Computer Assisted Passenger Prescreening System II (CAPPS II) project, which is being replaced by the Secure Flight passenger screening program, administered by the Transportation Security Administration.

While technological capabilities are important, there are other implementation and oversight issues that can influence the success of a data mining project's outcome. One issue is data quality, which refers to the accuracy and completeness of the data being analyzed. A second issue is the interoperability of the data mining software and databases being used by different agencies. Interoperability is a critical part of the larger efforts to improve interagency collaboration and information sharing through e-government and homeland security initiatives. A third issue is privacy. Questions being considered include the degree to which government agencies should use and mix commercial data with government data, whether data sources are being used for purposes other than those for which they were originally designed, and possible application of the 1974 Privacy Act to these initiatives.

For Further Information

CRS Report RL31798, *Data Mining: An Overview*

Technology Development Issues

Technological Innovation and the Economy: Impact of Federal R&D Funding

Technological advancement is an important factor in the nation's economic growth. Experts widely accept that technical progress is responsible for up to one-half the growth of the U.S. economy and is one principal driving force for increases in our standard of living. Historically, industrial expansion was based on the use of technology to exploit natural resources. Today, such growth tends to be founded on scientific discoveries and engineering knowledge and is even more dependent than before on the development and use of technology. Technology can drive the economy because it contributes to the creation of new goods and services, new industries, new jobs, and new capital. It can expand the range of services offered and extend the geographic distribution of those services. The application of technologies also can contribute to the resolution of those national problems that are amenable to technological solutions.

Technological progress is achieved through innovation, the process by which industry provides new and improved products, manufacturing processes, and services. Research and development are important to this technological advancement in many

ways. R&D contributes to economic growth by its impact on productivity. Generally, productivity growth in an industry or a firm is related to the amount spent previously on R&D in that industry or company. Analysts estimate that one-half of productivity increases (output per person) are the result of investments in research and development (see CRS Report RL32324). Others argue that innovations arising from R&D are the most important ones. Profound changes in our society have been brought about by advances in research, resulting in new products and processes in the areas of medicine, semiconductors, computers, and materials, just to name a few.

Traditionally, the government funds R&D to meet the mission requirements of the federal departments and agencies. The government also supports work in areas where there is an identified need for research, primarily basic research, not being performed in the private sector. Basic research, that work undertaken to gain knowledge and understanding of the fundamental aspects of nature, is the foundation of many important new innovations. However, the payoff for basic research is generally long in coming, the results may be unmarketable, and the rewards often diffused among many users. Yet, while basic research is usually performed with little certainty that it will produce goods and services in the future, it appears that there is a significant relationship between the conduct of basic research and increases in productivity.

Federal funding reflects a consensus that while basic research is important for innovation, the rate of return to society as a whole generated by investments in this activity is significantly larger than the benefits that can be captured by any one firm performing it. It is estimated that the social rate of return on R&D spending is over twice that of the rate of return to the inventor. Ideas often can be easily imitated, the knowledge associated with an innovation dispersed and adapted to other products and processes. This, it is argued, often leads to underinvestment in research by the private sector and thus the need for federal funding.

Expert analysis has shown the importance of federally funded R&D to advancements in innovation (see CRS Report RL32076). Studies undertaken by economists in the field demonstrate that collaboration with publicly funded research organizations increased private sector productivity in many industries, findings that parallel additional work showing the importance of public science to innovation and technological advancement across industrial sectors. This federal R&D stimulates the additional and often substantial private investment necessary to bring new and improved technologies to the marketplace.

In the United States, the development of new products, processes and services for the commercial marketplace is primarily a private sector activity. The government generally becomes involved only for certain limited purposes, including activities that typically have been determined to be necessary for the “national good” but which cannot, or will not, be supported by industry. However, government plays a role in structuring the environment in which business decisions are made and thereby influences private sector behavior. Direct federal funding and the existence of government markets for certain technologies, including defense and information technology-related goods, have helped influence resource allocations in the business community.

The myriad effects of federal research and development spending on innovation and the economic growth generated by technological advancement highlight the importance of decisions regarding the amount and distribution of federal R&D funds. Choices made by the 109th Congress related to financing the research endeavor may have immediate impacts on current programs as well as long term effects on the nation's technological progress.

For Further Information

CRS Issue Brief IB91132, *Industrial Competitiveness and Technological Advancement: Debate Over Government Policy*
CRS Report RL32324, *Federal R&D, Drug Discovery, and Pricing: Insights from the NIH-University-Industry Relationship*
CRS Report RL32076, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*

R&D Partnerships and Intellectual Property

A major emphasis of R&D-related legislative activity has been to augment research in the private sector through efforts to encourage firms to undertake cooperative R&D arrangements. Various laws, including the Stevenson-Wydler National Technology Innovation Act (P.L. 96-418) and the "Bayh-Dole" Act (P.L. 96-517), as amended, have created an environment conducive to joint ventures between government and industry, or between industry and universities, as well as among companies. To date, Congress has determined that providing title to inventions made under federal funding to contractors and/or collaborating parties should be used to support innovation. In return for patent ownership, Congress has accepted as satisfactory the anticipated payback to the country through goods and services to improve our health, welfare, and standard of living. These benefits have been considered more important than the initial cost of the technology to the government or any potential unfair advantage of one company over another in a cooperative venture.

As such cooperative efforts become more widespread, new and additional issues have emerged. Concerns have been expressed regarding the cost of drugs developed in part with federal funding or in conjunction with federal agencies. Conflicts have surfaced over federal laboratories patenting inventions that collaborating parties believe to be their own. In some agencies, delays continue in negotiating cooperative research and development agreements (CRADAs) because of disagreements over the dispensation of intellectual property. Questions have been raised as to the effects of patenting early stage discoveries (e.g. research tools) on additional innovation. The National Institutes of Health has encountered difficulties obtaining for government-sponsored research new experimental compounds developed and patented by drug companies because of concerns over diminished effectiveness of the intellectual property if additional applications are discovered. Given these issues, additional decisions may need to be made during the 109th Congress regarding the way to maintain a balance between the importance of bringing new products and processes to the marketplace and protecting the public investment in R&D.

For Further Information

CRS Issue Brief IB89056, *Cooperative R&D: Federal Efforts to Promote Industrial Competitiveness*
CRS Issue Brief IB85031, *Technology Transfer: Use of Federally Funded Research and Development*
CRS Report RL32076, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*
CRS Report RL30320, *Patent Ownership and Federal Research and Development (R&D): A Discussion of the Bayh-Dole Act and the Stevenson-Wydler Act*
CRS Report RL32324, *Federal R&D, Drug Discovery, and Pricing: Insights From the NIH-University-Industry Relationship*
CRS Report 98-862, *R&D Partnerships and Intellectual Property: Implications for U.S. Policy*

Advanced Technology Program

The Advanced Technology Program (ATP) was created by P.L. 100-418, the Omnibus Trade and Competitiveness Act of 1988, to encourage public-private cooperation in the development of pre-competitive technologies with broad application across industries. Administered by the National Institute of Standards and Technology (NIST), a laboratory of the Department of Commerce, this activity has been targeted for elimination as a means to cut federal spending. Critics argue that R&D aimed at the commercial marketplace should be funded by the private sector, not by the federal government. Others stress that ATP is market driven and that investments in research are shared by industry and the public sector.

Beginning several years ago, the House of Representatives attempted to terminate ATP but strong support provided by the Senate led to continued funding. The Bush Administration also proposed eliminating the program in its FY2002, FY2004, FY2005, and FY2006 budget requests. These actions have renewed the debate over the role of the federal government in promoting commercial technology development. In arguing for less direct federal involvement, opponents of the Advanced Technology Program believe that the market is superior to government in deciding which technologies are worthy of investment. They prefer mechanisms that enhance the market's opportunities and abilities to make such choices. It is also suggested that agency discretion in selecting one technology over another can lead to political intrusion and industry dependency. On the other hand, supporters of direct methods maintain that reliance on indirect measures can be wasteful, inefficient, and ineffective and can compromise other goals of public policy in the hope of stimulating innovative performance. Proponents of ATP argue that it is important to put the nation's scarce resources to work on those technologies which will have the greatest promise as determined by industry and supported by the private sector's willingness to match federal funding. They assert that the government serves as a catalyst for companies to cooperate and undertake important new work, which would not be possible without federal participation. As Congress proceeds with the appropriations process in the 109th Congress, these issues are expected to be debated once again.

For Further Information

CRS Issue Brief IB91132, *Industrial Competitiveness and Technological Advancement: Debate Over Government Policy*
CRS Report 95-36, *The Advanced Technology Program*
CRS Report 95-50, *The Federal Role in Technology Development*

Prescription Drugs: Costs, Availability, and Federal R&D

Congressional interest in methods to provide prescription drugs at lower cost, particularly for the elderly, has focused attention on achieving a balance between the public's interest in new and improved technologies and concern over providing companies valuable benefits without adequate accountability or compensation. The federal government has various programs and policies facilitating the development of pharmaceuticals and their availability in the marketplace. Several laws, including the Stevenson-Wydler Technology Innovation Act and the Bayh-Dole Act, encourage commercialization of federally-funded R&D through technology transfer, cooperative R&D, and intellectual property rights (particularly patent ownership). These laws are intended to stimulate the private sector investment often necessary to develop marketable products utilizing the results of the government's research enterprise.

