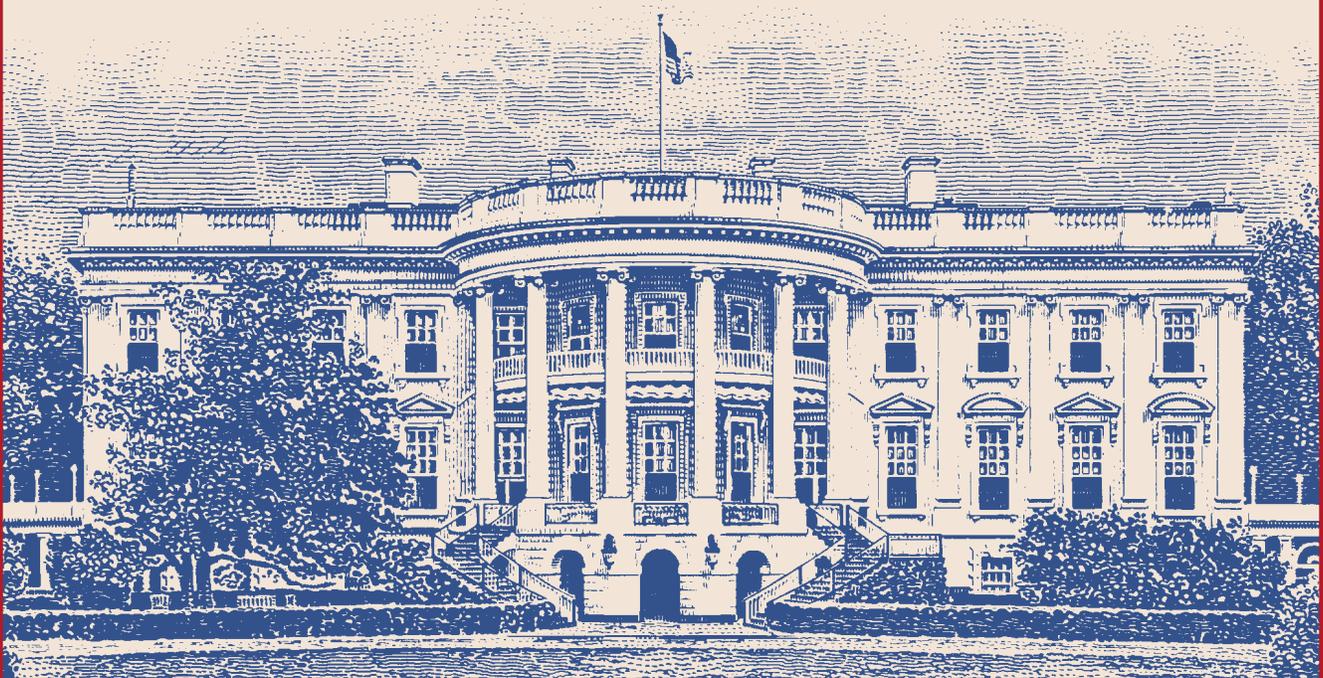




BUSH ADMINISTRATION SCIENCE & TECHNOLOGY ACCOMPLISHMENTS

*Promoting Innovation
for a Stronger, Safer America*

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Record Federal Investment in Research and Development

Forty-four percent growth in Federal R&D funding. With President Bush's FY 2005 budget proposal, total Federal R&D investment during the first term will be increased 44 percent, to a record \$132 billion in FY 2005, compared to \$91 billion in FY 2001. That represents increases of 10 percent each year.

Science is a Bush budget priority. The President's 2005 budget request commits 13.5 percent of total discretionary outlays to R&D—the highest level in 37 years. Not since 1968 and the Apollo program have we seen an investment in science of this magnitude. Of this robust amount, the Bush budget commits 5.7 percent of total discretionary outlays to non-defense R&D. This is the third highest level in the last 25 years. And while the President's budget proposes to reduce the overall growth in non-defense, non-homeland security discretionary appropriations to 0.5 percent, the “non-security” R&D growth rate is 2.5 percent.

