



MAY
1999

Genetic Testing Reviewed by Congress

On April 21, 1999, the House Science Committee's Subcommittee on Technology convened in light of new advances in genetic testing and the progress made by the Human Genome Project. The Subcommittee considered the personal, legal, ethical, and educational concerns associated with genetic testing.

Research advances now allow individuals to be tested for a variety of genetic, often hereditary mutations that increase an individual's risk of developing diseases such as breast cancer and cystic fibrosis. Dr. Francis Collins, Director of the National Human Genome Research Institute, testified that individuals concerned about their predisposition to develop cancer, for example, will be able to take a test for that particular mutation and accordingly, receive prevention counseling and treatment. This may help individuals make better decisions regarding his or her own healthcare, but for those people who have tested positive for a genetic predisposition, there may not be prevention options available. "Even when a test is highly accurate and the

clinical significance of the result is well understood, the outcome may do more to create anxiety for the patient than to provide reassurance," said Dr. William Raub, Deputy Assistant Secretary of Science Policy in the Office of the Secretary of Health and Human Services (HHS), "this can occur when an apparently healthy individual tests positive for a genetic marker associated with a disease that may or may not develop at some future time...and for which no validated preventative intervention is available."

Another major concern about genetic testing is the extent to which it is currently regulated under existing law. The Clinical Laboratory Improvement Amendments of 1988 (CLIA), establish quality standards for those laboratories which test specimens obtained from humans. In addition, HHS has regulations to protect human research subjects; indeed some laboratories do fall under this category. Under the Food and Drug Administration's (FDA) rules for medical devices, genetic tests packaged and sold as kits are subject to FDA

GENETIC TESTING, *continued page 4*

The Paradox of Privacy on the Internet

The idea of privacy has fully entrenched itself within the American psyche as an unalienable right. While, the "right to privacy" cannot be specifically found in the Constitution, several Supreme Court rulings have engrained privacy as a legally protected right. Landmark cases such as *Griswold v. Connecticut* and *Roe v. Wade* have cited elements of the First, Fourth, Fifth, and Ninth Amendments of the Bill of Rights as all contributing to the legal protection of privacy. Even the *American Heritage Dictionary, Third Edition*, defines privacy as "The state of being free from un-sanctioned intrusion: *a person's right to privacy.*"

Perhaps the most concise definition of the right to privacy comes from a Supreme Court case in 1967, *Katz v. United States*. Justice Harlan writes, "Legitimation of expectations of privacy by law must have a source outside of the Fourth Amendment, either by reference to concepts of real or personal property law or to understandings that

are recognized and permitted by society." This expands the definition of privacy beyond legal rulings by including the societal expectations of privacy which has undoubtedly evolved considerably throughout the decades.

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Budget Resolution Puts the Squeeze on R&D

As with the President's budget request, the American Association for the Advancement of Science (AAAS) prepares analyses of the potential impact of the budget resolution on research and development (R&D). Although there are few specifics in the concurrent budget resolution regarding federal support of R&D, it will have a major impact because it establishes broad spending targets under which all federal support for R&D will be considered. Because of the lack of specificity in the resolution, it is difficult to assess its potential impacts on federal R&D programs. Hence, the AAAS analysis presents only one scenario for how the budget could affect R&D. For the most part, the analysis assumes that each program within a function will be increased or cut proportionally to other programs in the function to meet the spending targets.

On April 15, 1999, a concurrent resolution establishing the congressional budget for the United States Government for fiscal year (FY) 2000 was completed. The budget resolution lays out congressional priorities for the federal budget in FY 2000 through FY 2009 and establishes broad budget aggregates for categories of federal spending.

Total discretionary spending is proposed to fall from \$557 billion in FY 1999 to \$546 billion in FY 2000, a cut of 1.9 percent (see Table on next page). Congress would cut spending in order to stay within statutory discretionary caps enacted in 1997. After the caps expire in FY 2003, discretionary spending would rise to \$587 billion in FY 2004, a gain of 5.4 percent over FY 1999 (down 4.9 percent after adjusting for expected inflation). Nearly all of the projected future surpluses would be dedicated to Social Security and tax cuts, with none for discretionary programs. And even within declining discretionary spending, R&D has been accorded low priority relative to other areas, namely education and defense.