Congress also has acted to encourage the development of lower cost generic drugs through the Hatch-Waxman Act. This 1984 law made several significant changes to the patent laws as they apply to pharmaceutical products in an attempt to stimulate the search for innovative new drugs while providing less expensive generic products. As a result of this legislation, generics generally are rapidly available after patent expiration and at lower prices than their brand name predecessors. Concurrently, given the increasing investment in pharmaceutical R&D and the gains in research intensity of the pharmaceutical industry, it appears that, on balance, the act has not deterred the search for, or the development of new drugs. However, Title XI of the Medicare Prescription Drug and Modernization Act of 2003 (P.L. 108-173) modified the Hatch-Waxman Act as it pertained to the listing of pharmaceutical patents in the Orange Book maintained by the Food and Drug Administration, patent challenges by generic firms, and the award of market exclusivity, among other things. It remains to be seen how these provisions affect the availability and cost of prescription drugs.

Concerns have been expressed by Members of Congress over whether the current legislative approach to encouraging innovation, particularly with respect to drug discovery, is appropriate. In the debate, some argue that the government's financial, scientific, and/or clinical support of biomedical R&D entitles the public to commensurate considerations in the prices charged for any resulting drugs. Others view government intervention in price decisions based upon initial federal R&D funding as contrary to a long-term trend of government promotion of innovation, technological advancement, and the commercialization of technology by the business community. Supporters of existing incentives for technology development argue that they have given rise to robust pharmaceutical and biotechnology industries. Critics maintain that the need for such incentives in the pharmaceutical and/or biotechnology sectors is mitigated by industry access to government-supported work at no cost, monopoly power through patent protection, and additional regulatory and tax

advantages such as those conveyed through the Hatch-Waxman Act. At issue, is which legislative initiatives, if any, can actually reduce the cost of safe and effective prescription drugs to individuals in the United States and what may be the long-term effects of these efforts on innovation in the pharmaceutical industry.

For Further Information

CRS Report RL32377, *The Hatch-Waxman Act: Legislative Changes Affecting Pharmaceutical Patents*
CRS Report RL30756, *Patent Law and Its Application to the Pharmaceutical Industry: An Examination of the Drug Price Competition and Patent Term Restoration Act of 1984*
CRS Report RL31379, *The Hatch-Waxman Act: Selected Patent-Related Issues*
CRS Report RL32076, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*
CRS Report RL32324, *Federal R&D, Drug Discovery, and Pricing: Insights From the NIH-University-Industry Relationship*
CRS Report RL30320, *Patent Ownership and Federal Research and Development (R&D): A Discussion of the Bayh-Dole Act and the Stevenson-Wydler Act*
CRS Report RL32400, *Patents and Drug Importation*

Telecommunications and Information Technology Issues

Telecommunications Act of 1996 Revision

The "Telecommunications Act of 1996," signed into law on February 8, 1996 (P.L. 104-104), represented the first major rewrite of our nation's telecommunications policy. The 1996 Act redefined and recast the 1934 Communications Act to address the emergence of competition in what were previously considered to be monopolistic markets. Despite its relatively recent enactment, however, a consensus has been growing that the 1996 Act is inadequate to address the convergence and technological changes now facing the telecommunications and broadcasting sectors. Whether a further rewrite is required, what form such a rewrite might take, and the timing of a rewrite, remains unclear; however, both the House and Senate are expected to continue to take an active role in examining and debating the issues related to a possible revision of existing telecommunications law. Included among the policy issues likely to be examined are: the digital television transition, the universal availability of broadband, the regulatory treatment of incumbent cable and telecommunications providers and the impact of recently proposed mergers, the funding of and eligibility criteria for the universal service fund (USF), the impact and regulatory treatment of newly emerging technologies such as voice of internet protocol (VoIP) and broadband over power lines (BPL), municipal deployment of broadband, and the relationship between the Federal Communications Commission (FCC) and state regulatory bodies.

For Further Information

CRS Report RL32949, *Communications Act Revisions: Selected Issues for Consideration*
CRS Report RL33034, *Telecommunications Act: Competition, Innovation, and Reform*
CRS Issue Brief IB10045, *Broadband Internet Access: Background and Issues*
CRS Report RL32421, *Broadband Over Powerlines: Regulatory and Policy Issues*

Broadband Internet Regulation and Access

Broadband Internet access gives users the ability to send and receive data at speeds far greater than conventional "dial up" Internet access over existing telephone lines. Broadband technologies — cable modem, digital subscriber line (DSL), satellite, and fixed wireless Internet — are currently being deployed nationwide primarily by the private sector. While President Bush has set a goal of universal broadband availability by 2007, some areas of the nation — particularly rural and low-income communities — continue to lack full access to high-speed broadband Internet service. In order to address this problem, the 109th Congress is considering the scope and effect of federal broadband financial assistance programs (including universal service), and the impact of telecommunications regulation and new technologies on broadband deployment.

Some policymakers, believing that disparities in broadband access across American society could have adverse economic and social consequences on those left behind, assert that the federal government should play a more active role to avoid a "digital divide" in broadband access. One approach is for the federal government to provide financial assistance to support broadband deployment in underserved areas. Others, however, question the reality of the "digital divide," and argue that federal intervention in the broadband marketplace would be premature and, in some cases, counterproductive. Another issue under examination is whether present laws and subsequent regulatory policies are needed to ensure the development of competition and its subsequent consumer benefits, or conversely, whether such laws and regulations are overly burdensome and discourage needed investment in and deployment of broadband services.

Finally, emerging broadband technologies — such as wireless (including "3G", "wi-fi" and "Wimax") and broadband over power lines (BPL) — continue to be developed and/or deployed, and have the potential to affect the regulatory and market landscape of broadband deployment. Congress and the FCC will likely consider policies to address the emergence of these and other new broadband technologies.

For Further Information

CRS Issue Brief IB10045, *Broadband Internet Access: Background and Issues*
CRS Report RL30719, *Broadband Internet Access and the Digital Divide: Federal Assistance Programs*
CRS Report RL32421, *Broadband over Powerlines: Regulatory and Policy Issues*
CRS Report RS20993, *Wireless Technology and Spectrum Demand: Third Generation (3G) and Beyond*

Transition to Digital Television

Digital television (DTV) is a new service representing the most significant development in television technology since the advent of color television in the 1950s. Congress and the FCC have set a target date of December 31, 2006 for broadcasters to transition to DTV, cease broadcasting their analog signals, and return their existing analog television spectrum licenses to be auctioned for commercial services (such as broadband) or used for other purposes, such as public safety telecommunications. If and when analog TV signals are turned off, consumers will not be able to receive over-the-air television broadcast signals unless they have a digital television or connect their existing analog televisions to converter boxes. The Balanced Budget Act of 1997 (P.L. 105-33) requires the FCC to grant extensions for reclaiming the analog television licenses in the year 2006 from stations in television markets where at least 15% of television households do not receive digital signals.

Given the slower-than-expected pace at which digital televisions have been introduced into American homes, few observers believe that the goal of digital televisions in 85% of American homes by 2006 will be reached, with the result that — under current law — television stations will continue to broadcast both analog and digital signals past the 2006 deadline. The key issue for Congress and the FCC is: what steps, if any, should be taken by the government to further facilitate a timely, efficient, and equitable transition to digital television? The 109th Congress is debating whether and how a "hard date" for the digital television transition should be implemented, thereby freeing reclaimed analog spectrum. Key policy questions include should the existing statutory digital transition deadline of December 31, 2006 be implemented by modifying or removing the 85% digital penetration threshold requirement, or would a later and redefined transition deadline be more appropriate? Should the reclaiming of analog spectrum for public safety uses be singularly designated, or should it be included as part of a comprehensive approach to returning all of the analog spectrum? Paramount in this debate is the issue of addressing the millions of American over-the-air households whose existing analog televisions will require converter boxes in order to receive digital signals, if and when the analog signal is turned off. The 109th Congress is exploring the question of whether some form of financial assistance (subsidies or tax credits, for example) should be provided by the federal government to enable low-income over-the-air households to purchase converter boxes.