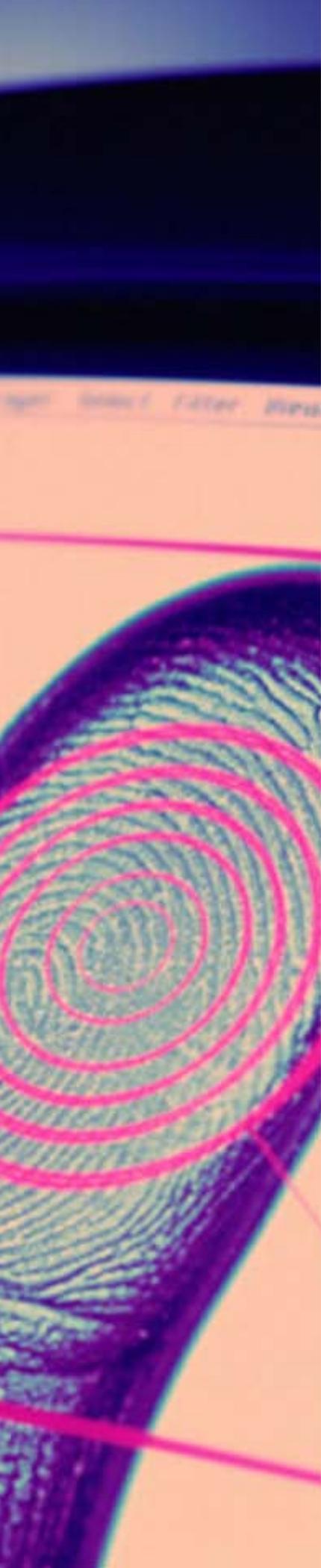
Historically high share of GDP. In the context of the overall economy, Federal R&D spending in the FY 2005 Budget is the greatest share of GDP in over ten years. In fact, the last time Federal R&D has been over one percent of GDP was in 1993. And even more noteworthy, FY 2005 non-defense R&D is the highest percentage of GDP since 1982.

Focus on basic research. The FY 2005 Budget for basic research, the fuel for future technology development, is at an all-time high of \$26.8 billion, compared to funding of \$21.3 billion just four years ago. That's a 26 percent increase or the equivalent of increases of six percent each year. Ninety-five percent of this basic research spending occurs outside the Defense Department.

Fulfilling commitments. The President completed the doubling of funding for the National Institutes of Health (NIH). During the four years of this Administration, funding for NIH will be increased more than 40 percent to \$28.6 billion. Funding for the National Science Foundation (NSF) will be increased 30 percent over FY 2001 to \$5.7 billion in FY 2005.

Advancing the physical sciences. In FY 2005, \$11.4 billion is targeted for key research activities in the physical sciences, math, and engineering at NSF, DOE's Office of Science, NASA's Office of Space Science, the National Institute of Standards and Technology (NIST), and the National Oceanic and Atmospheric Administration (NOAA) at the Department of Commerce. This is \$2.6 billion (29 percent) more than the funding in FY 2001.

Critical manufacturing technology. The President's Budgets have increased funding for a number of programs aimed at strengthening manufacturing innovation, including those within NSF's Design, Manufacture, and Industrial Innovation Division—up 27 percent since 2001 to \$66 million—and the Manufacturing Engineering Laboratory at NIST—up 50 percent since 2001 to \$30 million. The FY 2005 Budget sustains funding for the Manufacturing Extension Partnership at the FY 2004 level and proposes to implement reforms to improve the efficiency and effectiveness of the program.



Cutting-edge research for the future. Since 2001, funding for nanotechnology R&D more than doubled to \$1 billion and funding for information technology R&D is up to \$2 billion. FY 2005 hydrogen energy research, now embodied in the President's Hydrogen Fuel Initiative at \$228 million, is more than triple what it was in FY 2001.

