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MARCH 1999

# R&D in the FY 2000 Budget

On February 1, President Clinton released his proposed budget for fiscal year (FY) 2000. The Administration's budget projects a string of surpluses well into the next century after recording the first surplus in three decades during FY 1998. In contrast, the President's budget proposes fiscal restraint in FY 2000 for discretionary spending, allocating $555 billion in budget authority for defense and nondefense expenditures. Most federal R&D funds reside in the discretionary portion of the budget, the one-third of the budget subject to annual appropriations. The request for total federal R&D in FY 2000 is $78.2 billion, $1.4 billion or 1.8 percent less than FY 1999 (see Table on page 3).

The Administration was constrained in drafting its discretionary proposals by spending caps signed into law in 1997. The FY 2000 cap is $537 billion, $18 billion below the request. In order to fit discretionary spending under the cap, the President proposes an $18 billion package of offsets. The largest offset would come from tobacco in the form of a new 55-cent-a-pack tax on cigarettes, and an accelerated phase-in of an existing tobacco tax increase. Other offsets would come from extending a Superfund tax, new aviation user fees, and a package called "health care savings" that includes a one-year freeze on Medicare payment rates to hospitals.

Because of the tight constraints, discretionary programs are caught in a funding squeeze in FY 2000. As a result, the budget proposal contains either cuts or small to moderate increases for most R&D programs in FY 2000, in contrast to across-the-board increases in FY 1999. Nevertheless, the budget proposal does find room for significant increases for a few priority programs and some new initiatives.

As reflected in the President's State of the Union Address, information technology (IT) is a high priority in the FY 2000 budget. The request proposes an Information Technology for the 21st Century ($IT^2$ ) initiative of $366 million in new funding for long-term fundamental research in computing and communications, development of a new generation of powerful supercomputers and

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# Encryption Bill Starts Off Safely

The battle for less restrictions on encryption software has begun anew. Rep. Bob Goodlatte (R-VA) and Rep. Zoe Lofgren (D-CA) announced in late February that they would reintroduce their Security and Freedom Through Encryption Act (H.R. 850). H.R. 850 allows Americans to select their type of encryption, prevents the government from accessing encryption programs, and relaxes export controls on encryption software.

H.R. 850 has gotten off to a robust start, improving its co-sponsors from 55 last year to 210 this year and gaining widespread bipartisan support. The signatories include House Majority Leader Richard Armey (R-TX), House Minority Leader Richard Gephardt (D-MO), House Majority Whip Tom DeLay (R-TX), and House Minority Whip David Bonior (D-MI). "Every American is vulnerable online. . .all because of the Administration's current encryption policy," stated Rep. Goodlatte in a press release, "strong encryption protects consumers, and helps law enforcement."

H.R. 850, known as the SAFE Act, has three purposes. First, it will allow the purchase of any type of encryption software. Current federal restrictions on encryption software only permit the sale of 56-bit encryption products that are far less complicated and far less secure than products that can be bought overseas. Second, it allows for few-

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## Also In This Issue

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infrastructure for civilian applications, and research on the economic and social implications of information technology. The National Science Foundation (NSF; $146 million), the Department of Energy (DOE; $70 million), and the Department of Defense (DOD; $100 million) would be the lead agencies in this effort.

A significant change in the make up of the proposed budget is the balance between nondefense and defense spending. Nondefense R&D would exceed defense R&D for the first time since the Carter Administration, fulfilling a Clinton Administration goal. Nondefense would increase by $1.1 billion or 2.9 percent to $39.8 billion, or 51 percent of total R&D while defense R&D would reduce $2.2 billion to $38.5 billion, a decline of 5.3 percent from FY 1999. Basic research continues to be a high priority and would total $18.1 billion, an increase of $816 million or 4.7 percent. Applied research funding would remain flat at $16.6 billion.