Federal support for R&D is projected to fall from \$79.3 billion in FY 1999 to \$76.1 billion in FY 2004, a decline of 13.4 percent after adjusting for expected inflation. By FY 2004, defense R&D would fall 14.3 percent in inflation-adjusted terms even as total defense spending would rise. Nondefense R&D is projected to fall if the budget resolutions' assumptions are followed, from \$38.1 billion in FY 1999 to \$37.0 billion in FY 2004, a 12.4 percent decline after adjusting for inflation.

The budget resolution provides increases above FY 1999 levels for only the defense, education and veterans budget function in FY 2000. The defense budget function would increase 3.5 percent to \$290 billion, and education would grow 9.7 percent to \$51 billion. Within the general science and space function—a category that covers most of NSF, NASA, and the science account in DOE—it provides just

\$17.9 billion for discretionary programs. This amount is 4.7 percent less than the FY 1999 level. The AAAS analysis assumes that all general science programs would have to be reduced by 4.7 percent in FY 2000. Although appropriators may distribute the overall cut differently by setting priorities, any program increases must be offset by cuts in other programs in a zero-sum situation.

Because of the tight discretionary caps and the increases for defense and education, only the Department of Education (up 11.2 percent after inflation) would see its R&D budget increase to FY 2004. Every other agency would see its R&D budget decline. The National Science Foundation (NSF) would decrease 14.0 percent, the National Institutes of Health (NIH) down 6.3 percent, the Department of Energy (DOE) down 13.5 percent, the National Aeronautics and Space Administration (NASA) would decrease 14.8 percent, and the Department of Agriculture (USDA) drops 13.3 percent.

The House and Senate Appropriations Committees must now begin drafting appropriations bills to meet the spending targets. Because of the severe constraints imposed by the resolution, the targets leave appropriators with little choice but to make cuts within discretionary programs. Any appropriations bills that actually meet the targets could draw presidential veto threats, and may prove impossible to pass in either chamber.

BUDGET RESOLUTION, *continued next page*

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Albert H. Teich, Director
Science and Policy Programs

Joanne Padrón Carney, Assistant Director
Leandro Lagera, Project Assistant
Julie Miller, Intern

DISCRETIONARY SPENDING PROPOSALS IN THE FY 2000 CONGRESSIONAL BUDGET RESOLUTION

(BUDGET AUTHORITY IN BILLIONS OF DOLLARS)



	FY 1999 Estimate	FY 2000 Proposed	FY 2001 Proposed	FY 2002 Proposed	FY 2003 Proposed	FY 2004 Proposed	% Change FY 99-04 current \$	% Change FY 99-04 constant \$
Discretionary Spending by Budget Function								
Defense	280.3	290.0	304.8	309.3	319.4	328.1	17.1%	5.6%
Nondefense	276.3	256.1	245.0	247.5	255.2	258.6	-6.4%	-15.6%
-international	22.5	17.7	16.4	16.1	16.0	16.4	-27.0%	-34.1%
-general science	18.8	17.9	17.9	17.9	17.9	17.9	-4.7%	-14.0%
-energy	2.9	1.8	0.5	1.9	1.9	1.9	-34.2%	-40.6%
-environment	23.4	22.0	21.3	21.1	22.0	22.5	-3.7%	-13.1%
-agriculture	4.3	3.9	3.7	3.7	3.6	3.6	-16.6%	-24.8%
-commerce	3.7	3.5	2.1	1.7	1.8	1.8	-51.4%	-56.2%
-transportation	13.3	12.2	11.9	11.3	11.2	11.2	-16.0%	-24.2%
-education	46.6	51.1	50.6	51.3	54.3	56.3	20.8%	9.0%
-health	30.1	29.3	27.9	27.7	27.5	27.3	-9.2%	-18.1%
-income security	32.8	28.7	27.9	30.3	34.6	35.2	7.3%	-3.2%
-veterans	19.3	20.9	19.1	19.0	19.0	19.0	-1.5%	-11.1%
-justice	26.2	23.1	24.4	24.4	24.4	24.4	-6.8%	-15.9%
-general gov't	13.2	11.4	11.0	11.1	11.1	11.1	-15.9%	-24.1%
-all other nondefense	19.3	12.6	10.3	10.0	9.9	10.0	-48.2%	-53.2%
Total Discretionary	556.6	546.1	549.8	556.8	574.6	586.7	5.4%	-4.9%
proposed financing for above total:								
Allowances	0.0	9.8	8.5	6.4	4.4	4.5		
Discretionary Limits	556.6	537.2	541.9	551.0	--	--		