For Further Information

CRS Report RL31260, *Digital Television: An Overview*
CRS Report RL31375, *Meeting Public Safety Spectrum Needs*
CRS Report RS21570, *Spectrum Management: Public Safety and the Transition to Digital Television*
CRS Report RS22218, *Spectrum Use and the Transition to Digital TV*
CRS Report RS22217, *The Digital TV Transition: A Brief Overview*

Spectrum Management and Wireless Technologies

Spectrum policy issues are characterized by economic, technological and regulatory complexity. Spectrum, a valuable resource governed by available technology, is regulated by the federal government with the primary objectives of maximizing its usefulness and efficiency, and preventing interference among spectrum users. To minimize interference, users are assigned radio frequencies within spectrum bands allocated for defined uses. Spectrum policy covers both satellite and terrestrial (primarily antenna-broadcast) transmissions. Members of Congress, through hearings and public statements, have expressed a willingness to address spectrum management issues. The Intelligence Reform and Terrorism Prevention Act (P.L. 108-458) requires the Chairman of the Federal Communications Commission, in consultation with the Secretary of Homeland Security and others, to prepare a study for Congress by year end 2005 on public safety uses of spectrum. The act also requires the Secretary of Homeland Security to submit a report on strategies for achieving interoperability among first responders, a critical issue. These and other provisions of the act requiring studies or pilots of communications technology will add to Congress's base of knowledge regarding wireless technologies and spectrum management.

Spectrum is integral to wireless technology and so its management is connected to many issues that may be of interest to Congress. These include new technologies such as "third-generation" (3G) cell phone services, wireless Internet, mesh networks, software-defined radio (SDR), Ultra-Wideband (UWB) and location-finding technology. The latter includes applications for wireless enhanced 911.

CRS Report RL32594, *Public Safety Communications: Policy, Proposals, Legislation and Progress*
CRS Report RL31764, *Spectrum Management: Auctions*
CRS Report RS21508, *Spectrum Management and Special Funds*
CRS Report RS22218, *Spectrum and the Transition to Digital TV*
CRS Report RL32408, *Spectrum Policy: Public Safety and Wireless Communications Interference*
CRS Report RS20993, *Wireless Technology and Spectrum Demand: Advanced Wireless Services*

Networking Information Technology R&D

At the federal level, almost all of the funding for information science and technology and Internet development is part of a single government-wide initiative, the Networking and Information Technology Research and Development program (NITRD). This program was previously (1997-2000) called the Computing, Information, and Communications program (CIC) and, prior to that (1992-1997), the High Performance Computing and Communications program (HPCC). The NITRD is an interagency effort to coordinate key advances in information technology (IT) research and leverage funding into broader advances in computing and networking technologies. Under the NITRD, participating agencies receive support for high-performance computing science and technology, information technology software and

hardware, networks and Internet-driven applications, and education and training for personnel.

The FY2006 budget calls for $2.155 billion for the NITRD Program, a 4.5% decrease from the FY2005 budget of $2.256 billion. During the 109th Congress, one NITRD-related bill has been introduced, H.R. 28. (See CRS Issue Brief IB10130 for updated information). A significant part of this decrease can be attributed to the reduction in funding for NITRD activities at the National Aeronautics and Space Administration (NASA). Also, within the NITRD Program, funding for high-end computing research and development (R&D) is down 6%, due in part to a decrease in funding for these activities at the Office of Science within the Department of Energy (DOE). The majority of NITRD Program funding goes to the National Science Foundation, National Institutes of Health, NASA, Defense Advanced Research Projects Agency, and the DOE's Office of Science.

NITRD research emphases are focused on six program component areas (also called PCAs): high-end computing research; human computer interaction and information management; large-scale networking; software design and productivity; high-confidence software and systems; and social, economic, and workforce implications of IT and IT workforce development. Key issues facing congressional policymakers include is NITRD accomplishing its goals and objectives to enhance U.S. information technology research and development; is the funding level appropriate or should it be changed to reflect changing U.S. priorities; and what should be the private sector's role in this federal initiative?

For Further Information

CRS Issue Brief IB10130, *Federal Networking and Information Technology Research and Development Program: Funding Issues and Activities*

E-Health: Health Information Technology

The Institute of Medicine, the National Committee on Vital and Health Statistics, and other expert panels have identified information technology (IT) as one of the most powerful tools for reducing medical errors, lowering health costs, and improving the quality of care. However, the U.S. health care industry lags far behind other sectors of the economy in its investment in IT, despite growing evidence that electronic information systems can play a critical role in addressing the many challenges the industry faces. Adoption of health IT systems faces significant financial, legal, and technical obstacles. The issue for Congress, in which there is broad bipartisan support for increasing health IT resources, is how best to create incentives to promote IT throughout the health care sector.

Congress and the Administration have already taken a number of important steps to promote health IT. The 2003 Medicare Modernization Act instructed the HHS Secretary to adopt electronic prescription standards and establish a Commission for Systemic Interoperability. The Commission is charged with developing a comprehensive strategy for implementing data and messaging standards to support the electronic exchange of clinical data. On April 27, 2004, President Bush called for the widespread adoption of interoperable electronic health records (EHRs) within 10 years

and established the Office of the National Coordinator for Health Information Technology (ONCHIT). ONCHIT has developed a strategic 10-year plan outlining steps to transform the delivery of health care by adopting EHRs and developing a National Health Information Infrastructure (NHII) to link such records nationwide. The strategic plan identifies several potential policy options for providing incentives for EHR adoption. They include providing grants to stimulate EHRs and regional information exchange systems; offering low-rate loans and loan guarantees for EHR adoption; amending federal rules (e.g., Medicare physician self-referral law) that may unintentionally impede the development of electronic connectivity among health care providers; and using Medicare reimbursement to reward EHR use.

Congress laid the groundwork for establishing an NHII when it enacted the 1996 Health Insurance Portability and Accountability Act (HIPAA). HIPAA instructed the HHS Secretary to develop privacy standards to give patient more control over the use of their medical information, and security standards to safeguard electronic patient information against unauthorized access, use, or disclosure. Several bills have been introduced in the 109th Congress to boost federal investment and leadership in health IT and provide incentives both for EHR adoption and for the creation of regional health information networks, which are seen as an important step towards the goal of interconnecting the health care system nationwide. On July 27, the Senate Committee on Health, Education, Labor, and Pensions reported a bipartisan health IT bill.

In what would signal a major shift in the way Medicare pays for many products and services, the 109th Congress is considering basing a portion of providers' payments on the quality of their care. The Senate Finance Committee has included such pay for performance language in its budget resolution legislation. Under the current payment systems, providers are paid the same regardless of the quality of their services. Introducing pay for performance into Medicare will likely boost IT use; existing pay for performance programs reward providers for adopting electronic medical records and other IT products and services. Adopting health IT systems in clinical settings is also crucial for monitoring and reporting patient outcomes.

For Further Information

CRS Report RL32858, *Health Information Technology: Promoting Electronic Connectivity in Healthcare*
CRS Report RL31983, *Health Care Quality: Improving Patient Safety by Promoting Medical Errors Reporting*
CRS Report RS20500, *Medical Records Privacy: Questions and Answers on the HIPAA Rule*

E-Government

Electronic government (e-government) is an evolving concept, meaning different things to different people. E-government initiatives vary significantly in their breadth and depth from state to state and agency to agency. As policymakers continue to grapple with a common understanding of e-government, a central issue is oversight of the coordination and implementation of the disparate e-government initiatives across the federal government.

Pursuant to the July 18, 2001, OMB Memorandum M-01-28, an E-Government Task Force created a strategy for achieving the Bush Administration's e-government goals [http://www.whitehouse.gov/omb/inforeg/egovstrategy.pdf]. In doing so, the Task Force identified 23 interagency initiatives designed to better integrate agency operations and information technology investments. These initiatives, sometimes referred to as the Quicksilver projects, are grouped into five categories; government-to-citizen (G2C), government-to-government (G2G), government-to-business (G2B), internal effectiveness and efficiency, and addressing barriers to e-government success. Examples of these initiatives include an e-authentication project led by the General Services Administration (GSA) to increase the use of digital signatures, the eligibility assistance online project (also referred to as GovBenefits.gov) led by the Department of Labor to create a common access point for information regarding government benefits available to citizens, and the Small Business Administration's One-Stop Business Compliance project, being designed to help businesses navigate legal and regulatory requirements. A 24th initiative, a government wide payroll process project, was subsequently added.

On December 17, 2002, President Bush signed the E-Government Act of 2002 (P.L. 107-347) into law. The law contains a variety of provisions related to federal government information technology management, information security, and the provision of services and information electronically. One of the most recognized provisions involves the creation of an Office of Electronic Government within OMB. The Office is headed by an Administrator, who is responsible for carrying out a variety of information resources management (IRM) functions, as well as administering the interagency E-Government Fund provided for by the law.

For the 109th Congress, some of the oversight issues attracting the most interest include the completion of the Quicksilver projects, efforts to develop a Federal Enterprise Architecture (FEA), and the implementation of the E-Government Act, as well as efforts to mediate the differences and capitalize on the similarities between e-government and homeland security priorities. In addition, the movement to expand the presence of government online raises as many issues as it provides new opportunities. Some of these issues concern: security, privacy, management of governmental technology resources, accessibility of government services (including "digital divide" concerns as a result of a lack of skills or access to computers, or disabilities), and preservation of public information (maintaining comparable freedom of information procedures for digital documents as exist for paper documents). Although these issues are neither new nor unique to e-government, they do present the challenge of performing governance functions online without sacrificing the accountability of or public access to government that citizens have grown to expect. (See CRS Report RL31057.) For a discussion of evolving policies related to scientific and technical information access, see the "Public Access to Scientific Information" section earlier in this report.

