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## Science Committee Begins Education Study

On March 17, the House Science Committee held the first of what will be a series of hearings on the state of science and math education in the United States. The objective of the hearing, led by Vice Chairman Vernon Ehlers (R-MI), was to expand on recommendations laid out in the committee's study, *Unlocking Our Future: Toward a New National Science Policy*. If this first hearing is any measure of our nation's future prospects, it painted a rather bleak picture.

In addition to the Ehlers study, the hearing also focused on the *Third International Mathematics and Science Study* (TIMSS), conducted by the Department of Education's National Center for Education Statistics. TIMSS surveyed the quality of science and math education globally, and concluded that U.S. children were well ahead of other nations in fourth grade science and math education, about average for the eighth grade, and well below average for twelfth graders.

However poorly our nation's children may be doing today, according to witnesses at the hearing, the full consequences of a decline in the quality of science and math education has yet to be felt. For

example, the United States is still considered the world's leader in technological innovation and as a result, maintain the world's strongest economy. However, the nation is beginning to experience a shortage of highly-skilled workers needed to maintain that technological edge, a foreshadowing of things to come. "An acute skills shortage in every part of the country threatens the foundation of American competitiveness," argued Amy Kaslow, a senior fellow at the Council of Competitiveness. "While the debate rages on about the K-12 dilemma, the inadequacies of American schooling are inescapable in the American workplace, where too few people have learned how to learn."

In order to fill the void, the federal government has increased the allotted amount of H-1B visas so that the private sector may hire more skilled workers from other countries. U.S. firms realize that there is a skilled workforce shortage in the country, and more importantly, that the quality of science and math education in other nations greatly outpaces what is being taught domestically.

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## Deadline for Medical Privacy Protection Looms

Increasing use of electronic record keeping and the need for data sharing between healthcare providers and insurers has made it easier to misuse confidential medical information. While many states already have patient privacy laws, there is a growing demand for federal standards. The Health Insurance Portability and Accountability Act of 1996 requires Congress to adopt federal standards ensuring individual health information confidentiality by August 1999. If this deadline is not met, the Department of Health and Human Services (HHS) will assume responsibility for regulation. In 1997, HHS Secretary Donna Shalala submitted recommendations for standards, but even with the impending deadline, Congress has yet to pass legislation on this issue.

On February 24, 1999, the Senate Committee on Health, Education, Labor, and Pensions held a hearing on the subject using a General Accounting Office (GAO) report, *Medical Records Privacy:*

*Access Needed for Health Research, but Oversight of Privacy Protections Is Limited*, as a guideline. The report covered the following issues: the use of medical information for research and the need for personally identifiable information; types of research currently not subject to federal oversight;

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# New Drive for Database Protection Begins

One of the hot button issues facing the 106<sup>th</sup> Congress is how to create legislation in the age of information technology. Legislators are finding that rapid technological innovation also brings with it problems that could endanger the United States. "Computers have empowered individuals to the detriment of national sovereignty," stated Arnaud de Borchgrave, Director of the CSIS Global Task Force on Organized Crime, at the recent inaugural Forum on Technology and Information. Already, several bills have been introduced to confront these problems ranging from the millennium bug to technology transfer. Not least among congressional concerns is the idea of protection of privacy and intellectual property, a cherished American ideal, in the information age.

Already, policymakers are taking action. The Administration's budget request gives substantial increases to protecting critical infrastructures, and legislation for allowing the use of better encryption technology in the United States is safely on its way to the House floor for a vote. Another bill, H. R. 354, the Collections of Information Antipiracy Act, attempts to create a law to protect database information which can now be easily copied in our electronic society. Introduced by Rep. Howard Coble (R-NC), H.R. 354 is a reincarnation of last year's H.R. 2562 which passed through the House twice, once as a stand alone bill and the second as part of the Digital Millennium Copyright Act, but was subsequently dropped due to severe criticism from the science community. The difference now is that the bill has been changed to assuage some of last year's critics and therefore create a stronger support base.

The bill's intent is to insure that electronic information placed on a database, regardless of the nature of the information, is prohibited from being used for financial gain without compensation for the creators of the database. Since most materials on databases are factual, opponents of the bill cite that the Supreme Court has already ruled that factual material cannot be protected under law. However, the ruling by the Court did not take into account technological innovation which enables database information to be copied and spread in the blink of an eye. Online piracy can discourage database creators from investing substantial amounts of capital into creating databases and thus prevent the spread of useful information.