Source: Senate Budget Resolution for FY 2000. FY 1999 base figures adapted from *Budget of the United States Government FY 2000*. **REVISED April 28, 1999 to reflect conference budget resolution.** FY 1999 figures include emergency funding and contingent emergency funding expected to be released. FY 1999 figures do not include IMF quota and New Arrangements to Borrow funds. Discretionary spending figures do not include allowances, offsets or undistributed offsetting receipts. Allowances included Senate-assumed discretionary proposals, including undistributed reductions in the number of political appointees, undistributed reductions in federal costs, and offsets from user fees. Defense figures are net of DOD-wide savings proposals. Constant-dollar conversions are based on OMB's GDP deflators. Discretionary limits net of anticipated adjustments and current adjustments. FY 1999 limit is combination of three component limits (defense, nondefense, violent crime) and excludes IMF, NAB adjustments.

BUDGET RESOLUTION, from page 2

Between now and the conclusion of FY 2000 appropriations in the fall, it is almost certain that some mechanisms will be found to raise discretionary spending to at least the Administration's proposed level if not higher. This task may be made easier by the widespread assumption that as the year goes on, projections for future surpluses will only get better, freeing up more money for discretionary or other uses.

The budget resolution, then, is unlikely to last long as a framework because of the pain involved in actually executing it. Although a budget resolution is rarely executed as written, especially in future fiscal years, it does give an indication of current congressional priorities. At the moment it is not favorable to R&D programs. In the near term, the

FY 2000 spending targets are binding on the House and Senate Appropriations Committees and so it is a starting point for congressional action. Starting points are different from end points, of course. Between now and the fall appropriators will have to find an extra \$20 billion just to fund nondefense discretionary programs in FY 2000 at the FY 1999 level, with no allowance for inflation.

It is clear that the new era of budget surpluses is far from a dawning golden age for the federal investment in R&D. There are many other claims to the surplus, and more importantly there are restrictive caps. The good news for federal R&D is that projections are not the same as predictions, and may not come to pass. ■

-Kei Koizumi



regulation. However, CLIA guidelines do not contain specific provisions regulating individual genetic tests done in commercial testing laboratories.

In an effort to address this and other concerns, the National Institutes of Health (NIH) and the Department of Energy (DOE) formed a Task Force on Genetic Testing in 1996. The Task Force issued its recommendations last fall to HHS Secretary Donna Shalala in a report, *Promoting Safe and Effective Genetic Testing in the United States*. The Task Force's recommendations include calling for the creation of a genetics specialty category under CLIA regulations, to monitor quality-control in laboratories doing genetic testing, and, at the same time, make sure that laboratory personnel have formal genetics training.

The Task Force also recommended the introduction of some FDA regulatory oversight of commercial, laboratory-based testing services. Dr. Michael Watson, Professor of Pediatrics and Genetics at the Washington University School of Medicine and co-chair of the Task Force on Genetics Testing, testified that there was a need to establish inter-agency cooperation when setting up genetic testing regulations, and oversight should be provided by Institutional Review Boards assisted by the Office of Protection of Human Subjects from Research Risks at the NIH. Of course, any new federal regulations or additions will need to specify which institute's or agency's measurement standards is to be adopted by all laboratories, according to testimony by Dr. Raymond Kammer, Director of the National Institute of Standards and Technology (NIST).

