

THE NATIONAL ACADEMIES **IN FOCUS**

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Making Mathematics Education Count
Enhancing NASA's Contributions to Polar Science
Congestion on the Heartland's Main Waterway



Spring 2001

Note from the editor: As many magazines do, *NewsReport* magazine has undergone a facelift. With *The National Academies In Focus*, we wish to offer our readers broader coverage of the Academies' activities and expanded content, coupled with an updated, visually appealing design. We welcome your comments; e-mail us at <infocusmagazine@nas.edu>.

The National Academies In Focus is a magazine featuring activities of the National Academies, which serve as independent advisers to the federal government on scientific and technical questions of national importance. The National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine are self-perpetuating, honorific societies of distinguished scientists, engineers, and medical professionals. The National Research Council, along with the Institute of Medicine, brings the resources of the entire scientific and technical community to bear on national problems through its volunteer advisory committees. The Research Council is jointly administered by the National Academy of Sciences and National Academy of Engineering.

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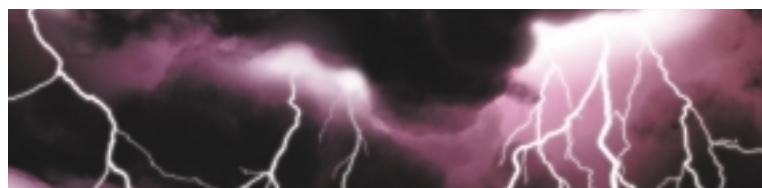
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Expanding Our Outreach Has Become a Mandate, Not an Option



In listing the traits of a responsible scientist, curiosity, honesty, and open-mindedness come to mind as key values. But typically missing from most lists of descriptors is “communicator.” And yet, the ability to communicate effectively about science is essential, particularly as science increasingly makes its way from the laboratory to public policy. For instance, had the scientific community done a better job of conveying the nature and promise of genetically modified organisms to the public, we might be engaged in a very different, and more productive, public debate today. The fact is that farmers have been breeding crops to bring out desirable qualities for centuries; today we simply use different — and more precise, I might add — tools for the job. Unfortunately, this basic point — along with much of the science — has all but gotten lost in the dialogue playing out across the pages of the world’s newspapers.

At the National Academies, we’ve begun to put together a wide portfolio of activities to spread the word about science and the work we do. *The National Academies In Focus* is one part of this undertaking. Along with articles on various recent reports, this inaugural issue includes a very sober look at bioterrorism by IOM member D.A. Henderson, and a thoughtful piece by NAS member May Berenbaum on some of her own success at bringing an understanding of science to the public.

In Focus is a new, evolving enterprise, so we welcome your comments and suggestions. Also, be on the lookout for the Web version at <infocusmagazine.org>.

The National Academies are a collective endeavor, and as such, this space will be shared with my colleagues at the helm of the National Academy of Engineering and Institute of Medicine, Wm. A. Wulf and Ken Shine, respectively. You’ll be hearing from them in future issues.

In the meantime, if you have remarks on this issue, please don’t hesitate to drop us a line at <infocusmagazine@nas.edu>.

A handwritten signature in cursive script that reads "Bruce Alberts".

BRUCE ALBERTS
President
National Academy of Sciences

MAKING IT COUNT



A Call for a Coordinated Approach to Math Education

In both subtle and noticeable ways, math permeates almost every facet of life. How far can you drive on a tank of gas? How do police officers use logical reasoning to solve crimes? Without math, how would you figure out weather forecasts, survey results, and medical reports?

In today's increasingly high-tech world, it's more important than ever to have a solid grasp of the subject. Yet the nation's education efforts in this area have been inconsistent and marked by an emphasis on routine arithmetic, says a new report from the National Research Council. A more coordinated and systematic approach to math education from pre-kindergarten through eighth grade is urgently needed.

A host of assessments conducted over the past 30 years indicate that U.S. students can adequately perform straightforward computational procedures, but their comprehension of underlying mathematical ideas is limited. They also have trouble applying mathematical skills to solve simple problems. And these difficulties may further impede the academic advancement of at-risk students, the report says. In addition, studies show that many elementary and middle school teachers have only a shaky grasp of math themselves.