Protecting the Homeland and Fighting the War on Terror

Technology-based solutions for homeland security. The events of September 11, 2001, underscored the challenges we face in securing the homeland. As part of the Administration's response, the President initiated an aggressive research and development effort focused on preventing another terrorist attack within the United States; minimizing our vulnerability to such an attack; and ensuring an effective response and recovery if an attack should occur. Recognizing the role that advanced technology plays in these efforts, the President's FY 2005 budget request includes more than \$3.6 billion devoted to research and development aimed at preparing for and responding to the full range of terrorist threats. As the President stated, "In the war against terrorism, America's vast science and technology base provides us with a key advantage."

BioWatch. The BioWatch program, which employs air sampling devices to quickly detect terrorist agents (such as anthrax) in time to distribute life-saving pharmaceuticals to affected citizens, has been established and deployed to numerous cities across the Nation. The program, managed by the Department of Homeland Security (DHS), is executed in cooperation with the Environmental Protection Agency and the Centers for Disease Control and Prevention. A key S&T accomplishment of this program has been the improvement of capabilities and capacities of our Nation's public health laboratories to analyze and detect bio-threat agents in a rapid manner. DHS is now focusing its efforts on piloting the next generation of air samplers that will reduce the amount of labor required and response time needed for devices while keeping the detection probability high and false alarm rates low. This, in turn, further enhances the nation's security by enabling even faster detection of terrorist agents.

Biosurveillance. The President has proposed a \$274 million initiative in FY 2005 to expand our ability to rapidly detect an outbreak of illness in humans, plants, or animals and to detect the environmental release of harmful pathogens through natural causes or deliberate action. Early warning of a biological weapon attack would allow rapid vaccination and/or treatment of the population, and could result in thousands of lives being saved. The initiative will also promote sharing of information across agencies, an important component of the detection and response to diseases such as avian influenza and SARS. This system will have significant benefits for public health, by allowing epidemiologists and health care workers to rapidly characterize and assess the extent of disease outbreaks, thereby targeting treatment and preventive resources in the most effective way.

Biosecurity. The Administration recently announced a Biosecurity initiative to reduce the likelihood that advances in medicine and biotechnology will be misdirected toward the creation of dangerous biological weapons. The National Science Advisory Board on Biosecurity (NSABB) is being established to provide guidance on biosecurity issues to the heads of all Federal agencies that conduct or support life sciences research. This advisory board will immediately begin to (1) develop guidelines for oversight of experiments that raise clear biosecurity concerns; (2) work with journal editors and other stakeholders to ensure the development of guidelines for the publication of potentially sensitive research; (3) provide guidance on the development of a code of conduct for scientists and laboratory workers; and (4) provide guidance on the development of mandatory programs for education and training in biosecurity issues for all scientists and laboratory workers at federally-funded institutions. Taken together, this series of measures will ensure that biosecurity in research is enhanced while the vast majority of research is allowed to proceed unimpeded.



Rapid diagnostic tests for threat agents. The Department of Agriculture (USDA) Agricultural Research Service (ARS) has sequenced the genomes of a number of plant and animal pathogens. These efforts have focused on pathogens not currently found in this country that would have serious consequences if used in a bioterrorist attack. These sequences have been used in the development of *Polymerase chain reaction (PCR)*-based rapid diagnostic tests for several pathogens including foot and mouth disease and classical swine fever. These tests are currently being validated for field use. The availability of such tests will provide a local-level capability to test samples and enhance the ability to rapidly diagnose these pathogens, thus enabling a faster and more effective response.

Cyber security R&D. The President announced his National Strategy to Secure Cyberspace in February 2003. This plan, which complements the national strategy for physical protection of critical infrastructure, depends on both public and private efforts to secure the many elements that comprise the national information infrastructure, including routers, switches, fiber-optic cables, and hundreds of thousands of interconnected computers. Given the increasing importance of e-commerce, Internet-based communications, and the use of cyberspace to control portions of our physical infrastructure, it is important that our access to and control of cyberspace remains free and unimpeded. The investments being made today in cyber security R&D are working to ensure that future generations of network software and hardware are less vulnerable to an attack and can maintain critical operations even when compromised.

Technologies for first-responders. NIST, working with DHS, has developed national standards for verifying the performance of equipment for detecting dirty bombs and other radiation hazards, evaluating biometric technologies for improving border security, and producing gas masks for firefighters and other first responders. These standards will ensure a level of performance for equipment that accomplishes the mission while assuring the safety of the first responders.