The witnesses also recommended utilizing or revising regulations already in place within federal agencies like HHS, and did not support the introduction of additional congressional legislation.

Another concern was the risk associated with insurance companies having access to genetic test results. Dr. Collins testified that the reason for low enrollment numbers in clinical trials for the breast cancer gene (BRCA) is because women are worried that their insurers will deny them coverage if found to test positive for a mutation. Individual states such as California and New York have passed laws

prohibiting insurance discrimination on the basis of genetic test results and services, however, there is currently no federal law providing protection at the national level. In the 106th Congress, several bills have been introduced that contain measures to prohibit health insurers and group plans from discriminating against individuals on the basis of genetic information or a request for genetic services.

Also in the legal arena, patenting issues associated with the Human Genome Project have become an area of concern due to the race between private and government-led ventures to sequence the entire human genome. Dr. Watson testified that this situation has created monopolistic testing practices, that limit competition and contribute to bickering over the licensing of small amounts of genetic information. So far, no regulation has been issued from the U.S. Patent Office in response to the increasing number of requests for patent rights on specific human genome sequences.

Subcommittee Chairwoman Rep. Connie Morella (R-MD) stressed the need to educate the public about the benefits of genetic testing and at the same time, prepare health professionals so that they can provide reliable tests and offer appropriate advice. Dr. Raub cited the creation of the Human Genome Epidemiology Network by the Centers for Disease Control to disseminate information via the World Wide Web for that purpose. However, he also noted that health care providers lack basic genetics knowledge and receive inadequate genetics training in medical schools. The Task Force on Genetic Testing recommended that the National Coalition for Health Professional Education in Genetics, which is composed of different medical entities, be the leader in promoting awareness of genetic concepts and testing consequences, and in developing genetics curricula for use in medical schools.

It is apparent that with respect to genetic testing, the issues of federal regulation and oversight, patent rights, insurance discrimination, and education awareness are on the congressional agenda. However, the extent to which and in what manner legislators will provide guidance in these areas, remains to be seen. ■



Now, with the Internet explosion, the right to personal privacy has taken on a whole new dimension. Lawmakers are focusing on society's expectations of privacy and the protection of those expectations within a medium whose goal is to disseminate as much information as possible in the quickest possible manner. Also, the protection of privacy or even discovering a breach of privacy becomes increasingly harder to achieve with the rapid improvement of technological capability. The challenge facing Congress is how not to impede a fast-growing high-technology industry while insuring that information transmitted through the World Wide Web is properly protected and not viewed or stolen by unwanted and unauthorized users.

Just in the first four months of the 106th Congress, several bills were proposed that tackle a wide-range of delicate privacy issues in the Information Age. There are those bills that try to regulate privacy through increased regulation such as Sen. Conrad Burns' (R-MT) Online Privacy Protection Act, and Rep. Bruce Vento's (D-MN) Consumer Internet Privacy Protection Act. And there are those bills that try to strengthen the technology needed to protect electronic privacy such as Rep. Bob Goodlatte's (R-VA) SAFE Act and Sen. John McCain's (R-AZ) PROJECT Act. More bills are expected that will attempt to define the right to privacy even further such as one proposal that would apply Fourth Amendment rights, the right against illegal search and seizure, to an individual's computers.

Legislators also have to take into consideration that they are trying to apply laws to a medium that does not pay attention to national borders. Regulation of the Internet must be coordinated with other nations so that regulatory practices can be consistent and afford uniform protection to all Internet users. Therefore, legislators also have to bear in mind international regulatory measures such as the European Union's Privacy Directive which requires reciprocal safeguards of intellectual property before information can be sent from or received by the member states of the European Union.