Federal R&D performed by colleges and universities would total $15.5 billion in FY 2000 (up 2.3 percent). The single largest agency sponsor of academic research would continue to be the Department of Health and Human Services (HHS). HHS provides 62 percent of the total amount of federal support to academic institutions, nearly all of which comes from the National Institutes of Health (NIH).

The NIH budget (including non-R&D components) would increase by $320 million or 2.0 percent to $15.9 billion in FY 2000, far less than the 15 percent increase it received in FY 1999. Most institutes and centers would receive increases between 2.0 and 3.0 percent. The new Center for Complementary and Alternative Medicine, created in FY 1999, would receive $50 million in FY 2000.

NSF's R&D would total $2.9 billion, up 7.8 percent, within a total budget request of $3.9 billion. The Directorate for Computer and Information Science and Engineering (CISE) would receive $110 million in new funds for IT$^2$, for a total CISE budget of $423 million, an increase of 41.5 percent. Another $36 million for IT$^2$ would come from Major Research Equipment for the development of terascale computing systems. In addition to funding in the traditional directorates, there is a new Integrative Activities account in FY 1999 to support emerging cross-disciplinary research and research instrumentation. The FY 2000 request of $161 million includes $50 million for a biocomplexity initiative.

DOD's R&D would decrease 5.8 percent or $2.1 billion to $35.1 billion, mostly because of cuts in weapons development activities. Although there would be an increase in the total DOD budget in FY 2000, the additional funds would mostly go toward military salaries and weapons procurement. Among the DOD R&D categories, only the "6.1" (basic research) category would show a slight increase. DOD's basic research would total $1.1 billion, only $6 million above FY 1999, while applied research ("6.2") would fall by 6.1 percent to $3.0 billion. The Defense Advanced Research Projects Agency (DARPA) would nearly double its research effort in anti-terrorism biological warfare defense ($146 million).

The total NASA budget ($13.6 billion) would decline in FY 2000, but NASA's R&D would increase slightly to $9.8 billion. The International Space Station project would receive $2.5 billion (up $231 million or 10.3 percent), including $200 million to assure completion of Russian components. There would be increases for Space Science (up 3.7 percent to $2.2 billion) and Earth Science (up 3.2 percent to $1.5 billion), but a steep 25 percent cut to Aero-Space Technology programs ($1.0 billion), which fund NASA's aeronautics R&D and new space vehicles development.

DOE's nondefense R&D budget of $4.0 billion (up 6.4 percent) includes $70 million for the Scientific Simulation Initiative (SSI), DOE's contribution to IT$^2$. The Accelerated Strategic Computing Initiative (ASCI) would also receive a significant increase (13 percent to $341 million). The budget also

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**PRELIMINARY ANALYSIS OF R&D IN THE FY 2000 BUDGET BY AGENCY**
**(BUDGET AUTHORITY IN MILLIONS OF DOLLARS)**

| Agency | FY 1998 Actual | FY 1999 Estimate | FY 2000 Budget | Change FY 99-00 Amount | Change FY 99-00 Percent |
|---|---|---|---|---|---|
| Defense (military) | 37,569 | 37,975 | **35,065** | -2,909 | -7.7% |
| *"S&T" (6.1-6.3)* | *7,712* | *7,791* | ***7,386*** | *-405* | *-5.2%* |
| *All other DOD R&D* | *29,857* | *30,184* | ***27,679*** | *-2,505* | *-8.3%* |
| Health and Human Services | 13,842 | 15,750 | **16,047** | 297 | 1.9% |
| *National Institutes of Health* | *13,110* | *14,971* | ***15,289*** | *318* | *2.1%* |
| National Aeronautics & Space Administration | 9,751 | 9,715 | **9,770** | 55 | 0.6% |
| Energy | 6,351 | 6,974 | **7,447** | 473 | 6.8% |
| National Science Foundation | 2,501 | 2,714 | **2,890** | 176 | 6.5% |
| Agriculture | 1,561 | 1,660 | **1,850** | 190 | 11.4% |
| Commerce | 1,091 | 1,075 | **1,172** | 97 | 9.0% |
| *NOAA* | *581* | *600* | ***600*** | *0* | *0.0%* |
| *NIST* | *503* | *468* | ***565*** | *97* | *20.8%* |
| Interior | 472 | 499 | **590** | 91 | 18.2% |
| Transportation | 590 | 603 | **836** | 233 | 38.7% |
| Environmental Protection Agency | 636 | 669 | **645** | -24 | 3.6% |
| All Other | 1,515 | 1,648 | **1,579** | -69 | -4.2% |
| **Total R&D** | **75, 878** | **79,282** | **77,890** | **-1,392** | **-1.8%** |
| Defense R&D | 40,571 | 41,208 | **38,483** | -2,726 | -6.6% |
| Nondefense R&D | 35,306 | 38,074 | **39,408** | 1,334 | 3.5% |
| Basic Research | 15,522 | 17,286 | **18,102** | 816 | 4.7% |
| Applied Research | 15,460 | 16,559 | **16,649** | 90 | 0.5% |
| Development | 42,600 | 43,051 | **40,729** | -2,322 | -5.4% |
| R&D Facilities and Equipment | 2,296 | 2,386 | **2,411** | 25 | 1.0% |