For Further Information

CRS Report RS22194, *Federal Enterprise Architecture and Information Technology Management: A Brief Overview*

CRS Report RL31057, *A Primer on E-Government: Sectors, Stages, Opportunities, and Challenges of Online Governance*

CRS Report RL31289, *The Internet and the USA PATRIOT Act: Potential Implications for Electronic Privacy, Security, Commerce, and Government*

Open Source Software

Open source software refers to a computer program whose source code, or programming instructions, is made available to the general public to be improved or modified as the user wishes. In contrast, closed source, or proprietary, programs, which comprise the majority of the software products most commonly used, are those whose source code is not made available and can only be altered by the software manufacturer. Some examples of open source software include the Linux operating system and Apache Web server software.

The use of open source software by the federal government has been gaining attention as organizations continue to search for opportunities to enhance their information technology (IT) operations while containing costs. For the federal government and Congress, discussion over the use of open source software intersects several other issues, including, but not limited to, the development of homeland security and e-government initiatives, improving government information technology management practices, strengthening computer security, and protecting intellectual property rights. In the 109th Congress, the discussion over open source software revolves primarily around information security and intellectual property rights. However, issues related to cost and quality are also of interest.

For proponents, open source software is often viewed as a means to reduce an organization's dependence on the software products of a few companies while possibly improving the security and stability of one's computing infrastructure. For critics, open source software is often viewed as a threat to intellectual property rights with unproven cost and quality benefits. So far there appear to be no systematic analyses available that have conclusively assessed security issues for closed source versus open source software. In practice, computer security is highly dependent on how an application is configured, maintained, and monitored. Similarly, the costs of implementing an open source solution are dependent upon factors such as the cost of acquiring the hardware/software, investments in training for IT personnel and end users, maintenance and support costs, and the resources required to convert data and applications to work in the new computing environment. Consequently, some computer experts suggest that it is not possible to conclude that either open source or closed source software is inherently more secure or more cost efficient.

The growing emphasis on improved information security and critical infrastructure protection overall will likely be an influential factor in future decisions on whether to implement open source solutions. The rapidly changing computer environment may also foster the use of a combination of open source and closed source applications, rather than creating a need to choose one option at the exclusion of another.

For Further Information

CRS Report RL31627, *Computer Software and Open Source Issues: A Primer*

Wireless Privacy, Internet Privacy, and Spyware

Wireless telecommunications devices are ubiquitous. Some consumers, already deluged with unwanted commercial messages ("spam") via computers that access the Internet by traditional wireline connections, are concerned that such unsolicited advertising is expanding to wireless communications, further eroding their privacy. Another concern is that their cell phone numbers may soon become public because some of the wireless service providers are creating a "wireless 411" phone directory. Whether the service providers should be legally required to obtain customers' consent before including their phone numbers in the directory, or if the service providers should be allowed to charge customers a fee if they want an unlisted number, is currently being debated.

Internet privacy issues encompass a range of concerns. One is the monitoring of electronic mail (e-mail) and Web usage by law enforcement officials or employers. In the wake of the September 11, 2001 terrorist attacks, debate over the issue of monitoring of e-mail and Web usage by law enforcement and government officials has intensified, with some advocating increased tools for law enforcement to track down terrorists, and others cautioning that fundamental tenets of democracy, such as privacy, not be endangered in that pursuit. The USA PATRIOT Act (P.L. 107-56) makes it easier for government and law enforcement officials to monitor Internet activities, and for Internet Service Providers to voluntarily disclose the content of e-mails under certain conditions. Congress and public interest groups are monitoring how the USA PATRIOT Act is implemented.

Another Internet privacy issue, spyware, is also a focus of congressional concern. There is no firm definition of spyware, but one example is software products that include a method by which information is collected about the use of the computer on which the software is installed, and the user. When the computer is connected to the Internet, the software periodically relays the information back to the software manufacturer or a marketing company. Some spyware traces a user's Web activity and causes advertisements to suddenly appear on the user's monitor — called "pop-up" ads — in response. Typically, users have no knowledge that the software they obtained included spyware and that it is now resident on their computers. Congress is debating what restrictions, if any, should be placed on spyware.

For Further Information

CRS Report RL31636, *Wireless Privacy and Spam: Issues for Congress*
CRS Report RL31408, *Internet Privacy: Overview and Pending Legislation*
CRS Report RL31289, *The Internet and the USA PATRIOT Act: Potential Implications for Electronic Privacy, Security, Commerce, and Government*
CRS Report RL32706, *Spyware: Background and Policy Issues for Congress*
CRS Report RS22082, *Identity Theft: the Internet Connection*

Tsunamis and Other Emergencies: Forecasting and Warning Systems

Tsunami Forecasting and Warning

Some U.S. lawmakers became concerned about the possible vulnerability of U.S. coastal areas to tsunamis, and about the adequacy of early warning for coastal areas of the far Pacific possessions and western Atlantic Ocean. These concerns stem from the December 26, 2004, tsunami that devastated many coastal areas around the northern Indian Ocean, where few tsunami early warning systems currently operate. Others have questioned whether the risks for the United States justify such expenditures, however. On February 14, 2005, the Bush Administration committed $30 million over two years to the National Weather Service to upgrade U.S. tsunami warning capabilities, including expanded coverage for the Pacific Ocean and the U.S. Atlantic seaboard. Passage of FY2005 emergency supplemental appropriations (P.L. 109-13) provided $24.3 million toward that goal. Legislation is currently pending in Congress about how to deploy such systems, including next generation tsunami detection buoys, additional coastal tidal-gages, and telecommunications enhancements for the U.S. Geological Survey's Global Seismic Network, which detects underwater earthquakes that can generate tsunamis. Many developed nations currently have the technological capacity to build warning networks, and some have long established advanced emergency management capabilities. Others, however, will have to rely on an international consolidation of resources and expertise to develop local tsunami warning capacity; to educate indigenous people and visitors about such disasters; and to learn to employ strategies for adapting to such risks. Participation in the Global Environmental Observation System of Systems (GEOSS) is one way the United States plans to meet global tsunami warning challenges. The National Oceanic and Atmospheric Administration (NOAA, part of the Department of Commerce) is the lead U.S. agency in the 61-nation GEOSS program.

For Further Information

CRS Report RL32739, *Tsunamis: Monitoring, Detection, and Early Warning Systems*
CRS Report RS22109, *The National Oceanic and Atmospheric Administration (NOAA) Budget for FY2006: President's Request, Congressional Appropriations, and Related Issues*

Technology for Warning Systems and Alerts

The absence of advance warning to communities inundated by the December 26, 2004 tsunami provided a harsh reminder of the role of emergency alert systems in saving lives. Today, the two major alert systems in the United Stares are the Emergency Alert System (EAS) and the NOAA Weather Radio (NWR) All-Hazards Network (NOAA is the National Oceanic and Atmospheric Administration, an agency of the Department of Commerce). The EAS is jointly administered by the Federal Communications Commission and the Federal Emergency Management Agency (FEMA). It depends on radio and television broadcasters, as well as most cable operators, to provide information in times of emergency. Widely used for local warnings about weather and other emergencies, EAS has never been activated for a

national emergency. The other mainstay for emergency alerts is provided through the National Weather Service (NWS) of NOAA. NWS sends alerts through the NWR All-Hazards Network. NOAA continues to expand its weather alert system to include warnings for all hazards and is working to expand the network to include all types of media.

Several initiatives are underway within the federal government to improve, expand, and integrate existing warning systems. The most important of these — in terms of using, testing and developing leading-edge technology — is the Integrated Public Alert and Warning System (IPAWS), a public-private partnership in which the Department of Homeland Security (DHS) has a leadership role. The Intelligence Reform and Terrorism Prevention Act (P.L. 108-458) contains two provisions for collecting information on emergency alert systems. One requires a study about the use of telecommunications networks as part of an all-hazards warning system, specifying that technologies to consider would be "telephone, wireless communications, and other existing communications networks...." The act also requires a pilot study using technology now being used for an Amber Alert network, to improve public warning systems regarding threats to homeland security. Increasingly, new technology is being put to use for Amber Alert programs administered in some states and communities to aid primarily in the recovery of abducted children.

The convergence of communications technology, typified by the near-ubiquity of the Internet and the wide availability of advanced wireless telephony, presages a world of end-to-end communications for public safety communications, including warning systems. The 9/11 Commission commented on the often inadequate response of the 911 call centers serving New York City, and suggested that 911 call centers be integrated into the emergency response team, in order to involve them in providing up-to-date information and assistance to the public. In a bill enacted in December 2004, Congress created an E-911 Implementation Coordination Office to foster improvements in 911 call centers (P.L. 108-494, Title I).