Last year's legislation encountered problems concerning the amount of time that information can be protected, ambiguities in the type of information to be protected, and the instances when data can be accessed freely. This year's bill has introduced a 15-

year time limit on data protection and has also made clear the type of data to be protected. Furthermore, language that states, "an individual act of use or extraction of information done for the purpose of illustration, explanation, example, comment, criticism, teaching, research, or analysis, in an amount appropriate and customary for that purpose, is not a violation of this chapter." This clarifies further the line between legitimate uses and illegal misappropriation of databases.

These changes, it seems, garnered enough support from agencies that opposed previous incarnations of the bill. "The provisions of H.R. 354 represent a significant improvement over the provisions of H.R. 2562," stated Marybeth Peters of the U.S. Copyright Office of the Library of Congress during her testimony before the House Judiciary Subcommittee on Courts and Intellectual Property. However, she tempered that statement with the caution that "several issues still warrant further analysis, among them the question of possible perpetual protection of regularly updated databases, and the appropriate mix of elements to be considered in establishing the new, fair use-type exemption."

Even the research community, the bill's staunchest opponent last year, has softened its stance. While researchers still oppose the bill and

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John E. Harrison, CEO and co-founder of a small high tech firm called Ecutel, noted that during their search for employees, "we received 630 résumés in our first few months, and of those that we considered qualified, none were U.S. citizens."

Eventually, deficiency in science and math education could start affecting *all* aspects of life. "The issues aren't just about making a living but about just plain living," stated Shirley Malcom, Director of AAAS' Education and Human Resources Programs. "[Its] about realizing that if the temperature is below 32°F the moisture on the road is likely to be ice, recognizing what household products should not be mixed, understanding that greater stopping distances are needed at greater speeds."

While finding the solution will not be easy, the panel did manage to cover several critical issues that might help focus subsequent hearings. Topics addressed include creating national standards or uniform curricula, methods for teaching science and math, improving science and math education in impoverished areas, and job skills re-training. There were two themes, however, that all witnesses agreed upon. The first was to make math and science education mandatory rather than an option. "Math and science education needs to be in a child's everyday activity so it increases their intellect and be-

comes second nature to them," argued Harrison, "Even if they don't want to be [a] scientist, we still need a technically savvy workforce to make use of these innovations."

The second was to insure that teachers are adequately trained and re-trained to teach cutting-edge science and math. Too many teachers today are ill-equipped to teach these subjects. In fact, many lack a background in the fields they are teaching. "We cannot expect world-class learning of mathematics and science if U.S. teachers lack the knowledge, confidence, and enthusiasm to deliver world-class instruction," said Vera Rubin, of the National Science Board.

The committee plans to continue these hearings throughout the session and hopefully produce a complementary report to last year's study. Rep. Ehlers acknowledged that the goal of this first hearing was to produce more questions than answers. "Learning the inquiry-driven process underlying math and science principles helps develop the human intellect, aiding the learning of other, seemingly unrelated subjects," remarked Rep. Ehlers. "We must insure that through our education system, we instill children with the motivation and desire to obtain the fundamental skills and knowledge to thrive in a technology-saturated future." ■



are unwilling to accept it in its present form, they recognize that progress has been made since last year. "We were encouraged by the two changes that already have been made to this Committee's previous version of this legislation," noted Nobel Prize winning researcher Dr. Joshua Lederberg during his testimony, "the first revision addresses one of the Constitutional defects that was pointed out by various critics. . . the second one responds to some of the concerns. . . regarding the potential negative impacts of the legislation on public interest uses."