To add to that, some industry representatives would rather that legislators leave regulation of privacy matters on the Internet to market forces. At an April 21 Senate Judiciary Committee hearing to discuss Internet privacy issues, several industry representatives voiced this opinion. "A new

statute is not the answer," testified Irving Wladawsky-Berger, General Manager of IBM's Internet Division, "the great majority of the business community recognizes that its real interests lies in maintaining the trust and confidence of their customers—and therefore it is smart business to respect the privacy of personal information." Katherine Borsechnik, America Online's Senior Vice President for Strategic Businesses, added, "ultimately, it is the consumer who will be the judge of whether these efforts are adequate. Because no matter how extraordinary the opportunities for electronic commerce may be, the marketplace will fail if we cannot meet consumers' demands for privacy protection and gain their trust."

Unfortunately, it may not be that simple. Individuals and the private sector are not the only parties that have access to the Internet. Nonprofit institutions and government constantly collect individual information and are not subject to market forces. These institutions, therefore, need to be regulated through other mechanisms. "The Internet is not just a communication forum, it is a future community," argued Jerry Berman, Executive Director of the Center for Democracy and Technology, before the committee, "cooperation among the business community and the nonprofit community is crucial." Berman foresees the need for a combination of self-regulation, legislation, and stronger technologies so that privacy can truly be protected on the World Wide Web.

The idea of maintaining privacy standards on the Internet is not a new concept. Legislation has been in place since as early as The Electronics Communications Privacy Act, passed by Congress in 1986, to address this issue. But, the technology driving the Internet has exploded at such a torrid pace that it has become an essential part of society's daily routine. Almost as if reflecting upon the 1967 *Katz* Supreme Court opinion, Berman adds, "Our legal framework for protecting individual privacy in electronic communications, while built upon constitutional principles buttressed by statutory protections, reflects the technical and social 'givens' of specific moments in history." It is now the job of Congress to first determine the societal expectations when it comes to privacy and then determine how to maintain those expectations in light of the pace of technological innovation. ■



Status of Major Legislation

SPACE

S. 832

Introduced by Sen. John McCain (R-AZ). A bill to extend the commercial space launch damage indemnification provisions of section 70113 of title 49, United States Code. 4/20/99 Referred to the Committee on Commerce, Science, and Transportation.

NATIONAL SECURITY

S. 887

Introduced by Sen. Richard C. Shelby (R-AL). A bill to establish a moratorium on the Foreign Visitors Program at the Department of Energy nuclear laboratories, and for other purposes. 4/27/99 Referred to the Committee on Armed Services.

ENCRYPTION

PROMOTE RELIABLE ON-LINE TRANSACTIONS TO ENCOURAGE COMMERCE AND TRADE (PROJECT) ACT OF 1999

S. 798

Introduced by Sen. John McCain (R-AZ). A bill to promote electronic commerce by encouraging and facilitating the use of encryption in interstate commerce consistent with the protection of national security, and for other purposes. 4/14/99 Referred to the Committee on Commerce, Science, and Transportation.

INTERNET

ONLINE PRIVACY PROTECTION ACT OF 1999

S. 809

Introduced by Sen. Conrad Burns (R-MT). A bill to require the Federal Trade Commission to prescribe regulations to protect the privacy of personal information collected from and about private individuals who are not covered by the Children's Online Privacy Protection Act of 1998 on the Internet, and to provide greater individual control over the collection and use of that information. 4/15/99 Referred to the Committee on Commerce, Science, and Transportation.

ENVIRONMENT

OMNIBUS MERCURY EMISSIONS REDUCTION ACT OF 1999

S. 673

Introduced by Sen. Patrick J. Leahy (D-VT). A bill to amend the Clean Air Act to establish requirements concerning the operation of fossil fuel-fired electric utility steam generating units, commercial and industrial boiler units, solid waste incineration units, medical waste incinerators, hazardous waste combustors, chlor-alkali plants, and Portland cement plants to reduce emissions of mercury to the environment, and

for other purposes. 3/19/99 Referred to the Committee on Environment and Public Works.