By the time children complete elementary school, their performance in math and reading can, to a large extent, predict their academic progress in later years. While U.S. schools have been relatively successful at

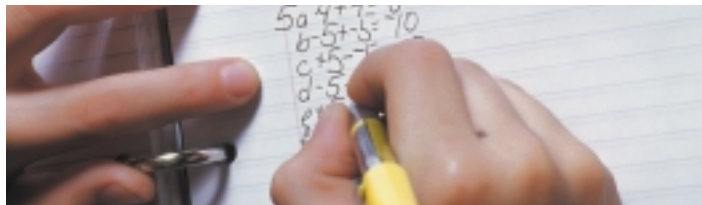
improving reading instruction and developing students' reading skills, the same cannot be said about math.

The report calls on the nation to groom all students to be "mathematically proficient," comprehending more than disconnected facts and procedures. "People today are much more exposed to numbers and quantitative ideas, and they need to deal with mathematics on a higher level than they did just 20 years ago," said Jeremy Kilpatrick, chair of the committee that wrote the report and a professor of mathematics education at the University of Georgia in Athens.

The committee's definition of mathematical proficiency comprises five intertwined and equally important strands, each requiring constant attention. Foremost, all students should be able to understand and apply important concepts. For example, if students understand that the order in which two numbers are added is irrelevant to the sum, they can learn basic addition in nearly half the time. What's more, knowing how such relationships work allows students to learn new facts more easily.

To possess mathematical proficiency, students also must be able to compute with ease, formulate and solve problems, and explain their reasoning, the report says. Finally, they should have confidence in their abilities and regard mathematics as a sensible and worthwhile subject. Here, teachers also play a critical role. How they feel about the subject affects their classroom practice, which influences not only what students learn, but also how students view themselves as math learners.

Children begin to understand math well before they enroll in school, the report



points out. From infancy through preschool, they develop a base of skills, concepts, and even misconceptions about math. Much of what they know is bound together with their initial understanding of counting.

Educators should use a child's rudimentary knowledge as a steppingstone toward mastery of more challenging skills and concepts in the subject. For example, teachers could use students' familiarity with the idea of fairness and getting "fair shares" as a springboard to lessons on division and proportional reasoning. Significant time also should be devoted to daily math instruction in every grade of elementary and middle school, the report says.

Teacher educators and school administrators must rethink their work, too. Colleges and universities should create programs that emphasize in-depth knowledge of mathematics and processes through which schoolchildren come to comprehend the subject, the committee said. And schools should give teachers more time as well as high-quality training to acquire a solid understanding of math. —*Vanee Vines*

■ **Adding It Up: Helping Children Learn Mathematics.**

Mathematics Learning Study Committee, Division on Behavioral and Social Sciences and Education (2001, approx. 450 pp.; ISBN 0-309-06995-5; available from National Academy Press, tel. 1-800-624-6242; \$29.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/9822.html>).

The committee was chaired by **Jeremy Kilpatrick**, Regents Professor of Mathematics Education, department of education, University of Georgia, Athens. The study was sponsored by the U.S. Department of Education and the National Science Foundation.

Putting English-Language Learners to the Test

In a country that has attracted millions of immigrants in the past century, U.S. schools have long been faced with the challenge of teaching children who are not fluent in English and educators have addressed the issue in different ways over the years. The current climate of school reform, however, has led states to set tough new academic standards and create tests in math, science, and other key subjects to hold all students accountable for meeting those standards. But many people have raised concerns about testing students for whom English is a second language.

Nearly 3 million children who are not fully proficient in English are enrolled in the nation's schools. Under what conditions, and for what purposes, should they be tested? Furthermore, what should be made of their scores? Some states make accommodations for such children, but the policies and goals for testing them vary widely across the country.

How educators address these issues may have lasting effects on students' academic progress. For example, low test scores from assessments that were used improperly with non-native speakers could serve as the basis for flunking students, a practice that often compounds the difficulties of children who are at risk of academic failure, studies show. Researchers, educators, test developers, and others must continue to seek better ways of assessing English-language learners to make sure that their academic needs are being met, concludes a new report from the National Research Council.

To be sure, kids who are still learning English have complex and varied needs.