It is clear that H.R. 354 has a long way to go before it will be considered for a vote on the House floor. Even with its predecessor's success last year, legislators are still willing to hear out all parties

concerned. "I want there to be no misunderstanding that I have shut-off anyone from the debate," stated Rep. Coble. However, there is a sense of urgency in trying to provide some protection for databases in an age where it is becoming easier and easier to steal data. Also, there is mounting pressure to comply with the European Union's (EU) privacy directive that requires reciprocal protection of EU data from countries outside the EU before incoming data can be protected equally. Where policymakers have to be careful is that overprotection of data could be detrimental to sharing information and stifle innovation, another cherished American value. ■

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# Bacteria Build Up Immunity to Antibiotics

It is estimated that the annual cost of treating antimicrobial-resistant infections in the United States is approximately \$5 billion. With the emergence of microbes resistant to treatment and bacterial outbreaks in food and water supplies, there is cause for public health concern. An increasing number of cases of fatal infections already have been reported – from contaminated organic apple juice to deadly *E. Coli* strains found in swimming pools. At the same time, media and public health consumer groups have become focused on the feeding of human antibiotics to livestock, which can provide a food-borne avenue for disease. On February 25, the Senate Subcommittee on Health, Education, Labor and Pensions met to hear testimony on the public health threat from antibiotic-resistant microbes.

Perhaps the overwhelming reason for antibiotic microbial resistance is the overabundance of prescribed antibiotics. Antibiotics are so prevalent that microbes have begun adapting to their effects due to constant exposure. The Centers for Disease Control (CDC) estimates that half of the more than 100 million annual prescriptions of antibiotics are unnecessary, and therefore they are working to promote the rational use of antibiotics. With regards to research on the topic, according to Dr. Anthony Fauci, Director of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health, experiments are currently underway on the biochemical/molecular mechanisms of resistance along with sequencing efforts for HIV, tuberculosis, and salmonella.

The reasons for the prevalence of antibiotics are many but they all seem to point towards severe logistical problems. Antibiotics are seen as a panacea for some of the other shortcomings of the system. Dr. Diane Dwyer, Director of Epidemiology and Disease Control Program for the State of Maryland, stated that testing methods used by public health laboratories vary greatly and the difficulty of hiring staff due to low salary and lack of benefits as some of the reasons. Furthermore, she pointed out that hospitals are reluctant to share their lab results with state health departments for fear of being identified as an infection source. To combat these problems, Dr. Dwyer cited a project in the Baltimore area that counters over-prescription of antibiotics through better training of physicians and distributing educational pamphlets at parent-teacher meetings.

The more pressing concern, however, are the existing diseases that have already built up a tolerance for antibiotics. Ms. Bernice Steinhardt, Direc-

tor of Health Services, Quality and Public Health, at the General Accounting Office (GAO), presented a GAO study entitled *Emerging Infectious Diseases: Consensus on Needed Laboratory Capacity Could Strengthen Surveillance*. It surveyed the directors of all state public health laboratories and infectious diseases epidemiology programs that report information directly to the CDC. The focus was on six specific emerging infectious diseases and pathogens: tuberculosis, Shiga-like toxin producing *E. coli*, pertussis, *Cryptosporidium parvum*, hepatitis C virus, and penicillin-resistant *Streptococcus pneumoniae*. In some reported cases, these pathogens showed resistance to antibiotic treatment and warrant close monitoring.

Furthermore, the survey indicated that state public health laboratories conduct surveillance tests on only four out of the six diseases above. Over half of the labs do not conduct tests for hepatitis C and *Streptococcus pneumoniae*. The GAO report recommends expanding surveillance programs and allowing for greater access to advanced molecular technology.

Many states reported that inadequate staffing and information-sharing, as well as a lack of computer equipment and integrated data processing/management systems, hinder surveillance efforts. State officials believe that the CDC needs to better integrate its data systems in order to help states build network systems that link them with surveillance organizations. As it stands now, the existing network of separate data reporting systems strain already scarce resources. The GAO recommended that the CDC “lead an effort to help federal, state, and local public health officials create a consensus on the core capacities needed at each level of government.” The consensus should address the number and qualifications of laboratory and epidemiology staff, laboratory and information technology, and the CDC’s support of the nation’s infectious disease surveillance system.

With respect to food-borne bacteria, the Food and Drug Administration (FDA) has been considering a ban of the use of human drugs on animals and whether or not to require the testing of drugs for their potential to foster harmful bacterial growth in livestock. Last fall, the FDA released a draft regulation (Federal Register, Docket No. 98D-0969) concerning animal drugs which assessed the impact that these bacterial-resistant livestock drugs will have on human health. This framework remains open to public discussion and comment. ■



the role of Institutional Review Boards (IRBs); and safeguards used by health care organizations.