The two reports on technologies that might be used to improve emergency notification and warning networks, required by P.L. 108-458, are due by the end of 2005. After receiving these reports, Congress may take further action regarding emergency alert systems in the United States. The availability of new technologies has raised the bar of public expectations for the provision of many types of public safety services.

CRS Report RL32527, *Emergency Communications: The Emergency Alert System and All-Hazard Warnings*
CRS Report RS21453, *Amber Alert Program Technology*
CRS Report RL32939 *An Emergency Communications Safety Net: Integrating 911 and Other Services*

Geosciences Issues

Ocean Commissions: Ocean Science and Oceanic Affairs

In June 2003, the Pew Oceans Commission presented to Congress and the nation 26 recommendations in its final report, *America's Living Oceans: Charting a Course for Sea Change*. The report outlined a national agenda for protecting and restoring our oceans. The final report of the U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century*, containing extensive recommendations on a coordinated and comprehensive national ocean policy, was delivered to Congress and the President on September 20, 2004.

Those reports cover an array of issues, such as law of the sea; national and regional governance; federal organization, regulation, and enforcement; offshore management regimes; funding for sound science, research and exploration and for implementing commission recommendations; oceanic education; coastal and watershed management; and ecosystem based management. Congress is in the process of considering legislative responses to the findings and recommendations of both commissions. Ancillary issues relate to questions about the timing and level of the response and the fiscal implications and out-year budgetary impacts on current and future ocean programs. While some argue that congressional action is more pressing for major coastal and marine laws that are expiring or expired, others counsel delay in reauthorization until Congress can draw form the reports. The same law that created the U.S. Commission (P.L. 106-256) also required the President to submit to Congress a statement responding to the commission's recommendations for a national policy on ocean and coastal resources. That statement, *U.S. Ocean Action Plan*, was delivered to Capitol Hill on December 17, 2004. It was largely limited to documenting current efforts. Many in the ocean community view the Administration's response as limited and are likely to seek more extensive action through Congress, especially to address topics that are driving this interest. In this current session, committees of relevant jurisdiction have adhered to their own ocean action agendas, guided, in large part, by the Pew and U.S. Commission reports, and have shown little interest in holding hearings to assess the Administration's statement.

Consideration has focused on organic legislation for the National Oceanic and Atmospheric Administration (NOAA), a prominent recommendation in both commission reports. Members have dealt with such organizational issues as, establishing NOAA as an independent agency, transferring NOAA to another department, or maintaining the status quo in the Department of Commerce, with enhanced budget authority. The 109th Congress is also considering other ocean matters, including ocean exploration; ocean and coastal observing systems; marine debris research, prevention, and reduction; and ocean and coastal mapping integration. Related issues have arisen, such as whether to: (1) provide additional funds for ocean and coastal resource management, oceanic education, marine science, and ocean research; (2) replace a fragmented administrative structure with a more overall, coherent federal organization; or (3) adopt bold new approaches for managing marine resources, such as setting aside large reserves from selected or all uses. Omnibus legislation has been introduced in the House and Senate whose contents encompass this broad array of crosscutting concerns. Hearings on that legislation are anticipated.

For Further Information

CRS Issue Brief IB10132, *Ocean Commissions: Ocean Policy Review and Outlook*

Global Climate Change

Congress has maintained an active and continuing interest in the implications of, and the issues associated with, possible global climate change for the United States. Having received the required number of ratifications, the Kyoto Protocol to the United Nations Framework Convention on Climate Change entered into force on February 16, 2005, establishing binding commitments for reductions in greenhouse gases. The United States "signed" the protocol, but President Clinton during his term did not submit it to the Senate for advice and consent to ratification. In March 2001, the Bush Administration indicated its opposition to the Kyoto Protocol and essentially rejected it, citing possible harm to the U.S. economy and lack of developing country participation.

On February 14, 2002, President Bush announced a U.S. policy framework for global climate change, outlining a Climate Change Research Initiative (CCRI) and a National Climate Change Technology Initiative (NCCTI), along with a new Cabinet-level Committee on Climate Change Science and Technology Integration to oversee their implementation. The CCRI focuses on short-term, policy-relevant objectives of climate change science. A previously established U.S. Global Change Research Program (USGCRP) supports long-term, fundamental, scientific research objectives. Both the new CCRI and the existing USGCRP were combined for the first time into the Climate Change Science Program (CCSP) in the FY2004 budget. The FY2006 budget requested a total spending level of $1.886 billion for research managed by the CCSP, which was $27 million (1.4%) below the FY2005 funding estimate of $1.913 billion. Included in the $1.886 billion CCSP funds were $183 million for the CCRI. While funding for the embedded CCRI experienced growth over two fiscal years from FY2003 to FY2005, the FY2006 request for CCRI at $183 million was $38 million less than the FY2005 funding estimate of $221 million. That left the FY2006 request for the embedded USGCRP standing at $1.703 billion, approximately level with the FY2005 funding estimate. There was some $2.87 billion in the FY2006 funding request for technology research and development in the NCCTI/Climate Change Technology Program, an amount $120 million, or 4%, below the FY2005 funding estimate of $2.99 billion. Three reports released in 2003 currently serve as guidance documents for those activities: *Climate Change Science Program Strategic Plan*, *Technology Options for the Near and Long Term*, and *Research and Current Activities*. The FY2006 budget request indicated that a strategic plan for climate change technology research and development would be released sometime in 2005. Two issues of concern for Congress are the extent to which spending for the CCRI and NCCTI represent new money versus how much is attributable to the reclassification of ongoing research and technology programs, and whether the overall reduced level of requested funds may be deemed necessary or sufficient to accomplish the work of the CCSP.

Discourse in Congress over the prospect of global warming and what the United States could or should do about it has yielded, over the last several years, a range of legislative proposals. Arguments have been presented that policy actions to reduce

emissions of carbon dioxide and other greenhouse gases should be taken now, in line with the intent of the Kyoto Protocol. Alternative arguments have called for delay, citing challenging issues that were regionally complex, politically delicate, and scientifically uncertain; the need to expand technological options for mitigating or adapting to the effects of any climate change; and the associated high cost of certain mitigation schemes that would prematurely replace existing capital stock before the end of its economic life. Issues before the 109th Congress include greenhouse gas reduction and carbon dioxide emissions trading systems (see CRS Report RS22076 and CRS Report RL32721); energy issues relevant to climate change, especially those associated with energy efficiency and alternative energy sources; carbon sequestration technologies and methodologies; federal and national response strategies vis-a-vis the prospect of abrupt climate change, climate change impacts, and climate system surprises; performance and results of federal spending on climate change science and technology programs, and, more broadly, on global change research programs; long-term research and development programs to foster new technologies to help stabilize greenhouse gas emissions; and efforts to promote climate change technology deployment both here and abroad.

For Further Information

CRS Issue Brief IB89005, *Global Climate Change*
CRS Issue Brief IB10041, *Renewable Energy: Tax Credit, Budget and Electricity Production Issues*
CRS Issue Brief IB10020, *Energy Efficiency: Budget, Oil Conservation, and Electricity Conservation Issues*
CRS Report RL32997: *Climate Change: Federal Expenditures for Science and Technology*

Energy and Water Issues

Hydrogen Fuel and Fuel Cell Vehicles

Hydrogen fuel and fuel cell vehicles have been the focus of increased attention, especially with the announcement of the Hydrogen Fuel Initiative during the January 2003 State of the Union Address. Over five years, the Administration is seeking a total funding increase of $720 million. This initiative would fund research on hydrogen fuel and fuel cells for transportation and stationary applications, and would complement the existing FreedomCAR initiative, which focuses research on the development of advanced technologies for passenger vehicles. In the FY2004 Energy and Water Development appropriations act (P.L. 108-137), and the FY2004 Interior and Related Agencies appropriations act (P.L. 108-108), Congress approved an increase of approximately $55 million for the initiatives. For FY2005, Congress approved an additional $25 million above the FY2004 level in the FY2005 Consolidated Appropriations Act (P.L. 108-447). For FY2006, the Administration has requested an additional $19 million above FY2005 — $98 million above FY2003.

In addition to appropriations legislation, on August 8, 2005, the President signed the Energy Policy Act of 2005 (H.R. 6). Among other provisions, this bill includes

authorizations for hydrogen and fuel cell R&D. The energy bill authorizes a total of $3.3 billion between FY2006 and FY2010. The bill also establishes a tax credit for the purchase of hydrogen-fueled and fuel cell vehicles.

Issues facing Congress on hydrogen fuel and fuel cell vehicles include the proper role of the government in the research and development of consumer products; the ultimate viability of hydrogen and fuel cell technologies; the potential role for the government in expanding hydrogen fueling infrastructure; safety standards, codes, and liability concerns surrounding new technology and a new system for delivering energy; and issues related to future market penetration of fuel cell vehicles.