Are Standardized Assessments Setting These Students Up for a Fall?

They must master not only conversational English, but also formal, academic English — which can take non-native speakers four to seven years, on average. Moreover, such students also need to advance in other subjects and receive high-quality instruction to help them meet required standards, said the committee that wrote the report. Disentangling these students' progress in English from their academic performance in

other areas is difficult because oral and written English are essential tools used in many types of academic work.

The committee urged researchers to focus on ways to improve or expand existing assessment strategies that gauge English and other academic skills, or create new approaches. In addition, it called on federal and state policy-makers to consider measures that would encourage the consistent collection of data over many years on the overall progress of non-native speakers, both while they are in school and after they enter the work force. Such long-term tracking would allow researchers to more closely evaluate educational programs and methods. — V.V.

■ **Testing English-Language Learners in U.S. Schools: Report and Workshop Summary.** Committee on Educational Excellence and Testing Equity. Division on Behavioral and Social Sciences and Education (2000, 58 pp.; ISBN 0-309-07297-2; available from National Academy Press, tel. 1-800-624-6242; \$18.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/9998.html>).

The committee was co-chaired by **Ulric Neisser**, professor, psychology department, Cornell University, Ithaca, N.Y., and **William T. Trent**, professor, educational policy studies department, University of Illinois, Urbana-Champaign. The study was sponsored by the U.S. Department of Education.



A team of British researchers recently determined that a glacier in western Antarctica has been thinning by up to 1.6 meters per year since 1992. If this Antarctic ice sheet were to melt completely, scientists predict that it would discharge enough water to raise global sea levels by 5 meters.

These scholars didn't make their discovery by spending years trekking across the frozen icecap with measuring instruments in tow. Instead, they looked in what are known as distributed active archive centers — where information from NASA satellites is compiled into polar geophysical data sets — and watched the Antarctic water slowly change from solid to liquid.

A new report from the National Research Council recommends ways NASA can improve the information going into these data sets and make the archive centers more useful to scientists. Understanding the polar climate has become more important in recent years since the effects of global warming often are detected there first.

After surveying more than 100 scientists who use polar geophysical data in their day-to-day research, the committee that

wrote the report identified gaps between the data needed and what is available, and made specific recommendations for air, water, and land measurements that NASA should take to enhance the information already on hand. It urged the agency to consider also using aircraft, automated underwater vehicles, and some ground-based technologies in data-collection endeavors.

NASA also needs to do a better job of letting scientists know what is available in the archives and make them as user-friendly as possible, especially since they contain data from as far back as 20 years that are still proving very useful to researchers today. —*Bill Kearney*

■ **Enhancing NASA's Contributions to Polar Science: A Review of Polar Geophysical Data Sets.** Committee to Review NASA's Polar Geophysical Data Sets, Polar Research Board, Division on Earth and Life Studies (2001, 138 pp.; ISBN 0-309-07401-0; available from National Academy Press, tel. 1-800-624-6242; \$31.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10083.html>).

The committee was chaired by **John E. Walsh**, professor of meteorology, University of Illinois, Urbana. The study was funded by NASA.



Millions of landmines remain buried in old battlefields around the world, an unfortunate legacy of war. Over the past 25 years, they have killed or maimed tens of thousands of civilians and made it difficult to return mined fields to everyday use after conflicts end.

New Technologies Hold Promise for Eliminating Antipersonnel Landmines

Concern about the continuing risks landmines pose led to the Ottawa Convention, an international agreement that seeks to ban the types of mines that explode automatically on contact and to destroy those now in military inventories. But because they still provide a unique and important element of protection for military forces, the Clinton administration indicated that the United States would not sign until alternatives could be developed that offered the U.S. military an equivalent system for protection.

A committee of the National Research Council recently examined this issue and found several promising technologies under development that could offer similar or greater tactical advantages to antipersonnel landmines and reduce the risk to civilians. And with sufficient funding, these alternatives could replace some of the U.S. military's mines by 2006 — the target date set for making a decision about signing the treaty.

Antipersonnel landmines generally are used in two ways — on their own against

ground troops and as part of a mixed system to prevent antitank mines from being disabled by ground troops. An alternative for stand-alone use could be ready in the next five years if the military steps up funding, research, and development, the committee said. But no suitable substitute for mixed systems will be available by 2006 under current military production timelines.