Source: AAAS, based on OMB data for R&D for FY 2000, agency budget justifications, and information from agency budget offices.

**March 8, 1999 - Revised from February - Preliminary.**

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includes $214 million for the Spallation Neutron Source, and operating funds for a large number of scientific user facilities coming on line in FY 2000. In energy, there would be increases of 20 percent for Solar and Renewables R&D and Energy Conservation R&D.

The U.S. Department of Agriculture's (USDA) R&D budget of $1.7 billion in FY 2000 would be an 11.4% increase from FY 1999, but that figure assumes that $120 million in funds for a competitive grants program blocked by Congress will be made available in FY 2000. USDA proposes $200 million for the National Research Initiative competitive grants program, $81 million more than the current year.

The FY 2000 budget request would, for the most part, build on the significant increases to R&D programs approved in the FY 1999 budget. Budget cuts enacted in the mid-90s, when the deficit loomed large as a policy priority, left many agencies with R&D budgets below the levels of the early 1990s. But because of large increases last year and smaller proposed increases in this budget, a few agencies have now recovered lost ground.■

-Kei Koizumi

# Economics of the Kyoto Protocol Uncertain

*Second in a series.*

As with the science, the costs associated with the implementation of the Kyoto Protocol are much in dispute. In the case of the United States for example, in order to reduce greenhouse gas emissions levels to 7 percent below 1990 levels by the year 2012, it requires both a stabilization of present day emissions and a gradual reduction until 2012. It is estimated that an aggregate 24 percent reduction of U.S. emissions levels would therefore actually be needed to meet Kyoto's goals. The cost to the nation, of course, is dependent on a variety of factors with the most important element in the equation being the degree of international cooperation and adherence to the auspices of the treaty.

The U.S. would have to enact new initiatives in order to comply with these requirements. There are various mechanisms that can be used to limit greenhouse gas emissions such as switching to more energy efficient technologies, simple conservation of resources, or making present day energy producing facilities more efficient. However, it is commonly accepted that it will be market forces and economic policy which will spur the use of these mechanisms. In the past, U.S. policy has long preferred demand side incentives to encourage limitations on emissions. Policies such as tax credits for using more efficient technologies and domestic emissions trading have been prevalent. However, studies have shown that more aggressive supply side methods such as taxes and charges on carbon use would have to be instituted in order to comply with the protocol.