For Further Information

CRS Report RS21442, *Hydrogen and Fuel Cell Vehicle R&D: FreedomCAR and the President's Hydrogen Fuel Initiative*
CRS Issue Brief IB10128, *Alternative Fuels and Advanced Technology Vehicles: Issues in Congress*

Reprocessing of Spent Nuclear Fuel

Spent fuel from commercial nuclear reactors still contains most of its original uranium, as well as plutonium created from some of the fuel's uranium during reactor operation. A fundamental issue in nuclear policy is whether spent fuel should be "reprocessed" to extract its plutonium and uranium for use in new reactor fuel, or whether spent fuel should be directly disposed of without reprocessing. Nuclear power supporters point out that huge amounts of energy could be produced from the uranium and plutonium in spent fuel. However, plutonium can also be used for nuclear weapons, so groups concerned about nuclear weapons proliferation contend that federal support for spent fuel reprocessing could undermine U.S. nuclear nonproliferation policies.

In the 1950s and 1960s, the federal government expected that all commercial spent fuel would be reprocessed, even though existing "light water reactors" — the type still in use today — produced relatively little plutonium and could not fission all the isotopes of the plutonium that they did produce. The federal government's nuclear strategy called for the eventual replacement of light water reactors with "breeder reactors" that would convert enough uranium into plutonium to fuel a growing fleet of commercial breeder reactors indefinitely.

In the 1970s, however, concern increased about the weapons-proliferation implications of nuclear reprocessing, while the growth of nuclear power was far slower than initially projected. President Carter halted commercial reprocessing efforts in 1977, along with a demonstration breeder reactor. President Reagan restarted the breeder demonstration project, but Congress halted further funding in 1983. Nevertheless, Congress continued to fund a breeder-related research and development program, called the Advanced Liquid Metal Reactor (or the Integral Fast Reactor). To address weapons proliferation concerns, spent fuel from this reactor was to be reprocessed with an electrometallurgical system designed to only partially separate plutonium and uranium. Congress halted funding for the Advanced Liquid

Metal Reactor in 1993, but appropriations continued at a lower level for research on the associated electrometallurgical reprocessing technology.

The Bush Administration's energy policy, issued in early 2001, called for renewed federal support for nuclear reprocessing and related technologies. The Department of Energy is implementing that policy through the Advanced Fuel Cycle Initiative (AFCI), which was first funded in FY2003 and then increased by Congress for FY2004, and again in FY2005.

The Administration's FY2006 budget request continues to view the AFCI program as complementing nuclear nonproliferation efforts by developing proliferation-resistant fuels and supporting the Administration's "National Energy Policy" (NEP) goals by expanding the potential contribution of nuclear power to the nation's energy portfolio. The Consolidated Appropriations Act for FY2005 (P.L. 108-447) funded the program at $68.0 million. The Administration's FY2006 request would boost funding to $70.0 million, approximately 3%.

The Administration contends that in addition to extending nuclear fuel supplies, the Advanced Fuel Cycle Initiative could significantly reduce the volume and long-term toxicity of nuclear waste. Separating plutonium and other long-lived radioactive isotopes from spent fuel and splitting them or "transmuting" them into shorter-lived isotopes would reduce the hazardous life of nuclear waste from 300,000 years to less than 1,000 years, asserts the Administration. Critics of the program counter that spent fuel reprocessing in the past has generated large quantities of radioactive waste that can create significant management and disposal problems. They also contend that reprocessing is not economically viable (especially given the price and availability of uranium ore), and continues to pose the same weapons proliferation risks that prompted President Carter to end it in the 1970s.

The Energy Policy Act of 2005 (Sec. 953, Advanced Fuel Cycle Initiative) calls for an advanced fuel recycling technology program to evaluate proliferation-resistant fuel recycling and transmutation technologies as an alternative to aqueous reprocessing technologies. This program would support the evaluation of alternative national strategies for spent nuclear fuel and the Generation IV advanced reactor concepts.

For Further Information

CRS Issue Brief IB88090, *Nuclear Energy Policy*

Fusion Research: ITER

The ITER project is an international scientific collaboration to construct a facility for fusion energy research. The partners include the European Union, Japan, Russia, the United States, China, and South Korea. Canada withdrew its participation in December 2003. India announced in July 2005 that it wishes to join. A long-running disagreement over where to build the facility was resolved in June 2005 with the selection of a site in Cadarache, France, in preference to a site in Japan. (The United States initially supported the Japanese site.) In 1998, the United States withdrew from the design phase of ITER at congressional direction, largely because of concerns about

cost and scope. The project has since been restructured, and in January 2003, the Administration announced its intention to reenter the project. The U.S. share of the cost of building ITER (about 10 percent) is expected to be about $1.1 billion over eight years. Only a small portion of that would be required in FY2006 since construction has not yet begun. Once construction is complete, the U.S. share of the cost of operating ITER is expected to be about an additional $58 million per year. Key issues in the 109th Congress are the cost of U.S. participation, and the budget impact of ITER on the rest of the U.S. fusion program.

Water Supply Technology and Energy-Water Efficiency

Water resources research represents 0.5% of the approximately $130 billion annual federal R&D investment. This research is spread across almost twenty agencies. A 2004 report by the National Research Council (NRC), *Confronting the Nation's Water Problems: The Role of Research*, calls for a new commitment to water resources research to address the nation's water problems, and suggests a more central role for federal research in informing water resources issues. In particular, it calls for significant new investment research on water use and institutions, and a more coordinated federal water resources research agenda.

Real levels of spending on water resources research have remained relatively constant, at $700 million (in 2000 dollars) annually since the mid-1970s. Although the overall level is constant, funding appears to have declined for research in the following categories: water supply augmentation and conservation, water quality management and protection, water resources planning and institutions, and water resource data. In contrast, aquatic ecosystem research has increased substantially.

Because of the growing pressures on developed water supplies, interest in research on water supply technologies has been receiving particular attention. According to the 2004 NRC report, "water supply augmentation and conservation" research by federal agencies totaled $14.5 million in FY2000. In the past the federal government invested more in this area; in the late 1960s, federal research in desalination and other saline water conversion activities exceeded $100 million (in 2000 dollars) annually. Desalination is the process of removing dissolved solids (primarily dissolved salts and other minerals) from water. Interest in desalination of seawater, brackish water, and contaminated freshwater water has increased as the cost of the dominant technology in the nation — reverse osmosis — has fallen and the pressure to develop new water supplies has grown.

Desalination is seen as a possible option for meeting water demands particularly for coastal communities that can desalinate seawater or estuarine water, interior communities above brackish groundwater aquifers, and communities with contaminated water supplies. Desalination's attraction is that it can create a new source of freshwater from otherwise unusable waters, and a more predictable source than freshwater supplies that rely more directly on annual or multi-year precipitation, runoff, and recharge rates. At issue is the level of federal investment that Congress establishes for desalination research and development by federal agencies. The Bush Administration has expressed support for current desalination research efforts aimed at reducing costs, while criticizing bills seeking financial support for specific desalination facilities. A water supply technology program for research, technology

transfer, and commercialization was the subject of some congressional discussion in the 108th Congress, and debate may continue in the 109th Congress.

Biomedicine Issues

National Institutes of Health (NIH) Organization and Management Issues

The National Institutes of Health (NIH), the primary medical research agency of the federal government, is facing challenges in a number of areas that may interest the Congress. In the budgetary arena, the past two years have been a time of transition from a period of marked growth in the NIH appropriation to the current climate of restrained domestic discretionary spending. Over a five-year period, Congress doubled the NIH budget, from $13.6 billion in FY1998 to $27.1 billion in FY2003. Since then, growth has slowed to below the rate of inflation, and the President's request for FY2006 is for $28.6 billion, an increase of 0.5% over FY2005.

In looking ahead to the post-doubling years, the research advocacy community had urged that there be a less-precipitous drop in funding in order to maintain support of research grants, keep young investigators in the pipeline, and capitalize on the momentum of discoveries in both basic and applied research. The NIH institutes and centers likewise have been making adjustments in their research portfolios to protect funding for grants, and the FY2006 budget request emphasizes funding for research project grants over some other activities, such as facilities construction. Nonetheless, the extramural research community, which has urged a 6% increase for FY2006, is expecting cutbacks in grant budgets, tight competition for new awards, and postponement of some large projects previously anticipated, including clinical trials. Advocates warn that research advances on the major chronic conditions that burden our society, such as heart disease, cancer, stroke, and diabetes, may be slowed. Other commentators advise that coping with the reality of budget constraints will require NIH and the research community to rethink some of their traditional approaches to planning and organizing research. The resources of the doubling years have spurred development of unifying concepts of fundamental biology and understanding of disease processes that formerly were thought to be unrelated. Scientific leaders in and out of NIH urge critical examination of the best ways to transform knowledge into medical applications and allocate resources into the most critical priorities for return on the public's investment.