Nuclear. The Administration is pursuing a multi-tiered approach to deter and prevent the terrorist use of a radiological or nuclear device within the United States. First, the Departments of State, Energy, and Defense are working with other countries to better secure their special nuclear materials. Second, the Administration is enhancing international counterproliferation efforts to prevent the spread of nuclear technology. Third, the Administration is investing in the development of passive and active detection technologies to better detect and locate nuclear or radiological material in transit, thus enabling interception of such material beyond our borders. Fourth, research and development is being conducted to improve crisis response such as advanced search and render safe capabilities. And finally, enhanced consequence management is being pursued to include remediation and medical triage if an incident should occur. These aggressive actions, taken together, decrease the likelihood that a terrorist could get hold of or transport the material necessary to threaten the United States with a nuclear device.

Increasing security in our laboratories and our Nation. The Administration is on a very ambitious timetable for implementation of select agent registration, including requirements for physical security measures for laboratories that work with dangerous human, plant, and animal pathogens known as “select agents;” inventories of such agents; and training and background checks for anyone having access to the pathogens. Led by the Homeland Security Council, the three agencies responsible for implementing the select agent rules (the Department of Health and Human Services, the Department of Justice, and the Department of Agriculture) have made it their priority that ongoing research not be disrupted by the new rules. In this way, important research can be conducted to uncover how select agents cause illness and death, leading to treatments and prevention methods that will defeat their use as weapons.



Enhancing Competitiveness and Creating New Jobs

President's economic growth package spurs tech investment. Enacted in May 2003, the Jobs and Growth Tax Relief Act reduced the double taxation of dividends paid to shareholders, thereby returning an estimated \$20 billion to the economy—which will yield faster economic growth and greater investment. This investment is particularly important for start-ups, where many innovative technologies are developed. To ensure continued innovation by entrepreneurs and small businesses, the President's plan also accelerated reductions in marginal tax rates, leaving more resources with the entrepreneurs and companies that are generating successful products and services, better jobs, and greater wealth. Three-quarters of taxpayers in the top tax bracket are small business owners. It also increased the limit for small business expensing and offered businesses 50-percent bonus depreciation to reduce the cost of capital purchases and spur business investment.

Internet tax moratorium and research and experimentation tax credit. The Administration strongly supports passage of legislation to make permanent the moratorium on Internet access taxes, believing that government should support e-commerce and Internet usage, including broadband technology, and not discourage it through new administrative barriers or taxes. In addition, the President's tax relief plan includes making the Research and Experimentation tax credit permanent, thereby spurring the sustained, long-term investment in R&D that America needs to develop the next generation of advanced technologies.

Nanotechnology. In December of 2003 the President signed into law the 21st Century Nanotechnology Research and Development Act, which authorizes funding for nanotechnology R&D over four years, starting in FY 2005. This legislation puts into law programs and activities supported by the National Nanotechnology Initiative (NNI), one of the President's highest priorities in multi-agency research and development. Nanotechnology is expected to have a broad and fundamental impact on many sectors of the economy, providing economic growth in the form of new products, new businesses, and new jobs.

Manufacturing R&D. R&D-related recommendations in the recently-issued Department of Commerce report *Manufacturing in America: A Comprehensive Strategy to Address the Challenges to U.S. Manufacturers* are being implemented:

President Bush signed an Executive Order promoting manufacturing research and development in small businesses earlier this year. The Order makes manufacturing-related R&D a priority in two complementary Federal grant programs that target small business innovation. This will help enable more small businesses, which play a key role in the manufacturing sector, to pursue technological innovation.

An interagency working group on manufacturing-related R&D has been established, under the National Science and Technology Council, to identify gaps in Federal R&D and to optimize future investments.

Free trade agreements (FTAs) covering e-commerce, telecommunications, and intellectual property rights. The Administration brought into force FTAs with Singapore and Chile early last year, and has recently finished negotiations on other FTAs (e.g., Australia, central American countries, Morocco). These agreements facilitate electronic commerce in a fair and non-discriminatory manner, as well as access to, and use of, the public telecommunications network for the provision of services. These agreements also have strong provisions protecting intellectual property rights, including in the area of digital products. As a result of these FTAs, the U.S. technology and telecommunication sectors will have opportunities to expand their services and products abroad.