Within the Kyoto Protocol, several factors will determine the effectiveness of these market mechanisms and the costs associated with them. Kyoto's goal, with the correlation between economic growth and energy use being obvious, is to ensure that greenhouse gas emissions are reduced while maintaining energy output levels and without a detrimental effect on economic growth. The most widely accepted indicator is the cost of reducing the amount of carbon emissions since $CO_2$ is the most prevalent greenhouse gas. Therefore, a simplification of Kyoto's goal, in economic terms, would be to ensure that the benefit, including social benefits, received from reducing 1 ton of carbon from the atmosphere would be greater than the cost. Of course, this is not as easy as it may seem. The Organization for Economic Co-operation and Development (OECD) estimates that the relationship between carbon based energy sources will be more closely intertwined with economic growth in the upcoming twenty years than it was in the past twenty years due to technological advancement and a greater demand for energy. Therefore, it would be harder to remove carbon from the equation in a way that is not detrimental to economic growth. For example, studies have shown that it would cost the U.S., without any international collaboration and using only domestic measures, between $125-240 to remove one ton of carbon. This translates into approximately 1 percent of the nation's $8 trillion GDP. The protocol attempts to alleviate these costs by spreading emissions requirements among regions.

Kyoto could potentially be a cost-effective mechanism. In a recent presentation hosted by Resources for the Future, Scott Barrett of the London Business School argued that Kyoto can be a cost-efficient treaty, but with two conditions. The first provision is that reducing carbon emissions is globally cost-effective. This means that an overall reduction of carbon is beneficial to each individual country and that every country's benefit outpaces its costs. The second stipulation is that carbon leakage, or a reallocation of carbon production from one country to another is prevented. This implies that nations would not be able to move factories or other carbon emitting centers to other nations with little or no carbon emissions restraints.

The treaty, in its present form, makes the achievement of these conditions and cost efficiency very difficult. Perhaps the most glaring flaw of the treaty is the lack of a joint implementation requirement between Annex I (industrialized) and non-Annex I (developing) countries since it encourages emissions leakage. This could allow Annex I countries to "leak" their carbon intensive industries to non-participating countries. While this would reduce their national emissions it would also increase global emissions since developing countries tend to be less efficient. Costs would be reduced in some countries but increase globally since carbon reduction is not being achieved and therefore, no benefits are gained. Even with emissions trading, where it would be efficient to share costs among different countries, the incentive is still there to transfer emissions to nations without limits on carbon production rather than to nations with a quota.

The Kyoto Protocol does, however, allow for a number of flexible mechanisms that are aimed at reducing costs. First, nations can create "umbrellas and bubbles" that could enable them to pool their carbon allotments and spread out emissions between groups of nations, much like the European Union. Second, nations are able to "bank" or holdover emissions numbers so that they can apply those num-

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bers in a different control period beyond 2012. Third, joint implementation among Annex I countries allow for project based trades among countries, allowing countries to implement joint programs. Fourth, the Clean Development Mechanism within the protocol can extend joint implementation to non-Annex I countries in exchange for cleaner technologies and other incentives.

Ultimately, the costs are still difficult to calculate, but economic models do exist. Studies for reducing carbon emissions to Kyoto's standards have been estimated to be from anywhere between $7 and $150 per one ton of carbon. The Intergovernmental Panel on Climate Change estimates that it would cost anywhere between $7 and $34 per ton, and the Clinton Administration has promised to hold the U.S. costs between $14 and $23 per ton. The Cato Institute has calculated the number to be $150 per ton of carbon. This range of estimates translates into anywhere from slightly below 1 percent of U.S. GDP to about 2.3 percent of GDP annually. In addition, the U.S. already spends about $4 billion on initiatives dealing with climate change (e.g. the Climate Change Technology Initiative and the U.S. Global Change Research Program). The President's fiscal year 2000 budget request included substantial increases in these programs. However, these programs are primarily for research and development purposes supporting future energy efficient technology, and they have only a minimal short-term impact on alleviating emissions.

As with the pure science behind the Kyoto Protocol, the economics behind it's provisions are uncertain. There are significantly more factors that can be considered when quantifying costs, such as the effect of innovation and new energy efficient technology, but those would be guesses at best. However, the sophisticated economic models used today seem to be just as uncertain. The only consensus seems to be that the earth's climate is getting increasingly warmer. Unfortunately, experts cannot seem to agree on how this will affect the planet, not to mention how much it will cost.■

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er export restrictions on the software, such as limiting the complexity of the encryption software to 56 bits when industry standards have reached 128 bits. Finally, it calls for a prohibition on any third party access to the encryption key of any piece of software.

