Order Code RL32837

CRS Report for Congress
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Science and Technology Policy: Issues for the 109th Congress

Updated February 3, 2006

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Science and Technology Policy: Issues for the 109th Congress

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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Science and Technology Policy: Issues for the 109th Congress

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 *Science 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 requested $132.4 billion in federal research and development (R&D) funding for FY2006. This sum represented a $400 million increase over the FY2005 estimated funding level of $132.0 billion. CRS estimates that Congress has approved a record $135.7 billion for federal R&D in FY2006 (this figure does not reflect the 1% across-the-board rescission passed in the Department of Defense Appropriations Act, 2006, P.L. 109-148). This represents a 2.8% increase over the FY2005 estimated funding level. Most of the increase can be attributed to increases in defense weapons systems and the National Aeronautics and Space Administration's (NASA) human space exploration technology program.

Five agencies account for 90% of all federal basic research expenditures. For FY2006, basic research funding declined to an estimated $26.7 billion before the 1% rescission (0.5% below estimated FY2005 levels). Total federal research funding (the sum of basic and applied research) is projected to increase $1 billion to $57 billion. However, the majority of that increase would go to NASA, while most of the remaining federal agencies would receive increases below the inflation rate for research funding.

While the President essentially requested flat funding for the Department of Defense (DOD) R&D programs, Congress approved an estimated $ 72.1 billion DOD R&D, a 4.2 % increase over FY2005 funding levels. Much of that increase is a result of Congress increasing DOD's proposed science and technology budget by $2.5 billion more than was requested by the Administration.

After the 1% rescission, funding for the National Institutes of Health (NIH) declined, in current dollars, for the first time in 36 years. When accounting for inflation, most R&D funding agencies now face budgets that are shrinking to levels of years past. NIH, National Science Foundation, DOE's Office of Science, NASA (excluding human space exploration), and Agriculture all have less R&D funding in FY2006 than in FY2003 in constant dollars.

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). Hearings were held in September 2005 on the two House bills. There are also proposals in the 109th Congress to create accountability commissions (H.R. 2470 and S. 1155). Some in Congress 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*
CRS Report RL32726, *Proposals for a Commission on the Accountability and Review of Federal Agencies (CARFA): Analysis and Issues for Congress*

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 35 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. OMB issued a second report on the IQA in December 2005, noting that agencies had received a total of 85 substantive correction requests by the end of FY2004. Of these, 45 were denied and 28 were appealed.

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. In December 2005, agencies were to file their first reports with OMB on the implementation of their peer review programs.

Congressional interest in both OMB's peer review bulletin and IQA during the second session of 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. Additionally, 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). In February 2005, the Government Accountability Office released the report *Border Security: Streamlined Visas Mantis Program Has Lowered Burden on Foreign Science Students and Scholars, but Further Refinements Needed* which 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."

On September 13, 2005, the House Subcommittee on National Security, Emerging Threats, and International Relations held a hearing to examine the procedures put in place to correct the gaps and vulnerabilities in the visa process. Attention was directed at the mechanisms that are necessary to strengthen the visa process as an antiterrorism tool while simultaneously facilitating legitimate travel by foreign students, scientists, researchers, and others in the United States. Witnesses testified that consular workloads have increased significantly, yet the visa-processing offices continue to lack strategic direction, adequate resources, and training. In

addition, reliable data are not readily available, across and among departments and agencies, to determine security and visa fraud related issues and overall increased visa wait times. Witnesses stated that because visa policies and requirements are ongoing and can change quickly, clear procedures on visa issuance and monitoring operations worldwide are necessary to guarantee that visas are adjudicated in a consistent manner at each visa-issuing post.

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 again proposed consolidating the Coast Guard program, along with the R&D activities of the Transportation Security Administration and some smaller programs. Congress again rejected the Coast Guard move. Consolidation remains an issue for congressional oversight in the 109th Congress. Other issues include questions about how DHS sets priorities among its various R&D programs, how it utilizes the R&D capabilities of the national laboratories, and how it manages and oversees R&D procurement.

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, was an estimated $4.6 billion (of which only $1.4 billion of was in DHS). The Administration has made homeland security a budget priority for interagency R&D planning, but further growth may pose challenges as the 109th Congress continues to balance 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 countermeasure 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 biomedical countermeasure development. 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 biomedical countermeasure 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. This attention appears likely to continue for the remainder of the 109th Congress.