Under the 1991 Federal Policy for the Protection of Human Subjects, federally funded research or research regulated through federal agencies must be reviewed by an IRB to ensure human subjects receive adequate privacy and protection from risk through informed consent. This works well for the large proportion of federally funded research. However, privately funded research has increased dramatically since the 1980s and IRBs may provide oversight only through voluntary compliance by private research institutions.

In reference to personal identifiers, the report found that a good portion of research involving human subjects does indeed rely on them. It allows investigators to track treatment of individuals over time, link multiple sources of patient information, conduct epidemiological research, and identify the number of patients fitting a certain criteria. Dr. Brent James, Executive Director of the Intermountain Health Care (IHC) Institute for Health Care Delivery Research in Utah, cited positive benefits for his patients' health as a result of other physicians having access to electronic records. For example, a computerized ordering system accessed by multiple users can warn physicians of potentially negative drug interactions. However, he also emphasized the need to balance the use of personal medical information with patient confidentiality.

The IHC ensures privacy by making employees sign confidentiality agreements and monitoring those who have access to electronic records. Also, patient identifiers are separated from the records and particularly sensitive information, such as reproductive history or HIV status, is segregated. Some organizations are even using encryption and other forms of coding while others have entered into Multiple Project Assurance (MPA) agreements which place research institutions into compliance with HHS regulations.

Dr. James also emphasized that increased IRB involvement would hamper the quality of care given by health care providers. The GAO study indicates that current IRB review may not necessarily ensure confidentiality, and in most cases IRBs rely on existing mechanisms within institutions con-

ducting research. Familiar criticisms of IRB such as hasty reviews, little expertise on the matter, and little training for new IRB members compound the problem.

An alternative could be the establishment of stronger regulations within the private institutions conducting the research. Dr. Elizabeth Andrews, representing the Pharmaceutical Research and Manufacturers Association, echoed this sentiment. She argued for the establishment of uniform national rules for confidentiality in lieu of going through IRBs.

In response, Senators Jim M. Jeffords (R-VT) and Christopher J. Dodd (D-CT) introduced S. 578, and Senators Patrick J. Leahy (D-VT) and Edward M. Kennedy (D-MA) introduced S. 573. Both bills outline guidelines for patient-authorized release of medical records. The Jeffords-Dodd bill requires one "blanket authorization" from the patient in releasing records and would cede precedence to state privacy laws. The Leahy-Kennedy bill requires patient authorization for each and every use of medical records and also allows states to pass stricter privacy laws. Similarly, Rep. Edward J. Markey (D-MA) introduced a companion to the Leahy bill, H.R. 1057, placing an emphasis upon the protection of state rights' in the privacy arena.

In addition, there is the HHS report. It reinforces the need for federal regulations and defines the "responsibilities of the record-keepers." Recommendations are based upon five principles: boundary, security, consumer control, accountability, and public responsibility. It emphasizes that confidential health information should be used for health purposes only and cited the need for researchers to obtain the approval of IRBs. However, some problems have been cited for these regulations. For example, there is a lack of regulation on the use of medical records by law enforcement officials.

It is evident that the critical topic that still needs to be resolved is the role of IRB oversight or lack thereof in research involving human subjects and related data collection. It will be an interesting race to see whether regulation of this vital public issue comes from the executive branch or the legislative branch. ■



# Status of Major Legislation

## EDUCATION

### EDUCATION FLEXIBILITY PARTNERSHIP ACT OF 1999

#### S. 280

Introduced by Sen. Bill Frist (R-TN). A bill to provide for education flexibility partnerships at the state level. 3/11/99 Measure returned to Senate calendar (CR S2569). 03/11/99 Text inserted in H.R. 800 as passed by Senate (CR S2569).

### EDUCATION FLEXIBILITY PARTNERSHIP ACT OF 1999

#### H.R. 800

Introduced by Rep. Michael Castle (R-At Large-DE). A bill to provide for education flexibility partnerships at the state level. 3/11/99 Measure passed Senate, amended, in lieu of S. 280, roll call #48 (98-1) (CR S2569). 3/11/99 Conference scheduled in Senate (CR S2569) 3/18/99 Senate appointed conferees.

## ENCRYPTION

### SECURITY AND FREEDOM THROUGH ENCRYPTION (SAFE) ACT

#### H.R. 850

Introduced by Rep. Bob Goodlatte (R-VA). A bill to amend title 18, United States Code, to affirm the rights of United States persons to use and sell encryption and to relax export controls on encryption. 2/25/99 Referred to the Committees on the Judiciary and on International Relations. 3/3/99 Referred to Subcommittee on Courts and Intellectual Property. 3/11/99 Forward to full Judiciary Committee. 3/24/99 Ordered to be reported.