A key factor in such rethinking is consideration of NIH's organizational structure, which has expanded markedly over time along with the growth in the budget. The agency is comprised of 27 semi-autonomous institutes and centers, loosely coordinated by the central Office of the Director. As new entities have been created by Congress, each with its own mission, budget, staff, review office, and other bureaucratic apparatus, the costs and complexities of administering the enterprise have multiplied. Further, NIH wishes to emphasize a culture of multi-disciplinary teamwork, but many observers fear that the present structure of multiple independently operated institutes may undermine important initiatives in cross-disciplinary research, especially in fields such as neurosciences. To address these issues, NIH has been increasingly emphasizing an effort termed the "NIH Roadmap

for Medical Research" [http://nihroadmap.nih.gov]. Launched in September 2003, the Roadmap has identified critical scientific gaps that may be constraining rapid progress in biomedical research, and which no one institute can tackle alone. NIH-wide priorities and initiatives have been developed in three broad areas, focusing on new paths to biological discoveries, more interdisciplinary research, and improving clinical research. Congress has already held a number of hearings on these issues, but has not reauthorized NIH since 1993. Oversight hearings and discussions on draft reauthorization legislation have considered questions such as NIH's stewardship of its resources; the relative roles of the NIH Director and the institutes; and the optimum alignment of budgetary accounts, organizational structure, and statutory authority. Possible proposals for change include giving the NIH Director's Office more planning involvement and budgetary control over cross-institute research initiatives, grouping the institutes and centers differently for authorizations and/or appropriations, and, for the first time, setting overall authorization levels for NIH.

Various personnel management issues concerning NIH employees have also been monitored by Congress. Following several oversight hearings, new ethics regulations were issued by the Department of Health and Human Services (HHS) in February 2005 to address the potential for conflicts of interest when NIH scientists engage in outside consulting work with pharmaceutical or biotech companies, receive awards or other forms of compensation from entities that might compete for NIH funds, or have financial holdings in companies connected to medical research. The concern is greatest in the case of scientists who have decision-making authority on grants, but many do not. The new regulations, which impose strict limits on all NIH staff, have been questioned for their fairness and for their possible effect on retention and hiring of scientists and other employees. Implementation of new rules on financial holdings and disclosure by NIH staff have been delayed several times by HHS. As a related issue, there are a number of hiring authorities under which scientists may work for NIH, some with special pay bonuses, and questions have been raised about the use of some of these authorities.

For Further Information

CRS Report RL32799, *Federal Research and Development Funding: FY2006*

Human Cloning and Embryonic Stem Cell Research

Embryonic stem cells have the ability to develop into virtually any cell in the body, and may have the potential to treat medical conditions such as diabetes and Parkinson's disease. Human embryonic stem cells are derived from very early embryos (5-days-old) that were created by in vitro fertilization (IVF) either for infertility treatment or for research purposes. Work on human embryonic stem cells is controversial, in the opinion of some individuals, because the cells are located within the embryo and the process of removing them destroys the embryo.

Another potential source of embryonic stem cells involves cloning: the nucleus of an egg is removed and replaced by the nucleus from a mature body cell, such as a skin cell. The cell created via cloning is allowed to develop for five days and then the stem cells are removed. In May 2005, scientists in South Korea announced they had

achieved major advances in the efficiency of creating human embryos using cloning methods and in isolating human stem cells from cloned embryos. This development and the unsubstantiated announcement by Clonaid in December 2002 of the birth of a cloned child have contributed to the controversy over research on human embryos.

President Bush announced in August 2001 that, for the first time, federal funds would be used to support research on human embryonic stem cells, but funding would be limited to "existing stem cell lines." The National Institutes of Health (NIH) has established the Human Embryonic Stem Cell Registry which lists stem cell lines eligible for use in federally funded research. Although 78 embryonic stem cell lines are listed, only 22 are currently available. Subsequently the debate has centered on whether the number of cell lines allowed under the Bush policy are sufficient to permit U.S. research to remain internationally competitive in this very important new technology.

Scientists are concerned about the quality, longevity, and availability of the 22 stem cell lines. For a variety of reasons, many believe research advancement requires new embryonic stem cell lines, and for certain applications, stem cells derived from cloned embryos may offer the best hope for progress in understanding and treating disease. A significant cohort of pro-life advocates support stem cell research; those opposed are concerned that the isolation of stem cells requires the destruction of embryos.

Another impediment to such research is the Dickey Amendment which has been added to each Labor, HHS and Education appropriations act from FY1997 through FY2005. It prohibits HHS from using appropriated funds for the creation of human embryos for research purposes or for research in which human embryos are destroyed. As a result, federal funds cannot be used for most forms of human embryo research including the isolation of new stem cell lines or the cloning of human embryos for any purpose. The Bush Administration established the President's Council on Bioethics in November 2001 to consider all of the medical and ethical ramifications of biomedical innovation. In July 2002, the Council released its report on human cloning, which unanimously recommended a ban on reproductive cloning and, by a vote of 10 to 7, a four-year moratorium on cloning for medical research purposes. The Council released a second report on the issue, *Monitoring Stem Cell Research*, in January 2004.

In May 2005. the House passed legislation that would allow federal support of research using embryonic stem cells regardless of the date on which the stem cells were derived from a human embryo, thus negating the current policy that limits funding to stem cell lines in existence as of August 2001. Only excess IVF embryos that the individuals seeking fertility treatments have determined will not be implanted and will be discarded are eligible for stem cell derivation; written consent is required. The House also passed a bill which would provide for the collection and maintenance of human cord blood stem cells for the treatment of patients and for research. Action on the Weldon bill, which passed the House in the 108th Congress and stalled in the Senate, is also likely. The bill bans the process of cloning as well as the importation of any product derived from an embryo created via cloning. It bans not only reproductive applications, but also research on therapeutic uses, which has implications for stem cell research. Advocates of the legislative ban say that allowing

any form of human cloning research to proceed raises serious ethical issues and will inevitably lead to the birth of a baby that is a human clone. Critics argue that the measure would curtail medical research and prevent Americans from receiving life-saving treatments created overseas. Given the changed composition of the Senate, it is more likely that this bill would move forward for a vote in that body during the 109th Congress. Legislation that bans only human reproductive cloning has also been introduced, as well as bills focused on alternative sources of stem cells. For information on the status of 109th Congress legislation, see CRS Report RL31358.

For Further Information

CRS Report RL31358, *Human Cloning*
CRS Report RL31015, *Stem Cell Research*
CRS Report RL31422, *Substantive Due Process and a Right to Clone*
CRS Report RS21044, *Background and Legal Issues Related to Stem Cell Research*
CRS Report RL31142, *Stem Cell Research and Patents: An Introduction to the Issues*
CRS Report RS21517, *State Laws on Human Cloning*
CRS Report RL31211, *Cloning: A Select Chronology*

Human Genetics

Collectively, genetic diseases and common diseases with a genetic component pose a significant public health burden. With completion of the human genome sequence, scientists will now focus on understanding the clinical implications of the sequence information. Clinical genetic tests are becoming available at a rapid rate. Testing is regulated by the federal government and tests are beginning to be included in health insurance benefits packages.

The National Human Genome Research Institute (NHGRI) supports genetic and genomic research, investigation into the ethical, legal and social implications surrounding genetics research, and educational outreach activities in genetics and genomics for HHS. In FY2005, NHGRI's budget was $488.6 million.

Issues surrounding genetic discrimination and privacy in health insurance and employment are currently being debated in the 109th Congress. Among the issues are whether health insurance plans should be able to deny enrollment or charge higher premiums to individuals based on the individual's or family member's genetic information; privacy of genetic information; enforcement; and discrimination in employment. Some members of the health insurance industry and the U.S. Chamber of Commerce believe that current federal protections are sufficient to protect individuals from discrimination based on their genetic information. Others are concerned that the fruits of federal investment in the human genome project cannot be translated into advances in genetic information without explicit protections. The Senate passed S. 306 on February 17, 2005; it is supported by President Bush, industry, and health care professionals and consumer groups. An identical bill, H.R. 1227, was introduced in the house on March 10, 2005. For information on the status of 109th Congress legislation, see CRS Report RL32478.

For Further Information

CRS Report RL32478, *Genetic Testing: Scientific Background and Nondiscrimination Legislation*
CRS Report RL30006, *Genetic Information: Legal Issues Relating to Discrimination and Privacy*

Space and Aeronautics Issues

Impact of The "Vision for Space Exploration" on NASA's Aeronautics and Other Space Activities

On January 14, 2004, President George W. Bush announced a new Vision for Space Exploration, directing NASA to focus its efforts on returning humans to the Moon by 2020, and someday sending them to Mars and "worlds beyond." (See CRS Report RS21720.) The President's plan calls for most of the funding for the Vision to come from redirecting spending from other NASA activities. In a projected budget chart for FY2004-2020 that NASA released the same day as the President's speech, NASA's programs were grouped into those associated with the Vision and those that are not. Those that are not were categorized as *Aeronautics and Other Science Programs*, with funding remaining flat through the FY2004-2020 time frame. The "other science" is Earth science, and two Space Science disciplines, Sun-Earth Connections, and Structure and Evolution of the Universe. Advocates of aeronautics and the "other science" disciplines worry that funding for their research will suffer. Tracking funding for the "other science" activities is difficult because, in the FY2006 budget, they are merged with other programs. Aeronautics funding, however, is clearly identified, and is projected to decline 32 % from $1 billion in FY2004 to $718 million in FY2010.