The most viable alternative for use as a stand-alone system is a combination of sensor technologies and explosive munitions, now under development by the U.S. Department of Defense. Known as the non-self-destructing alternative (NSD-A), this system would allow a soldier on watch to view a hand-held video display through which sensors would signal when an intruder had entered a protected area. The soldier could then choose whether to set off the explosive, placing the decision for detonation into human hands rather than having the mine explode on contact.

Because the sensor feature makes this new technology far superior both militarily and with respect to humanitarian concerns, the committee recommended that production be pursued aggressively to ensure its availability by 2006. But questions about use of a software option, known as the battlefield override switch, have resulted in delays since the option would render the system noncompliant with the Ottawa Convention. The software would permit the operator to automate the system under certain circumstances, allowing the mine to explode on contact. Therefore, the committee recommends that two options, one with and one without the switch, should be developed simultaneously to prepare for a

presidential decision concerning the treaty.

Should the United States agree to the Ottawa Convention before the prospective alternatives are in place, a transition period may be needed during which the current arsenal of antipersonnel landmines are temporarily retained, the committee said.

In the meantime, production of the "remote area-denial artillery munition," a technology already under development, should be halted and funding redirected toward other options that may be compliant with the international treaty, the committee recommended. This technology combines an artillery-delivered antitank mine and an artillery-delivered antipersonnel mine into one projectile. It would not comply with the Ottawa Convention and appears to be no more effective than using the two systems in tandem, the report notes.

The use of nonlethal weapons to temporarily immobilize or incapacitate the enemy on the battlefield also should continue to be investigated, the committee said. Although such weapons cannot completely replace antipersonnel landmines, they can be useful in situations when the threat is unclear or when large populations of non-combatants are in the vicinity.

—*Barbara Rice*

■ **Alternative Technologies to Replace Antipersonnel Landmines.** Committee on Alternative Technologies to Replace Antipersonnel Landmines, Division on Engineering and Physical Sciences and Division on Policy and Global Affairs (2001, 140 pp.; ISBN 0-309-07349-9; available from National Academy Press, tel. 1-800-624-6242; \$40.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10071.html>).

The committee was chaired by **George Bugliarello**, chancellor, Polytechnic University, Brooklyn, N.Y. The U.S. Department of Defense funded the study.

Eat Your Orange, Red, Green, and Dark-Yellow Fruits and Veggies



For generations, parents have urged their children to eat all their carrots for good eyesight. They were right, of course, but recently scientists have discovered that carrots don't provide the body with as much vitamin A — which prevents night blindness and other eye problems — as previously thought.

Darkly colored fruits and vegetables, such as carrots, sweet potatoes, and broccoli, contain carotenoids that are converted to an active form of vitamin A in the body. But in its latest report on Dietary Reference Intakes

(DRIs), the Institute of Medicine's Food and Nutrition Board says recent studies show that it takes twice as many carotenoids to yield the same amount of vitamin A that researchers believed were needed in 1989, when the board last issued recommendations for vitamin A.

The new findings mean people need to make especially sure they eat enough orange, red, green, and dark-yellow fruits and vegetables to meet their daily requirement for vitamin A, particularly if they are strict vegetarians. Meat eaters and vegetarians who eat egg and dairy products typically get plenty of vitamin A, since it is abundant in animal-derived foods. And while vitamin A deficiency is rarely observed in the United States, up to 500,000 children go blind each year in other parts of the world because of a lack of it.

Along with vitamin A, the report examines the nutritional value of vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. It says the daily requirements for Americans and Canadians of these nutrients can, in almost all instances, be met without taking supplements.

DRIs are developed by U.S. and Canadian scientists, who base their recommendations on indicators of good health and the prevention of chronic disease. DRIs include not only Recommended Dietary Allowances (RDAs), but also adequate intakes (AIs), which are recommended when not enough evidence exists to set an RDA, and tolerable upper intake levels (ULs).