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. As part the Department of Defense Appropriations Act, 2006 (P.L. 109-148), Congress limited the tort liability of biomedical countermeasure producers. Some of remaining issues likely to receive congressional consideration are provisions removing additional barriers that discourage private-sector countermeasures development, such as streamlining the Food and Drug Administration drug approval process and helping transition products from basic research into advanced development. 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*

CRS Report RS22327, *Pandemic Flu and Medical Biodefense Countermeasure Liability Legislation: P.L. 109-148, Division C (2005)*

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) barred access by certain groups of individuals, based on criminal history, immigration status, and other factors.

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 are required to submit detailed security, training, and record-keeping plans in order to be registered. Individuals given access to select agents must undergo background investigations conducted by the Federal Bureau of Investigation.

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 because this strain of human influenza is not included on the list of HHS select agents. However, highly pathogenic strains of avian influenza

("bird flu"), including the H5N1 strain now causing concern in Asia and Europe, are included on the USDA list. When scientists from the CDC and the Armed Forces Institute of Pathology recently re-created the 1918 pandemic flu virus, since it was a human influenza strain, it was not on the Select Agent list. It was subsequently added by HHS Secretary Leavitt on October 20, 2005. Other flu strains that typically affect humans — but not birds — remain unregulated at this time. Some have questioned whether human influenza strains should be included.

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 would 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. For example, 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.

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 control 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 were to become mandatory in December 2005, but NIST's release of all required documentation has been delayed for a few months.

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 preparing such guidance to the DHS Secretary; guidance has not been issued as of January 2006. On December 16, 2005 the President instructed federal agencies by memorandum to standardize procedures to designate, mark, and handle SBU information, and to forward recommendations for government-wide standards to the Director of National Intelligence (DNI). 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. Legislation has been introduced on these issues and the Government Accountability Office is inventorying federal agency use of SBU procedures.

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 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 will 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 the authority and influence of the DHS chief information officer (CIO), IT funding, information security, outsourcing, and technology development. In addition, in light of 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, compared to earlier efforts. Since September 2001, there have been a number of initiatives to use data mining to identify potential terrorists and/or terrorist-related activities that have attracted a high level of congressional interest. Some of these initiatives include DARPA's Total Information Awareness (TIA) program and the U.S. Army's Able Danger project, both of which are reported to have 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. Most recently, some Members of Congress have called for a broader congressional review of domestic data mining activities following the public revelation of reported ongoing data collection and sharing activities by the National Security Agency (NSA) in an attempt to identify potential terrorists who may be in the United States.

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 applicability 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 universal availability of and access to broadband, the regulatory treatment of incumbent cable and telecommunications providers and the impact of recent 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 over 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: Advanced Wireless Services*
CRS Report RL32985, *Defining Cable Broadband Internet Access Service: Background and Analysis of the Supreme Court's Brand X Decision*

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. DTV can provide sharper pictures, a wider screen, CD-quality sound, better color rendition, multiple video programming or a single program of high definition television (HDTV), and other new services currently being developed. Congress and the FCC 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) required 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 television stations would continue to broadcast both analog and digital signals past the 2006 deadline. The key issue for Congress and the FCC is: what steps should be taken by the government to further facilitate a timely, efficient, and equitable transition to digital television?

Paramount in this debate is setting a "hard" and "date-certain" deadline for the digital transition and addressing the millions of American over-the-air households whose existing analog televisions will require converter boxes in order to receive television service after analog signals are turned off. The FY2005 budget reconciliation conference agreement (Deficit Reduction Act of 2005, S. 1932, H.Rept. 109-362) sets the digital transition deadline at February 17, 2009, and allocates up to $1.5 billion for a digital-to-analog converter box subsidy program.

Other issues related to the digital transition could possibly be addressed during the second session of the 109th Congress. The conference agreement did not contain language addressing the multicast must-carry issue or the broadcast flag. Also, the conference agreement did not retain provisions in the House bill on digital to analog conversion and must carry (the "downconversion" issue, which addresses cable and satellite provision of broadcast signals to analog televisions).