## GENETIC & MEDICAL PRIVACY

### GENETIC INFORMATION NONDISCRIMINATION IN HEALTH INSURANCE ACT OF 1999

#### S. 543

Introduced by Sen. Olympia J. Snowe (R-ME). A bill to prohibit discrimination on the basis of genetic information with respect to health insurance. 3/4/99 Referred to the Committee on Health, Education, Labor, and Pensions.

### MEDICAL INFORMATION PRIVACY AND SECURITY ACT

#### S. 573

Introduced by Sen. Patrick J. Leahy (D-VT). A bill to provide individuals with access to health information of which they are a subject, ensure personal privacy with respect to health-care-related information, impose criminal and civil penalties for unauthorized use of protected health information, to provide for the strong enforcement of these rights, and to protect States' rights. 3/10/99 Referred to the Committee on Health, Education, Labor, and Pensions.

### HEALTH CARE PERSONAL INFORMATION NONDISCLOSURE ACT OF 1999

#### S. 578

Introduced by Sen. James M. Jeffords (R-VT). A bill to ensure confidentiality with respect to medical records and health care-related information, and for other purposes. 3/10/99 Referred to the Committee on Health, Education, Labor, and Pensions.

### MEDICAL INFORMATION PRIVACY AND SECURITY ACT

#### H.R. 1057

Introduced by Rep. Edward J. Markey (D-MA). A bill to provide individuals with access to health information of which they are a subject, ensure personal privacy with respect to health-care-related information, impose criminal and civil penalties for unauthorized use of protected health information, to provide for the strong enforcement of these rights, and to protect States' rights. 3/10/99 Referred to the Committees on Commerce and on the Judiciary.

## HEALTH

### CONSUMER HEALTH FREE SPEECH ACT

#### H.R. 1077

Introduced by Rep. Ron E. Paul (R-TX). A bill to amend the Federal Food, Drug, and Cosmetic Act to allow consumers greater access to information regarding the health benefits of foods and dietary supplements. 3/11/99 Referred to the House Committee on Commerce.

## NATIONAL MISSILE DEFENSE

### NATIONAL MISSILE DEFENSE ACT OF 1999

#### S. 257

Introduced by Sen. Thad Cochran (R-MS). A bill to state the policy of the United States regarding the deployment of a missile defense capable of defending the territory of the United States against limited ballistic missile attack (whether accidental, unauthorized, or deliberate). 3/17/99 Measure passed Senate, amended, roll call #51 (97-3).

### MISSILE DEFENSE BILL

#### H.R. 4

Introduced by Rep. Curt Weldon (R-PA). A bill to declare it to be the policy of the United States to deploy a national missile defense. 3/18/99 Measure passed House, roll call #59 (317-105). 3/24/99 Received in the Senate. Read twice. Placed on the legislative calendar. ■

# Reports and Publications

## CONGRESSIONAL RESEARCH SERVICE

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

*Global Climate Change: Carbon Emissions and End-use Energy Demand* (RL30036). This report presents the potential impacts of the Kyoto Protocol on U.S. energy demand. It focuses on 27 common end-uses for energy in the United States. The report models the reduction of energy required by each of the 27 end-uses in order to reduce carbon emissions.

*Internet: An Overview of Six Key Policy Issues Affecting Its Use and Growth* (98-67 STM). This report summarizes six key issues before the 106<sup>th</sup> Congress that could affect the growth and use of the Internet: encryption and digital signatures, computer security, computer privacy, protecting children from unsuitable material on the World Wide Web, unsolicited electronic mail, and Internet domain names.

*Research and Development Budget of the Department of Energy for FY2000: Description and Analysis* (RL30054). This report provides a detailed overview of the FY2000 DOE budget request for R&D programs. The report describes each of the R&D programs and highlights of the FY2000 request. It also includes analyses of several issues that may arise during budget deliberations.

## GENERAL ACCOUNTING OFFICE

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

*NASA's Internet Service Improves Access to Contracting Information* (NSIAD 99-37). The report assesses NASA's Acquisition Internet Service (NAIS) and whether it is an effective mechanism for disseminating procurement information to industry. It found that NAIS has contributed to the development of a more standardized and streamlined acquisition process at NASA and provides a central electronic source of procurement information.