ULs are established in the report — some for the first time — for vitamin A, boron, copper, iodine, iron, manganese, molybdenum, nickel, vanadium, and zinc to help people avoid harm from taking too much of a nutrient. For example, while the RDA for vitamin A was set at 900 and 700 micrograms a day for men and women respectively, a UL also was set at 3,000 micrograms daily since excessive consumption may increase the risk of birth defects, liver abnormalities, and bulging of the skull where bone has not yet completely formed in infants and young children.

The report also includes either RDAs or AIs for vitamin K, chromium, copper, iodine, iron, manganese, molybdenum, and zinc. Whenever the data allows, recommendations are made for all age groups as well as for pregnant and lactating women. For instance, pregnant women need more iron, as do all women during pre-menopausal years when iron is lost through menstrual bleeding. In fact, surveys show that only

half of all pregnant women who live in the United States consume adequate amounts of iron in their diets.

Although there is some evidence suggesting a beneficial role for arsenic, boron, nickel, silicon, and vanadium in human health, not enough data exist to set recommended intake levels. To fill in the gaps in what is known about these trace elements and the other nutrients, the report calls for more research specifically designed to estimate nutrient requirements and detect side effects from chronic overconsumption.

—Bill Kearney

■ ***Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc.*** Panel on Micronutrients, Food and Nutrition Board, Institute of Medicine (2001, approx. 650 pp.; ISBN 0-309-07279-4; available from National Academy Press, tel. 1-800-624-6242; \$49.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10026.html>).

The panel was chaired by **Robert Russell**, professor of medicine and nutrition, School of Medicine, and associate director, Jean Mayer U.S. Department of Agriculture Human Nutrition Research Center on Aging, Tufts University, Boston. The study was funded by the U.S. Department of Health and Human Services; the National Institutes of Health; the Centers for Disease Control and Prevention; Health Canada; the Institute of Medicine; the Dietary Reference Intakes Private Foundation Fund, including the Dannon Institute and the International Life Sciences Institute; and the Dietary Reference Intakes Corporate Donors' Fund, which includes contributions from Roche Vitamins Inc., Mead Johnson Nutrition Group, Nabisco Foods Group, U.S. Borax, Daiichi Fine Chemicals Inc., Kemin Foods Inc., M&M/Mars, Weider Nutrition Group, and the Natural Source Vitamin E Association.



PAIN ON THE JOB

What Science Has to Say About the Relationship Between the Workplace and Health Problems

For lots of Americans, work literally brings pain. Lower backache, tendinitis, and carpal tunnel syndrome are among the many ailments that afflict about 1 million workers each year, costing the nation between \$45 billion and \$54 billion in compensation expenditures and decreased productivity.

Musculoskeletal disorders, or MSDs, is the medical term that refers to these health problems, which affect muscles, nerves, spinal disks, joints, cartilage, tendons, and ligaments. And scientific evidence shows that such health effects can indeed be attributed to particular jobs and working conditions, says a new report from the National Research Council and the Institute of Medicine.

MSDs are a concern among many types of workers — from long-haul truck drivers to nurses who often have to lift, turn, and physically support their patients. There is a strong relationship between back disorders and jobs where people manually lift materials, frequently bend and twist their bodies, or experience whole-body vibration from motor vehicles, the report says. For shoulder,

arm, and hand disorders, risk factors include repetition, force, and vibration.

Workers' individual characteristics — such as gender and age — as well as stressful, fast-paced job settings can make employees more vulnerable to MSDs, noted the panel that wrote the report. And risks may be compounded if workers feel powerless in such environments.

But properly implemented strategies to reduce the incidence, severity, and consequences of work-related musculoskeletal disorders can be effective. Successful programs can be found in a variety of workplaces, and take into account procedures and characteristics specific to the organization. Furthermore, they usually involve a high level of commitment from employers and employees, the panel said.

To do a better job of tracking the disorders nationwide, federal agencies should create a broad surveillance system to more accurately quantify the problems and pinpoint risk factors both on and off the job, the panel said. In addition, they should expand the scope of research activities in this area. A clearer understanding of the risk factors could help policy-makers and employers alike in determining whether and how to enact measures addressing MSDs in the work environment. —*Vanee Vines*

■ **Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities.** Panel on Musculoskeletal Disorders and the Workplace, Division on Behavioral and Social Sciences and Education and Institute of Medicine (2001, approx. 450 pp.; ISBN 0-309-07284-0; available from National Academy Press, tel. 1-800-624-6242; \$59.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10032.html>).