For Further Information

CRS Report RL31260, *Digital Television: An Overview*
CRS Report RL32622, *Public Safety, Interoperability and the Transition to Digital Television*
CRS Report RS22218, *Spectrum Use and the Transition to Digital TV*
CRS Report RS22106, *Copyright Protection of Digital Television: The 'Broadcast Flag'*

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) required 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. In the study requested by Congress, the FCC sought comment on whether additional spectrum should be made available for public safety, possibly from the 700 MHz band. (*Report to Congress; on the study to assess short-term and long-term needs for allocations of additional portions of the electromagnetic spectrum for federal, state and local emergency response providers,* Federal Communications Commission, December 19, 2005.) Comments received from the public safety community overwhelmingly supported the need for additional spectrum, although other bands besides 700 MHz were also mentioned. The FCC did not make a specific recommendation for additional spectrum allocations in the short-term although it stated that it agreed that public safety "could make use of such an allocation in the long-term to provide broadband services." It further announced that it would move expeditiously to see whether the current band plan for the 24 MHz at 700 MHz currently designated for public safety could be modified to accommodate broadband applications.

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*
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 President's FY2006 budget calls for $2.155 billion for the NITRD Program, a 4.5% decrease from the FY2005 budget of $2.256 billion (See CRS Issue Brief IB10130 for updated information). The majority of funding goes to the National Science Foundation, National Institutes of Health, National Aeronautics and Space Administration, Defense Advanced Research Projects Agency, and the Department of Energy's Office of Science.

Research emphases are focused on eight program component areas (also called PCAs): High-End Computing (HEC) Infrastructure and Applications, HEC Research and Development, Cyber Security and Information Assurance, 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 whether NITRD is accomplishing its goals and objectives to enhance U.S. information technology research and development, whether the funding level is appropriate or should be changed to reflect changing U.S. priorities, and defining the private sector's role in this 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 the Commission on Systemic Interoperability are among a growing number of expert panels that 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. The U.S. health care industry lags well behind other sectors of the economy in its investment in IT, despite growing evidence that the electronic exchange of health information can play a critical role in addressing the many challenges the industry faces. However, there are significant financial, legal, and technical obstacles to the adoption of health IT systems. The issue for Congress, in which there is broad bipartisan support for health IT, is how best to create incentives for IT adoption throughout the health care industry.

On April 27, 2004, President Bush called for the widespread adoption of interoperable electronic health records (EHRs) within 10 years so that health information will follow patients throughout their care in a seamless and secure manner. To help achieve that goal the President established the Office of the National Coordinator for Health Information Technology (ONCHIT) within the Department of Health and Human Services (HHS) to coordinate federal health IT activities and work with the private sector on its health IT efforts. ONCHIT began by developing a strategic framework for the nationwide implementation of interoperable EHRs. That was followed by a request for public comment on how best to develop a National Health Information Network (NHIN). There is broad consensus among stakeholders that the NHIN should be a decentralized and Internet-based architecture, built on a framework of open standards and policies.

ONCHIT recently awarded contracts to fund activities in four key areas: (1) harmonizing health information standards, (2) certifying health IT products to ensure consistency with standards, (3) addressing variation in privacy and security policies that can pose challenges to interoperability, and (4) developing an architecture for nationwide sharing of electronic health information. In another important development, the HHS Secretary has established the American Health Information Community, a 17-member public-private body that will provide input and recommendations on the market-based transition to interoperable EHRs.

Congress has taken a number of important steps to promote health IT and is poised to enact new legislation to boost federal investment and leadership in this area. In November 2005, the Senate passed the bipartisan Wired for Health Care Quality Act (S. 1418) which, among other things, would authorize grants to facilitate widespread EHR adoption and the creation of regional health information networks. Such networks are seen as a critical step towards the goal of interconnecting the health care system nationwide. Competing health IT legislation has been introduced in the House (H.R. 4157). Congress laid the groundwork for establishing an NHIN when it enacted the 1996 Health Insurance Portability and Accountability Act (HIPAA). HIPAA instructed the HHS Secretary to develop privacy standards to give patients more control over the use of their medical information, and security standards to safeguard electronic patient information against unauthorized access, use, or disclosure.

Congress also may take up legislation (S. 1356, H.R. 3617) to introduce pay for performance into Medicare's payment systems. Basing a portion of the payment on the quality of care would be a major shift in the way Medicare pays for many products and services. Currently, Medicare pays health care providers the same regardless of the quality of their services. Introducing pay for performance into Medicare would have important implications for IT adoption. Many private sector health plans and purchasers have incorporated IT use into their pay for performance initiatives. Thus, adoption of IT in the clinical setting is included as one of the measures used to financially reward providers on the basis of quality.