With the departure of key opponents to last year's bill, there is an increased likeliehood that H.R. 850 can pass this session. "It is a common sense issue. It makes no sense to stay out of the [encryption] market. Our country can and should compete," according to Rep. Bonior. Some Congressmen, however, are still cautious about the bill. While supportive of H.R. 850, Rep. Howard Berman (D-CA), ranking minority member of the House Judiciary Committee's Subcommittee on Courts and Intellectual Property, advised in a hearing concerning H.R. 850 that, "stronger encryption products freely and without limits might have the ability to impede national security." Even Senator Bob Kerrey (D-NE), once an ardent supporter of current U.S. policy, has changed his opinion and agrees with the bill's three objectives but not necessarily with its methods. He warns, in an interview with *National Journal's Technology Daily*, that H.R. 850 is "a very blunt instrument" that could endanger public safety and national security.

The widespread support, however, ends at the White House. Administration officials have cited that the proposed relaxation of export controls goes too far and the lack of regulations on key recovery poses a severe threat to national security. "With respect to H.R. 850, the Administration opposes this legislation," stated William Reinsch, the Undersecretary for Export Administration for the Department of Commerce. Reinsch continues that H.R. 850 "proposes export liberalization far beyond what the Administration can entertain and. . .despite some cosmetic changes, the bill the authors have made, in letter and spirit, would destroy the balance we have worked so hard to achieve and would jeopardize our law enforcement and national security."

Last year's bill ultimately failed on the House floor. Goodlatte blamed its failure on the various revisions made to the bill while in committee and said that this year would be an easier go, as evidenced with the large number of co-sponsors. The bill has already passed through a markup, without amendments, in the House Judiciary Committee's Subcommitte on Courts and Intellectual Property. Even some U.S. allies have begun loosening restrictions on encryption. France has made plans to ease controls which prompted the European Union to analyze the prospect of adopting similiar measures. On 1 March, the United Kingdom dropped its plans to require third key access to encryption. The Administration, however, remains adamant in maintaining strict encryption regulations and regardless of H.R. 850's strong support, it could still be in for quite a fight.■

# Status of Major Legislation

## DATA ACCESS

**H.R. 88**

Introduced by Rep. George E. Brown, Jr. (D-CA). A bill to amend the Treasury and General Government Appropriations Act, 1999, to repeal the mandate that the OMB revise Circular A-110 so that all data produced under a Federal grant be made available through the Freedom of Information Act. 1/6/99 Referred to the House Committee on Government Reform. 1/13/99 Referred to the Subcommittee on Government Management, Information and Technology.

**CONGRESSIONAL RESEARCH ACCESSIBILITY**

**H.R. 654**

Introduced by Rep. Christopher Shays (R-CT). A bill to make available on the Internet, for purposes of access and retrieval by the public, certain information available through the Congressional Research Service web site. 2/09/99 Referred to the Committee on House Administration.

## TECHNOLOGY TRANSFER

**TECHNOLOGY TRANSFER COMMERCIALIZATION ACT OF 1999**

**H.R. 209**

Introduced by Rep. Constance Morella (R-MD). A bill to improve the ability of Federal agencies to license federally owned inventions. The bill amends the Stevenson-Wydler Technology Innovation Act of 1980 to revise requirements regarding enumerated authority under a cooperative research and development agreement (CRADA). 1/6/99 Referred to the Committee on Science and Committee on the Judiciary. 2/4/99 Referred to the Subcommittee on Technology.

## INTELLECTUAL PROPERTY

**COLLECTIONS OF INFORMATION ANTIPIRACY ACT**

**H.R. 354**

Introduced by Rep. Howard Coble (R-NC). A bill to amend title 17, United States Code, to provide protection for certain collections of information through substantial monetary or other resources. 1/19/99 Referred to the House Committee on the Judiciary.