*Concerns With DOE's Efforts to Reduce the Risks Posed by Russia's Unemployed Weapons Scientists* (RCED-99-54). This report is an assessment of the Initiatives for Proliferation Prevention program whose objective is to engage weapons scientists and institutes in nonmilitary work in the short term and create high-technology jobs for former weapons scientists in the long term. It concludes that short-term goals have been successful but long term goals have still not been achieved. Also addressed are concerns over insufficient administrative and technical oversight, weapons proliferation, and potential threats to U.S. national security.

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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>.

*Chemical and Biological Terrorism: Research and Development to Improve Civilian Medical Response* (ISBN 0-309-06195-4). This publication identifies the following key areas of R&D needed to improve medical response: pre-incident intelligence, detection and identification of chemical and biological agents, protective clothing and equipment, early recognition of population exposure, mass casualty decontamination and triage, vaccines and pharmaceuticals, and psychological effects.

*Starting Out Right: A Guide to Promoting Children's Reading Success* (ISBN 0-309-06410-4). This book discusses how best to help children succeed in reading. It identifies the methods of how children can grow into readers. Included are 55 activities to do with children, a list of recommended children's books, and a guide to CD-ROMs and websites.

*Health Effects of Exposure to Radon: BEIR VI* (ISBN 0-309-05645-4). This book reviews the effects of radon and its links with lung cancer. A model has been developed for lung cancer risk associated with radon that provides an assessment of exposure-dose relationships and discusses key issues in estimating the risks posed by indoor radon. It also addresses such uncertainties as the combined effects of smoking and radon, and the impact of the rate or exposure.

*Defense Manufacturing in 2010 and Beyond: Meeting the Changing Needs of National Defense* (ISBN 0-309-06376-0). The book reviews the nation's defense manufacturing, including policies, technologies, systems, processes, practices, and financial implications in the post-Cold War world. Some of the forecasted trends include defense spending, the relationship with commercial industries, the nature of threats, and the emergence of new technologies.

*Sustaining Marine Fisheries* (ISBN 0-309-00526-1). The book explores the effects of fishing on marine ecosystems and how it interacts with the complex factors that shape their productivity. It documents the condition of marine fisheries today, highlighting species and geographic areas that are under particular stress. Challenges to achieving sustainability are discussed, and shortcomings and strengths of current fisheries management are examined. ■



## HEARD OFF THE HILL



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Chemists at Sandia National Laboratories in Albuquerque, New Mexico, have created a foam that neutralizes many chemical poisons and disease-causing microbes. The foam, made from chemical agents commonly found in hair conditioners and toothpaste, can be dispensed as a spray or fog in an open environment. This may prove to be an effective protection tool in areas faced with the threat of a bioterrorist attack employing nerve gases or anthrax, for example in airports or subway systems. *New York Times*, March 16, 1999.

Researchers at the Georgia Institute of Technology have developed new safeguards for information security in electronic commerce. The threat of external attacks on business systems has prompted the development of artificial neural networks, a new intrusion detection system. These computer systems are able to identify previous types of network attacks and "learn" from the characteristics of such attacks. Theoretically, the system should eventually be able to predict an attack. *Georgia Tech Research News*, March 16, 1999.

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New York University researchers have found that a human hormone, found in pregnant women's urine, contains proteins which destroyed the HIV virus in preliminary test-tube experiments. To protect the developing baby, pregnant women apparently manufacture more of the anti-viral proteins lysozyme and ribonucleases in their body. By understanding the mechanisms by which these proteins work, researchers hope to develop new HIV drugs. *Proceedings of the National Academy of Science*, March 16, 1999.

Chemists at the University of Texas at Austin have developed an artificial tongue that is able to "taste" different chemicals. The artificial tongue is a chip consisting of permeable beads coated with synthesized receptor molecules that will bind to recognizable molecules. As a sample liquid washes over it, the molecules bind to their receptors, subsequently producing a glow. Computer software can then trace the glow and identify the composition of the substance. This new technology could enable lab technicians to "taste" blood samples for the abundance of glucose or other bloodstream chemicals. *The Washington Post*, March 22, 1999. ■



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