The amount of funding for various activities will affect workforce levels at the nine NASA field centers around the country, and the Jet Propulsion Laboratory, a Federally Funded Research and Development Center (FFRDC) operated for NASA by the California Institute of Technology. For example, according to NASA briefing charts, the reduction in aeronautics funding will mean the elimination of 1,100 civil service jobs at NASA centers. Also, a 2003 assessment of NASA's aeronautics program by the National Research Council found that its center infrastructure exceeds its current needs. NASA officials insist that there are no plans to close any NASA centers. How to "right size" NASA, its facilities, and its workforce, and ensure NASA has the necessary skill mix for the Vision, are among the issues facing Congress.

The Vision also calls for the space shuttle fleet to be retired in 2010. Placing a fixed termination date on the shuttle system, however, may create schedule pressure similar to what the CAIB found to have contributed to the February 2003 *Columbia* tragedy (see CRS Report RS21408). Also, retiring the shuttle without another vehicle to replace it means that the United States would be completely dependent on Russia to take American crews to and from ISS until a new "Crew Exploration Vehicle" (CEV) is available. The President directed NASA to have the CEV ready for Earth-orbital flights by 2014, although NASA Administrator Griffin is taking action to accelerate the CEV's development. Some argue that the shuttle should be retained

until the CEV is available, while others want to retire the shuttle as soon as possible either so the funding can be redirected toward other aspects of the Vision, or because of shuttle safety concerns. Russia has been providing crew transport and "lifeboat" services to NASA for free since the *Columbia* tragedy under a 1996 agreement. That agreement will be fulfilled in April 2006, and Russian space officials have indicated that they will not provide such services for free thereafter. However, NASA is not permitted to make payments to Russia in connection with the ISS program under terms of the Iran Nonproliferation Act (INA, P.L. 106-178) unless Russia stops proliferating certain technologies to Iran (see CRS Report RS22072). The Bush Administration has proposed amending the INA to permit NASA to pay Russia for ISS-related services; Congress is considering the proposal. If INA is not amended, NASA is facing two deadlines: April 2006, when U.S. crews could only be aboard the ISS when the U.S. shuttle is docked there; and 2010, when U.S. crews would not be able to be aboard the ISS at all. Meanwhile, the shuttle's schedule remains uncertain because of problems during the launch of the first Return to Flight mission (STS-114) in July 2005. NASA has indefinitely postponed the next shuttle mission because of a foam-shedding event that occurred during STS-114's launch that is similar to what led to the loss of *Columbia.*

NASA officials have indicated that NASA may complete its use of the ISS by FY2017. Under the Vision, the only U.S. research that will be conducted on ISS is that needed to fulfill the Vision, i.e., to support human health and safety in exploring the Moon and Mars. NASA spends about $2 billion a year on ISS, in addition to the costs of the shuttle program (about $4-5 billion annually). Some question whether ISS is worth that level of investment considering the modest research objectives that remain. NASA is building ISS in partnership with Canada, Japan, Russia, and 10 European countries. Fulfilling U.S. commitments to those partners may be another rationale for continued U.S. involvement.

For Further Information

CRS Report RS21720, *Space Exploration: Overview of President Bush's "Vision for Space Exploration," and Key Issues for Congress*
CRS Report RS22063, *The National Aeronautics and Space Administration: Overview, FY2006 Budget in Brief, and Key Issues for Congress*
CRS Report RS22072, *The Iran Nonproliferation Act and the International Space Station: Issues and Options*
CRS Issue Brief IB93026, *Space Launch Vehicles: Government Activities, Commercial Competition, and Satellite Exports*
CRS Issue Brief IB93017, *Space Stations*

The Future of the Hubble Space Telescope

Two days after the President's Vision speech (see above), NASA announced that it would not use the space shuttle to conduct further servicing missions to the Hubble Space Telescope (see CRS Report RS21767). Then-NASA Administrator Sean O'Keefe cited shuttle safety concerns as the primary reason for his decision. Widespread criticism of that decision led NASA to explore the possibility of a robotic servicing mission. A December 2004 report from the National Research Council (NRC), however, concluded that a robotic servicing mission was not likely to succeed in the time available. The NRC

recommended proceeding with a shuttle servicing mission instead, but Mr. O'Keefe did not change his mind. Dr. Michael Griffin, who became NASA Administrator in April 2005, has stated that he will reassess whether to use the shuttle to service Hubble after the shuttle returns to flight status and flies two successful missions. Problems during the launch of the first "Return to Flight" mission in July 2005 led NASA to reground the shuttle fleet; a second mission is now not expected at least until March 2006. It is not known what impact this delay will have on the prospects for servicing Hubble. Meanwhile, cost estimates of $1 billion or more have raised questions about the affordability of a servicing mission. In the initial FY2006 budget, NASA requested money only for a deorbit mission (to ensure that Hubble reenters from orbit without posing danger to populated areas). A budget amendment in July 2005, however, included $30 million "to preserve the option of servicing the Hubble with a Space Shuttle mission until a decision can be made." Whether or not to service Hubble is a major issue facing Congress.

For Further Information

CRS Report RS21767, *Hubble Space Telescope: Should NASA Proceed with a Servicing Mission?*

National Security Space Programs

The Department of Defense (DOD) and the intelligence community conduct a space program larger in terms of funding than NASA. It involves building and launching satellites for communications, navigation, early warning of missile launches, weather, intelligence collection, and other purposes. Tracking the overall funding amount for the national security space program is difficult because it is not consolidated into a single account. According to the DOD Comptroller's office, DOD is requesting $22.5 billion for space programs in FY2006.

A number of DOD space programs are encountering cost growth and schedule delays, including the Air Force's Space Based Infrared System-High (SBIRS-High) for early warning of missile launches, the Air Force's Advanced Extremely High Frequency (AEHF) communications satellite system, and the National Reconnaissance Office's (NRO's) Future Imagery Architecture reconnaissance satellite system. DOD requests to initiate new programs, including the Transformational Satellite (T-SAT) communications satellite program, and a Space Based Radar (SBR) program, are controversial because of the potentially large costs involved (and therefore their affordability), and concern as to how to avoid the cost growth and schedule delays experienced in other DOD space programs.

For Further Information

CRS Report RS21148, *Issues Concerning DOD's SBIRS and STSS Programs*
CRS Issue Brief IB92011, *U.S. Space Programs: Civil, Military, and Commercial*
CRS Issue Brief IB93062, *Space Launch Vehicles: Government Activities, Commercial Competition, and Satellite Exports*

Appendix: List of Acronyms

ATP	Advanced Technology Program
CBRN	Chemical, Biological, Radiological, and Nuclear (terrorism)
CCRI	Climate Change Research Initiative
CCSP	Climate Change Science Program
CDC	Centers for Disease Control and Prevention
DARPA	(Department of) Defense Advanced Research Projects Agency
DHHS	Department of Health and Human Services (alternatively, HHS)
DHS	Department of Homeland Security
DOD	Department of Defense
DOE	Department of Energy
DTV	Digital Television
EHR	Electronic Health Records
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FOIA	Freedom of Information Act
GAO	Government Accountability Office
GPRA	Government Performance and Results Act
GSA	General Services Administration
HHS	(Department of) Health and Human Services (alternatively, DHHS)
IT	Information Technology
MEP	Manufacturing Extension Partnership
NAS	National Academy of Sciences (which together with the National Academy of Engineering and the Institute of Medicine form the "National Academies")
NASA	National Aeronautics and Space Administration
NCCTI	National Climate Change Technology Initiative
NHGRI	National Human Genome Research Institute
NHII	National Health Information Infrastructure
NIAID	National Institute of Allergy and Infectious Diseases (part of NIH)

NIH	National Institutes of Health (part of the Department of Health and Human Services)
NIST	National Institute of Science and Technology (part of the Department of Commerce)
NITRD	Networking Information Technology R&D
NOAA	National Oceanic and Atmospheric Administration (part of the Department of Commerce)
NSF	National Science Foundation
NSTC	National Science and Technology Council (part of OSTP)
OHS	Office of Homeland Security (in the White House)
OMB	Office of Management and Budget
ONCHIT	Office of the National Coordinator for Health Information
OSTP	Office of Science and Technology Policy
R&D	Research and Development
R&E	Research and Experimentation
RDT&E	Research, Development, Test and Evaluation
SBU	Sensitive But Unclassified
SHSI	Sensitive Homeland Security Information
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program