## SCIENTIFIC RESEARCH

**HUMAN CLONING PREVENTION ACT OF 1999**

**H.R. 571**

Introduced by Rep. Ron Paul (R-TX). A bill to prohibit Federal payments to any business, institution, or organization that engages in human cloning or human cloning techniques. 2/4/99 Referred to the House Committee on Commerce.

**SCIENCE INTEGRITY ACT**

**H.R. 574**

Introduced by Rep. Richard Pombo (R-CA). A bill to require peer review of scientific data used in support of Federal regulations, and for other purposes. 1/4/99 Referred to the Committee on Government Reform and the Committee on Science. 1/18/99 Referred to the Subcommittee on National Economic Growth, Natural Resources and Regulatory Affairs.

**FEDERAL RESEARCH INVESTMENT ACT**

**S. 296**

Introduced by Sen. Bill Frist (R-TN). A bill to provide for continuation of the Federal research investment in a fiscally sustainable way, and for other purposes. 1/22/99 Read twice and referred to the Committee on Commerce.

## TAX CODE

**H.R. 760**

Introduced by Rep. F. James Sensenbrenner, Jr. (R-WI). A bill to amend the Internal Revenue Code of 1986 to permanently extend the research credit. 1/12/99 Referred to the House Committee on Ways and Means.

**BIOMEDICAL RESEARCH ASSISTANCE VOLUNTARY OPTION ACT**

**H.R. 785**

Introduced by Rep. Michael Bilirakis (R-FL). A bill to amend the Internal Revenue Code of 1986 to allow taxpayers to designate that part or all of any income tax refund be paid over for use in biomedical research conducted through the National Institutes of Health. 1/23/99 Referred to the Committee on Ways and Means and the Committee on Commerce.

**H.R. 977**

Introduced by Rep. Michael P. Forbes (R-NY). A bill to amend the Internal Revenue Code of 1986 to establish, and provide a checkoff for a Biomedical Research Fund and for other purposes. 3/04/99 Referred to the Committee on Ways and Means and to the Committee on Commerce.

**S. 195**

Introduced by Sen. Barbara Boxer (D-CA). A bill to amend the Internal Revenue Code of 1986 to permanently extend the research credit. 1/19/99 Read twice and referred to the Committee on Finance.■

# Reports and Publications

**NATIONAL ACADEMY OF SCIENCES, NATIONAL ACADEMY OF ENGINEERING, INSTITUTE OF MEDICINE, NATIONAL RESEARCH COUNCIL**

Government offices may obtain single complimentary copies by calling the Office of Congressional and Government Affairs at 202/334-1513. Others may order copies from the National Academy Press by calling 800/624-6242.

*Funding a Revolution: Government Support for Computing Research* (ISBN 0-309-06278-0). This report examines the history of computing since World War II and the role that the federal government has played in funding and support of computer research. It examines the factors that have contributed to the nation's success in this field and recommends ways that the government can initiate other technological developments. The report is intended to guide current efforts to shape federal computing policy.

*Exposure of the American People to Iodine-131 from the Nevada Atomic-Bomb Tests: Review of the 1997 National Cancer Institute Report and Public Health Implications* (ISBN 0-309-06175-X). This report assesses the possible impact of radiation exposure on public health from atomic bomb tests conducted in Nevada in the 1950's and early 1960's. It explores the possible health consequences for Americans who were exposed to radiation and offers potential strategies to deal with this problem. In addition, the NCI recommends ways that the federal government can communicate with the public about these health risks.

*Global Environmental Change: Pathways for the Next Decade* (ISBN 0-309-06420-1). This report provides an overview of global change research and the interactions between ecosystems and human society. It explores the current understanding of global change by presenting case studies that highlight important scientific questions such as: the context of climate change and research priorities in atmospheric chemistry, climate, and ecosystem studies.