Digital Freedom Initiative. The Digital Freedom Initiative (DFI) promotes economic growth by transferring the benefits of information and communication technology to entrepreneurs and small businesses in the developing world. DFI accomplishes this goal by leveraging the leadership of the U.S. government, the creativity and resources of America's leading companies, and the vision and energy of entrepreneurs. The Technology Administration of the Department of Commerce, the US Agency for International Development, Department of State, Peace Corps, Small Business Administration, and the DFI private sector roundtable provide the DFI global governance structure with Commerce providing overall initiative leadership. The initiative was first launched in March 2003 in Senegal, and on October 16, 2003, President Bush announced that Peru and Indonesia had agreed to join the DFI partnership.

Spectrum Management. In June 2003, President Bush signed an Executive Memorandum launching the Spectrum Policy Initiative to develop recommendations for improving spectrum management of radio frequency within a one-year period. By promoting more efficient use of spectrum, the Initiative will help foster economic growth; promote national and homeland security; maintain U.S. global leadership in communications technology; and satisfy other vital U.S. needs in areas such as public safety, scientific research, Federal transportation infrastructure, and law enforcement.

Wide Area Augmentation System (WAAS). Commissioned on July 10, 2003, the Federal Aviation Administration's WAAS represents an enormous leap forward in air navigation by providing precision approach guidance to thousands of airports where there is no precision landing capability. WAAS improves the accuracy, availability, and integrity of the Global Positioning System (GPS) for aviation purposes. WAAS uses a system of widely dispersed ground stations to provide coverage and generate necessary augmentations to the GPS navigation signal resulting in location accuracy within a few meters. Users with certified avionics can now rely on GPS for any FAA-approved phase of flight and for all qualified airports within the WAAS coverage area. The WAAS improves the accuracy, availability, and integrity of GPS, thereby improving the overall capacity and safety of the national airspace.

Next Generation Air Transportation System. To assure aviation's continued prosperity, the Administration has announced the Next Generation Air Transportation System initiative, a multi-year, multi-agency effort to develop the air transportation system for the year 2025 and beyond. The creation of the Next Generation Air Transportation System will be as revolutionary and important to the Nation as the creation of the Interstate Highway System proved to be for the 20th century. The FAA, in partnership with the Department of Transportation, NASA, the Department of Defense, Homeland Security, and Commerce, the White House Office of Science and Technology Policy, and other experts from the public and private sectors, is leading the transformation. This collaboration, which will result in the National Plan for the Transformation of Air Transportation, represents a unified public/private sector commitment to shape the policy and research necessary to ensure our air transportation system results in more jobs, a strong economy, and a more positive balance of trade.

Improving Future Quality of Life through Discovery

Climate Change Science Program (CCSP). A joint Federal program of the President's Committee on Climate Change Science and Technology Integration, the CCSP issued its strategic plan in July 2003 to address some of the most complex questions and problems dealing with long-term global climate variability and change. This is the first comprehensive update of a strategic plan for U.S. global change and climate change research since the original plan for the U.S. Global Change Research Program was



adopted in 1989. According to a February 2004 review of the plan by the National Academies, “advancing science on all fronts identified by the program will be of vital importance to the nation.”

Clear Skies Initiative. On February 14, 2002, President Bush announced the most aggressive Presidential air quality initiative in American history. The Clear Skies Initiative, re-introduced in the current Congress, proposes to dramatically cut emissions of sulfur dioxide, nitrogen oxides, and mercury from power plants while keeping energy affordable for consumers and businesses. Through a market-based cap-and-trade system based on the proven, successful Acid Rain reduction program, Federal emissions limits (or caps) will be set and emissions permits distributed to electricity generators. Managers then have the advantage of determining the most efficient means of action—whether it is the employment of new pollution reduction technology and techniques, the sale or purchase of unused allowances or banking of credits for later use. Clear Skies provides regulatory certainty and lays out the timeframes necessary for managers to design a cost-effective strategy tailored to both their current budgets and their future plans. It is estimated Clear Skies will remove 35 million more tons of pollution over the decade from 2010-2020 than under the current Clean Air Act, reducing the number of premature deaths, trips to hospitals, and missed days of work and school due to asthma and breathing problems. Clear Skies will also reduce the acid rain affecting forests and lakes in the Northeast, reduce nitrogen loadings into the Chesapeake Bay and improve visibility nationwide.