COST-BENEFIT ANALYSIS

REGULATORY RIGHT-TO-KNOW ACT OF 1999

H.R. 1074

Introduced by Rep. Tom Bliley (R-VA). A bill to provide government wide accounting of regulatory costs and benefits' impact on private businesses and other entities. This effort would be under the direction of the Office of Management and Budget and would promote the public right-to-know about the costs and benefits of federal regulatory programs and rules. 4/20/99 Subcommittee on National Economic Growth, Natural Resources and Regulatory Affairs Consideration and Mark-up Session Held; forwarded by Subcommittee to Committee on Government Reform.

EDUCATION

TEACHER TECHNOLOGY TRAINING ACT OF 1999

H.R. 1075

Introduced by Rep. Debbie Stabenow (D-MI). A bill to amend the Internal Revenue Code of 1986 to provide incentives to elementary and secondary teachers for technology-related training for purposes of integrating educational technologies into the courses taught in our nation's classrooms. 3/11/99 Referred to the House Committee on Ways and Means.

MATHEMATICS AND SCIENCE PROFICIENCY PARTNERSHIP ACT OF 1999

H.R. 1265

Introduced by Rep. Eddie Bernice Johnson (D-TX). A bill to develop a demonstration project through the National Science Foundation to encourage interest in the fields of mathematics, science, and information technology. 3/24/99 Referred to the Committee on Science, and to the Committee on Education and the Workforce. 4/16/99 Referred to the Subcommittee on Early Childhood, Youth and Families.

MEDICINE

LIFESAVING VACCINE TECHNOLOGY ACT OF 1999

H.R. 1274

Introduced by Rep. Nancy Pelosi (D-CA). A bill to amend the Internal Revenue Code of 1986 to provide a credit for medical research related to developing vaccines against widespread diseases. 3/24/99 Referred to the Committee on Ways and Means, and to the Committee on Commerce, Science, and Transportation. 4/06/99 Referred to the Subcommittee on Health and Environment. ■

Reports and Publications

CONGRESSIONAL RESEARCH SERVICE

Copies of CRS reports for congressional use are available by calling 202/707-7132.

U.S. National Science Foundation: An Overview (95-307 SPR). This report presents an overview of the support that the NSF provides to universities as well as a summary of the NSF FY 2000 budget request. The FY 2000 request focuses on the following areas: biocomplexity in the environment, new approaches to education and workforce development, and information-technology activities. Included is a summary of policy goals and strategic plans as outlined in a response to the Government Performance and Results Act.

The National Earthquake Hazards Reduction Program: Preparing for the "Big One" (97-1003 STM). The report reviews the geological background behind earthquakes, the potential seismic hazards across the U.S., the National Earthquake Hazards Reduction Program, and the new National Earthquake Loss Reduction Program. It summarizes the concerns raised during reauthorization hearings for the National Earthquake Hazards Reduction Program in the 105th Congress, in view of the budget request for fiscal years 2000-2001.

Methane Hydrates: Energy Prospect or Natural Hazard? (RS20050). The report provides a description of methane hydrates, the location of deposits, its potential as a source of natural gas, and prospects for safe and feasible commercial development. It summarizes steps taken by federal agencies to evaluate the potential of methane hydrates and congressional action taken to fund initiatives.

GENERAL ACCOUNTING OFFICE

Copies of GAO Publications are available by calling 202/512-6000 or via the Internet at <http://www.gao.gov>.

Federal Research: Peer Review Practices at Federal Science Agencies Vary (RCED 99-99). This publication examines the processes used by federal agencies to oversee scientific research and development. It looks at the definition of peer review, the federal government's peer review policy, the peer review practices of 12 federal agencies, other agency quality assurance reviews, and identifies research not subject to review. Results indicated that agencies use varying degrees of peer review to evaluate research proposals and scientist performance, and also use agency supervisors and managers to assess the quality of proposals.