For Further Information

CRS Report RL32858, *Health Information Technology: Promoting Electronic Connectivity in Healthcare*
CRS Report RS22310, *Hurricane Katrina: HIPAA Privacy and Electronic Health Records of Evacuees*

E-Government

Electronic government (e-government) is an evolving concept, generally referring to the integration of information technology, especially Internet-related technology, into the delivery of government information and services. E-government initiatives vary significantly in their breadth and depth from state to state and agency to agency. 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 agency funding contributions for OMB-led e-government initiatives; the development of a second generation of e-government initiatives based on the federal government's lines of business (LoB) - core business functions common to most departments and agencies; 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 above.

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. In addition, some cell phone records, including phone numbers dialed and the caller's location, are being sold on the Internet, raising questions as to whether telephone companies are adequately safeguarding cell phone records.

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 is debating whether to extend the lifetime of several provisions of the USA PATRIOT Act, including two that affect Internet privacy (Sections 212 and 217), that otherwise will expire under sunset provisions in the act.

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. Congress is considering 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. In December of 2005 President Bush released a report *Tsunami Risk Reduction for the United States: A Framework for Action* (July 2005) prepared by the White House National Science and Technology Council outlining necessary actions to reduce tsunami risk domestically and in U.S. territories in the far Pacific Ocean and Carribean Sea.

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

As was demonstrated on September 11, 2001, after the southeast Asian tsunami on December 26, 2004, and again when Hurricane Katrina struck the Gulf Coast in August 2005, the ability to provide effective communications before and after a disaster is a critical factor 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. An important one — 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.

Among the technologies proposed or being tested to expand broadcast capabilities for emergency alerts are equipping cell phones with NOAA Weather Radio receivers; developing data casting for digital broadcasting; and using cell phone broadcasting technology. Data casting is a one-way broadcast transmission using Internet Protocols. The broadcasts can carry voice and data, including videos, graphics, and text messages. In an IPAWS pilot testing digital technologies, data casting is being broadcast to digital televisions and antennae linked to computer networks or directly to computers and laptops. Some advanced wireless phones and other portable devices can receive digital TV broadcasts, as is being demonstrated in several pilots. Some countries are advocating the use of cell broadcasting to send alerts to cell phones based on location. The Netherlands, for example, requires cell operators to transmit government warnings with cell broadcasts of text messages. Satellite radio could also become part of the new era of digital signal alert systems. XM Satellite Radio will broadcast emergency alerts to the D.C. region through a link with the alert system of Arlington County, Virginia.

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).

CRS Report RL32527, *Emergency Communications: The Emergency Alert System and All-Hazard Warnings*
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 from 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 the current Congress, thus far, 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 in the second session of the 109th Congress.

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 then-President Clinton did not submit it to the Senate for 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 includes a total spending level of $1.891 billion for research managed by the CCSP, which is $26 million (-1.4%) below the FY2005 funding estimate of $1.917 billion. Included in the $1.891 billion CCSP funds are $180.6 million for the CCRI. While funding for the embedded CCRI experienced growth over two fiscal years from FY2003 to FY2005, the FY2006 funding for CCRI at $180.6 million is $36 million (-17%) less than the FY2005 funding estimate of $216.7 million. That leaves FY2006 funding for the embedded USGCRP standing at $1.710 billion, which is $10 million (+0.6%) above the FY2005 funding estimate of $1.700 billion. There is some $3.069 billion in the FY2006 funding profile for technology research and development in the NCCTI/Climate Change Technology Program, an amount $79 million (+2.6%) above the FY2005 funding estimate of $2.99 billion. Four reports currently serve as guidance documents for those activities: *Climate Change Science Program Strategic Plan* (2003), *Climate Change Technology Program Strategic Plan Public Review Draft* (2006), *U.S. Climate Change Technology Program: Technology Options for the Near and Long Term* (2005), and *U.S. Climate Change Technology Program: Vision and Framework for Strategy and Planning* (2005). Release of the completed CCTP strategic plan is expected sometime in 2006. Two issues of concern for Congress are the extent to which spending for the CCRI and CCTP represent new money versus how much is attributable to the reclassification of ongoing research and technology programs, and whether the overall reduced level of funding 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. For FY2004, Congress approved an increase of approximately $46 million for the initiatives. For FY2005, Congress approved an additional $23 million above FY2004. In FY2006 Energy and Water Development Appropriations Act (P.L. 109-103), Congress approved a slight increase ($3 million) above FY2005 — $73 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 tax credits for the purchase of hydrogen-fueled and fuel cell vehicles, and for the installation of hydrogen fueling infrastructure.