*How People Learn: Brain, Mind, Experience, and School* (ISBN 0-309-06557-7). The publication explores the biological basis for the neural processes of learning and the influences of culture and teaching on both the brain and a child's learning. It offers recommendations for teachers and schools on curricula, classroom settings, and teaching methods to help children maximize learning. It looks at the role of technology in education and its preparation of students for a technologically-driven world.

*Nuclear Physics: The Core of Matter, The Fuel of the Stars* (ISBN 0-309-06276-4). The latest volume in a series, this report explores advances in physics by describing current research in nuclear structure and symmetries, the behavior of matter at extreme densities, the role of nuclear physics in astrophysics and cosmology, and the instrumentation and facilities used by the field. The report makes recommendations as to the resources required to make experimental and theoretical research advances in the next decade.

*The Unequal Burden of Cancer: An Assessment of NIH Research and Programs for Ethnic Minorities and the Medically Underserved* (ISBN 0-309-07154-2). The publication provides an overview of cancer as ethnic minorities experience it and economically disadvantaged people who do not have access to cancer care. Data is provided on the activities and expenditures of the NIH on cancer. It offers conclusions and recommendations in terms of: defining and understanding special populations, improving the collection of cancer-related data, ensuring that special populations are represented in clinical trials by setting priorities for specific NIH research programs, and disseminating research results to health professionals serving these populations.

**GENERAL ACCOUNTING OFFICE**

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*Medical Records Privacy: Access Needed for Health Research, but Oversight of Privacy Protections is Limited* (HEHS-99-55). The report examines the issue of balancing privacy protection with the need to use medical records and personal identifiers for laboratory research/data gathering. It addresses how medical information is used for research purposes, identifies private research that is not subject to federal oversight requirements, examines the effectiveness of Institutional Review Boards and how they ensure confidentiality of health information, and identifies safeguards put in place by a variety of health organizations to protect confidentiality.

*Emerging Infectious Diseases: Consensus on Needed Laboratory Capacity Could Strengthen Surveillance* (HEHS-99-26). This report focuses on surveillance efforts by the Centers for Disease Control (CDC) and state health departments to monitor infectious diseases, with a special emphasis on the contributions of laboratories. The report addresses the extent to which states conduct public health surveillance and laboratory testing of selected emerging infectious diseases, assesses the value of HHS and CDC's assistance to states for laboratory-related surveillance, and identifies problems that state public health officials face in gathering and using laboratory data.■

## HEARD OFF THE HILL

Researchers at the University of South Wales in Australia have found a link between breast cancer and microscopic changes in hair structure. X-ray studies conducted on a single human hair taken from breast cancer patients revealed an atypical protein structure. In addition, a few women possessing both a familial cancer history and a genetic mutation had this atypical hair structure. This discovery may pave the way for more affordable treatment for and accurate diagnosis of cancer. *Washington Post*, March 4, 1999.

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A team of Danish physicists and American collaborators have found a way to slow the speed of light to 38 miles per hour. The researchers used a chilled cluster of atoms – the Bose-Einstein condensate – to create a superatom effect that interacted with laser light to slow down the speed of light. This new method could potentially be used in communications systems, optical computers, and television displays. *Nature*, February 18, 1999.

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Researchers at the Massachusetts Institute of Technology's media lab have created a "sensory tabletop" that uses electrode currents and mathematical algorithms to detect the motion of one's hand in three dimensional space. This new technology, in addition to controlling computer software, could potentially be used by geophysicists to describe matter located beneath the earth's surface. *New Scientist*, March 6, 1999.

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Researchers at the Institute for Human Gene Therapy, at the University of Pennsylvania, have implanted the erythropoietin gene (EPO), the gene which stimulates the production of red blood cells, in an invasive virus and successfully injected the virus into the muscle cells of rhesus monkeys. Then, a simple pill given orally to these monkeys, rapamycin, activates this gene, and stimulates the production of more red blood cells. This new gene therapy holds promise for the treatment of certain types of cancer. *New York Times*, February 23, 1999.■

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