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Government offices may obtain single complimentary copies by calling 202/334-1513. Others may order copies from the National Academy Press by calling 800/624-6242 or via the Internet at <http://www.nap.edu>.

Ensuring Quality Cancer Care (ISBN 0-309-06480-5). This publication provides an overview of cancer care delivery in our nation, from early detection to end-of-life, and recommends how to monitor, measure, and extend quality care to all cancer patients. The book explains how lack of medical coverage, social and economic status, physician decisions, patient beliefs, and other factors can affect the patient's best possible outcome. It also explores how cancer care is shaped by the current focus on evidence-based medicine, the widespread adoption of managed care, the volume of services given at a particular institution, and physician specialization.

Sowing the Seeds: Informing Public Policy in the Economic Research Service of USDA (ISBN 0-309-07152-6). With the growth of the global economy, the analysis and information needed for public policy has changed rapidly and so have the means for acquiring them. This report analyzes the effect of technological advances on public economic policy, the type of information and analysis used for economic policy in a government agency, successful information and analysis programs, the work of a government agency in providing information and analysis, and the effective administration and organization of research and information programs in a government agency (i.e. USDA).

Observations on the President's Fiscal Year 2000 Federal Science and Technology Budget (0-309-06487-2). This report, prepared by the Committee on Science, Engineering, and Public Policy (COSEPUP), provides observations on the federal science and technology (FS&T) portion of the President's FY 2000 budget request. Included in this assessment is an overview of FS&T funding for the National Institutes of Health, National Science Foundation, and both civilian and noncivilian research budgets of all agencies. This publication also reviews the current level of federal funding for research and development at the nation's universities and colleges and the budget requests for information technology.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS Report XXIV Research & Development FY2000 (Pub. No. 99-07S; \$18.95, \$15.16 for AAAS members). This is the twenty-fourth in a series of AAAS R&D Reports, representing an annual collaborative publication effort involving contributors from 22 scientific, engineering, higher education, and industrial associations known collectively as the Intersociety Working Group. This reference work provides a comprehensive analysis of R&D in the President's budget for FY 2000, including specialized analyses by theme, major agency, and discipline. ■



HEARD OFF THE HILL



For people who increasingly rely on computers instead of their own messy notetaking, British Telecom has developed a new pen, dubbed "SmartQuill." SmartQuill uses ink and writes on paper, able to convert handwriting into digital characters. It can then be dipped into an "electric inkwell" and instantly fed into a computer. *MIT Technology Review*, May/June 1999.

Researchers at the Rotman Research Institute at the University of Toronto have found that the frontal lobe plays a dominant role in people's ability to appreciate humor and "have a good belly laugh." Humor responses to written and verbal jokes and cartoons were compared in healthy individuals versus people suffering from brain injuries caused by stroke, tumors, or surgical lobe removal. Results indicate that people with damage to the right frontal lobe of the brain chose the wrong punch lines to written jokes and showed a preference for slapstick humor. *Brain*, April 1999.

The Department of Defense's Defense Advanced Research Project Agency (DARPA) has invested in the development of micro air vehicles such as artificial flapping insects (for example, entomopters), using a variety of energy sources. The research draws upon Mother Nature's animals – by studying insects' abilities to lift themselves up and fly. Potentially, soldiers in the field will be equipped with tiny artificial fliers which contain remote sensing devices that could be let loose to observe enemy troops closeup. *Scientific American*, April 1999.

Researchers at Duke University Medical Center have grown new artificial blood vessels, using a tube of branched biodegradable polymer coated with different types of artery cells. To create normal pressure conditions, a pump was used to pulse the walls of the tubes with nutrients. After 8-10 weeks, the polymer had dissolved, and the tubes were then implanted into miniature pigs where they appeared to function like normal arteries. *Science*, April 16, 1999. ■



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Center for Science, Technology, and Congress
1200 New York Avenue, NW
Washington, DC 20005

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