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 contains plutonium produced during reactor operations and most of its original uranium. A fundamental issue in nuclear policy is whether spent fuel should be "reprocessed" to extract plutonium and uranium for new reactor fuel, or directly disposed of without reprocessing. Proponents of nuclear power point out that spent fuel still contains substantial energy that reprocessing could recover. However, reprocessed plutonium can also be used in nuclear weapons, so federal support for reprocessing could undermine U.S. nuclear nonproliferation policies, contend groups concerned about weapons proliferation.

In the 1950s and 1960s, the federal government expected that all commercial spent fuel would be reprocessed, even though "light water reactors" — the type still in use today — produced relatively little plutonium. The federal strategy called for replacing light water reactors with "breeder reactors" that would convert uranium into enough plutonium to fuel new commercial breeder reactors indefinitely.

Increased concern about weapons proliferation in the 1970s and the slower-than-projected growth of nuclear power prompted President Carter to halt commercial reprocessing efforts in 1977, along with a federal demonstration breeder project. President Reagan restarted the breeder demonstration project, but Congress halted project funding in 1983 while continuing to fund breeder-related research and development in an "Advanced Liquid Metal Reactor" (or the Integral Fast Reactor). To address proliferation concerns, this program would have used electrometallurgical reprocessing to only partially separate plutonium and uranium. Congress stopped funding breeder-reactor development in 1993, and reduced appropriations for reprocessing research.

The Bush Administration's 2001 National Energy Policy called for renewing federal support for reprocessing, which the Department of Energy has implemented through the Advanced Fuel Cycle Initiative (AFCI). The Energy Policy Act of 2005 (Sec. 953), calls for AFCI to evaluate proliferation-resistant fuel recycling and transmutation technologies as an alternative to previously developed reprocessing technologies. This program also supports the evaluation of alternative national strategies for spent nuclear fuel and Generation IV advanced reactor concepts.

The President's FY2006 budget request of $70.0 million in FY2006 was increased an additional $10 million by Congress (P.L 109-103) to accelerate the design activities associated with a proposed Engineering Scale Demonstration, submit a spent nuclear fuel recycling technology plan by March 1, 2006, and select a preferred technology no later than the end of FY2007.

The Bush Administration has yet to announce details an initiative tentatively referred to as the Global Nuclear Energy Partnership, which is intended to give U.S. vendors the opportunity to sell nuclear reactors to developing nations under the condition that the Unites States would back the spent nuclear fuel for reprocessing.

For Further Information

CRS Issue Brief IB88090, *Nuclear Energy Policy*
CRS Report RL32163, *Radioactive Waste Streams: An Overview of Waste Classification for Disposal*

Fusion Research: ITER

The ITER project is an international scientific collaboration to construct a facility for fusion energy research. The international partners are China, the European Union, India (joined December 2005), Japan, Russia, South Korea, and the United States. Canada withdrew its participation in December 2003. 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%) is expected to be about $1.1 billion over eight years. Only a small portion of that would be required in FY2006 since the construction work site was only opened in December 2005. 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*, called for a commitment to water resources research to address the nation's water problems, and suggested a central role for federal research in informing water resources issues. In particular, the report promoted both federally-funded research on water use and institutions, and a more coordinated federal water research agenda.

Real levels of spending on water research have remained relatively constant, at $700 million (in 2000 dollars) annually since the mid-1970s. Although the overall level is constant, funding declined for some specific research categories, including the 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.

Growing demands on developed water supplies has increased interest in water supply technologies, and desalination in particular. Desalination — the process of removing dissolved solids (primarily dissolved salts and other minerals) from water — has become an increasingly attractive water supply option as the cost of the dominant technology in the nation — reverse osmosis — has fallen and the pressure

to develop new water supplies has grown. Opportunities for using desalination are greatest for meeting water demands 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. 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.

Proposed legislation and enacted appropriations in the 109th Congress have aimed to reverse the declining trend in federal research funds for desalination and other water supply technologies. 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. Increasing federal funding for desalination research raises questions, such as: what should be the respective roles of federal agencies, academic institutions, and the private sector in conducting research and commercializing the results, and should federal research be focused on basic research or promoting the use of technologies?