Hydrogen Fuel Initiative. In his 2003 State of the Union address, President Bush announced his Hydrogen Fuel Initiative, a \$1.2 billion, five-year program aimed at developing the fuel cell and hydrogen infrastructure technologies needed to make pollution-free hydrogen fuel cell cars widely available by 2020. In the fall of 2003, the United States proposed the creation of the International Partnership for the Hydrogen Economy. The Partnership includes the European Commission and 15 nations that have agreed to coordinate and collaborate on multinational research and development to advance the transition to a global hydrogen economy. If hydrogen is developed to its fullest potential, DOE estimates that by 2040, light-duty vehicle (LDV) oil consumption in the U.S. may be reduced by over 11 million barrels per day (about a 75% reduction from the LDV base case) and LDV carbon emissions in the U.S. may be reduced by more than 500 million metric tons of carbon equivalent (about a 70% reduction from the LDV base case).

New Vision for Space Exploration. On January 14, 2004, President Bush announced a new, focused vision for the Nation’s space exploration program. The President committed the United States to a fiscally responsible long-term program to explore space through the use of robotic missions and human exploration, starting with a return to the Moon that will ultimately enable future exploration of Mars and other destinations. It will be affordable and sustainable while maintaining the highest levels of safety. The President’s vision affirms a commitment to a robust space exploration program that provides NASA with a new focus and clear objectives.

Mars exploration. NASA successfully launched the two largest and most sophisticated Mars exploration rovers in 2003. The first rover, *Spirit*, landed successfully on the Martian surface on January 3, 2004. Its twin, *Opportunity*, landed January 24. In March 2004, images from a rocky outcropping has provided the strongest evidence that at least parts of Mars were “soaking wet” in the past. These findings support the idea that the Martian environment may have once been suitable for life.

International fusion energy project. In January 2003, President Bush committed the United States to participate in ITER, the largest and most technologically sophisticated research project in the world. The goal of ITER, which is Latin for “the way,” is to



prove the viability of fusion energy, the same form of energy that powers the sun. If successful, this \$5 billion, internationally supported research project would advance progress toward producing clean, renewable, commercially available fusion energy by the middle of the century.

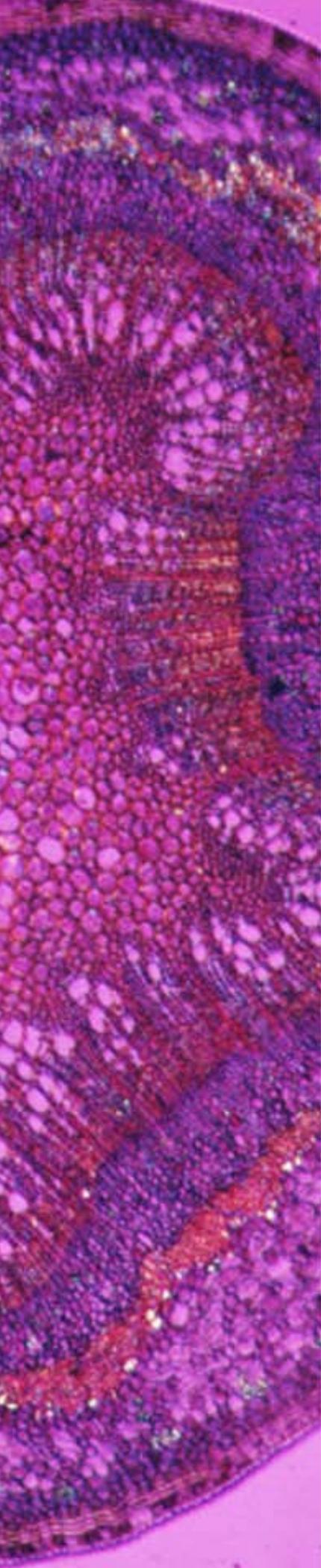
Earth Observation Summit. In July 2003, the United States hosted the inaugural summit of more than 30 nations to realize a common goal—to establish an international, comprehensive, coordinated, and sustained Earth observation system. An intergovernmental Global Earth Observation (GEO) working group was formed at the Summit to develop a 10-year implementation plan. The second Summit is scheduled for April 25, 2004 in Tokyo. The effort is aimed at providing critical data to address important global economic, social, and scientific challenges.