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 three years have been a time of rapid 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. After FY2003, growth slowed to below the rate of inflation, and the final FY2006 level represents a drop in funding for the first time since FY1970. NIH's budget for FY2006 is $28.5 billion, a decrease of $81 million or 0.3% below the FY2005 program level.

Since the doubling, the extramural research community has expressed its concerns about the lack of growth in the NIH budget, asserting that sustained funding is necessary 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. NIH has announced its FY2006 grant funding policies, which will involve cutbacks in grant budgets and in numbers of grants, tight competition for new awards, and possible 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 inter-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, and has been supportive of the goals of the Roadmap and of NIH's efforts to improve the management of its research portfolio.

The last major reauthorization of NIH was in 1993, although a number of laws focusing on individual NIH-related topics have amended the Public Health Service Act since then. Oversight hearings and discussions on a draft reauthorization bill 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. Some other areas of concern which Congress might consider include improving public reporting of research results, enhancing public access to scientific journal articles, and exploring ways to shorten the process for young researchers to become independent investigators.

An ongoing oversight issue is NIH's implementation of new conflict-of-interest regulations. Depending on the level of their positions, NIH scientists and other employees are subject to restrictions on their financial holdings and their ability to consult with industry and outside interests and colleagues. Questions have been raised about the impact of the ethics regulations on recruitment and retention of employees.

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, as some oppose such research because the process of removing the stem cells 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. Stem cells derived from cloned embryos may offer the best hope for understanding and treating disease. Although South Korean scientists had announced the creation of cloned human embryos and isolation of human stem cells from cloned embryos, an investigation in December 2005 found that the results had been fabricated — a major setback for the field. These developments 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.

One impediment to human stem cell research is the Dickey Amendment which has been added to each Labor, HHS and Education appropriations act from FY1997 through FY2006. 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.

In August 2001 President Bush announced 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. 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 H.R. 810 (Castle) 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. Action on H.R. 1357 (Weldon), a version of which passed the House in the 108th Congress but not 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. Legislation that bans only human reproductive cloning has also been introduced, as well as bills focused on alternative sources of stem cells. On December 20, 2005, the President signed legislation which provides for the collection and maintenance of human cord blood stem cells (a type of adult stem cell) for the treatment of patients and for research (P.L. 109-129). For information on the status of 109th Congress legislation, see CRS Report RL31015 and 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*

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. Advocates of aeronautics, space science, and earth science research worry that funding for their activities will suffer. In the FY2006 Science, State, Justice, Commerce appropriations act (P.L.109-108), which includes NASA, and the 2005 NASA authorization act (P.L. 109-155), Congress expressed its support for the Vision, but

stressed that NASA needs to maintain a balanced program that includes aeronautics and science.

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. NASA's FY2006 budget request assumed that the agency would cut about 2,500 civil service jobs by the end of FY2006. NASA officials insist that there are no plans to close any NASA centers. The agency is offering buy-outs and other incentives to encourage staff in certain disciplines to leave, but to date these efforts have not achieved their targets. NASA officials explain that everyone who currently is employed by NASA is funded through the end of FY2006. 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 FY2006 appropriations act that includes NASA (P.L. 109-108) restricts NASA's use of buyouts and Reductions in Force (RIFs) prior to NASA providing certain reports to Congress. The 2005 NASA authorization act (P.L. 109-155) prohibits RIFs or other involuntary separations (except for cause) prior to March 16, 2007.

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 Columbia Accident Investigation Board 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 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. 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 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*. The next launch is expected some time in 2006.

NASA officials have indicated that NASA plans to complete its use of the ISS by 2016. 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 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 led NASA to explore the possibility of a robotic servicing mission, but a report from the National Research Council (NRC) in December 2004 concluded that a robotic servicing mission was unlikely 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. In the 2005 NASA authorization act (P.L.109-155), Congress supported this plan "unless such a mission would compromise astronaut safety." It also required a status report on servicing plans within 60 days of the landing of the second successful shuttle flight. Problems during the launch of the first RTF mission in July 2005 led NASA to reground the shuttle fleet; a second mission is now expected some time in 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. Congress provided $80 million in FY2006. 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 requested $22.5 billion for space programs in FY2006. DOD has not released a figure for how much was appropriated.

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 Radar (formerly the "Space-Based Radar") 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
AFCI	Advanced Fuel Cycle Initiative
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)
IQA	Information Quality Act
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
NHIN	National Health Information Network
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
PART	Program Assessment Rating Tool
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