Weather and climate forecasting. NOAA improved the regional accuracy of weather forecast products. Improvements have also been made in the WSR-88D weather radar—Warning Decision Support System through enhanced WSR-88D severe weather detection and prediction algorithms and display capabilities provided to NOAA weather forecasters.

Forecasting solar storms. In October 2003, the Geostationary Operational Environmental Satellite (GOES-12) satellite's Solar X-ray Imager (SXI), an advanced solar storm detector built by NASA to continuously and accurately view the Sun's outer atmosphere or corona solar flares, captured images of some of the largest solar flare activity on record. With information on the solar wind recorded by the NASA Advanced Composition Explorer satellite, NOAA forecasts the impact of solar flare activity on Earth's environment, such as disruption in long-distance radio communication in the polar region and communication disruption in high-altitude airline operations.

Human genome sequence. In April 2003, more than two years ahead of schedule, the International Human Genome Consortium announced the completion of the sequencing of the human genome. DOE and NIH led this effort for the United States. Sequencing the human genome and understanding its meaning will eventually allow scientists and doctors to alert patients that they are at risk for certain diseases; reliably predict the course of disease; precisely diagnose disease; ensure the most effective treatment is used; and develop new treatments at the molecular level. Genomic sequencing of microorganisms, for example, has broader applications such as the development of biotechnology for energy and the environment and for understanding ecogenomics.

NIH Roadmap. With completion of the doubling of the NIH budget in 2003, the Administration has launched an ambitious effort called the "Roadmap." Its purpose is to identify major opportunities and gaps in biomedical research that no single institute at NIH could tackle alone but that the agency as a whole must address to make the biggest impact on the progress of medical research. Through the NIH Roadmap NIH will catalyze changes that must be made to transform our new scientific knowledge into tangible benefits for people. The Roadmap is organized into three core themes: New Pathways to Discovery; Research Teams of the Future; and Re-engineering the Clinical Research Enterprise. The focus under "New Pathways" is to generate new knowledge and to build a better "toolbox" for researchers in the 21st century, including new technologies, databases, and other resources. As the scale and complexity of research grows, scientists will need to move beyond the confines of their own disciplines and explore new organizational modes for team science, and this is the focus of the theme, "Research Teams." Finally, clinical research will be reengineered to develop new partnerships among organized patient communities, community-based physicians, and academic researchers so that basic research discoveries can be more quickly transformed into diagnostics, drugs, treatments, or prevention methods.



Screening blood for West Nile virus. In July 2003, the Food and Drug Administration (FDA) granted investigational protocols to two companies to implement the first nucleic acid tests for screening blood for West Nile virus infection in blood banks across the country, just eight months after the discovery that West Nile virus could be transmitted through blood transfusion. The FDA's collaboration with industry to rapidly develop and approve the screening tests has strengthened efforts to eliminate a potential avenue for the spread of this emerging infectious disease.

Do Not Call list and combating spam. In June 2003, the President inaugurated the nationwide "Do Not Call" Registry. A simple registration process has allowed consumers to block most unwanted telephone solicitations—reducing unwanted interruptions during family dinner hour. In addition, President Bush signed into law the Controlling the Assault of Non-Solicited Pornography and Marketing Act of 2003 (CAN-SPAM Act), which establishes a framework of administrative, civil, and criminal tools to help America's consumers, businesses, and families combat unsolicited commercial e-mail, known as spam.