The panel was chaired by **Jeremiah A. Barondess**, president, New York Academy of Medicine, New York City. The study was sponsored by the U.S. Department of Health and Human Services.

Modified Tobacco Products May Do **More Harm Than Good**



Despite all that is known about the dangers associated with using tobacco, about 47 million American adults smoke. Tobacco-related disease remains one of the nation's greatest controllable health problems and one of its most significant social burdens.

In the last 50 years, convincing and generally accepted evidence has established that exposure to tobacco products is the leading single cause of premature death worldwide. It also is clear that lifelong abstinence and avoidance of second-hand smoke is the only proven way to steer clear of the health risks from tobacco use. Cessation — even after many years of smoking — reduces risk and harm both immediately and in the long term for many tobacco-related conditions such as chronic breathing difficulties, cancer, and stroke.

For smokers desperate to quit, programs and products that could help them kick the habit are doggedly sought. Not surprisingly,

several novel products have emerged that make implied or explicit claims to reduce the health burdens of tobacco use while allowing the user to continue smoking. The array of such products includes modified tobacco and cigarette-like items that purport to deliver smaller amounts of some toxicants and are being test-marketed as “safer” alternatives to traditional cigarettes. However, they have not been thoroughly studied, nor are they regulated.

Some drugs, such as nicotine in gum, patches, inhalers, and nasal spray, have been available for several years to help people quit smoking and, when used as directed, they are safe and effective. They are strictly regulated for short-term use, though, and have not been reviewed for longer use to help cut down the number of cigarettes smoked each day.

To gain a better understanding of how the government should handle these products, the U.S. Food and Drug Administration asked the Institute of Medicine (IOM) in 1999 to delve into the issue and lay out scientific methods and standards by which these so-called harm-reduction products could be assessed. In a new report, an IOM committee concluded that lessening the risk

of disease by reducing exposure to toxic chemicals with these products is scientifically feasible, but in the absence of rigorous research, it is not clear if such a strategy would decrease the incidence of tobacco-related disease or actually increase it by encouraging smoking. For example, if non-smokers thought these products were safer than ordinary cigarettes, might they start smoking? Would former smokers begin again?

The report outlines how tried-and-true public health tools — research, surveillance, communication, and regulation — should be used to ensure that these products confer less risk to the individual and to the population as a whole compared with conventional tobacco products.

“Our committee applauds the notion of helping individuals who cannot or will not quit smoking,” said Stuart Bondurant, professor of medicine, University of North Carolina, Chapel Hill, and chair of the committee that wrote the report. “We believe that it may be possible to reduce harm from tobacco use with new products, but we frankly do not know the health effects of the various products on the market today that claim to do this. Many still incorporate tobacco, and because no tobacco product is safe, the effects of these new products must be studied carefully to make a reliable judgment as to whether they actually reduce risk and harm.”

New biomedical and behavioral research will be essential to show conclusively the health effects of these products. For example, biomarkers could be designed with the sensitivity needed to measure the effect of a tobacco toxicant on the human body. Over

the longer term, animal, clinical, and population studies could specifically address the health outcomes of modified vs. conventional tobacco products.

At the same time, a surveillance system is essential in assessing how the introduction and marketing of modified tobacco products has affected the public’s health. The distribution, sales, and use of tobacco products should be monitored, as well as the chemicals they contain. Prompt collection and reporting of these data would help officials know if these products were detrimental to public health.

In tandem with research and surveillance, careful regulation of these products is required, the committee said. It recommends 11 regulatory principles intended to assure that the public is accurately informed about the health effects of new products, to prevent cigarettes with greater toxicity than those sold today from entering the market, and to gather complete information about new products. Regulations would do this by requiring manufacturers to base claims on scientific evidence proving that their products reduce risk of disease. — *Cheryl Greenhouse and Barbara Rice*

■ ***Clearing the Smoke: Assessing the Science Base for Tobacco Harm Reduction.*** Committee to Assess the Science Base for Tobacco Harm Reduction, Board on Health Promotion and Disease Prevention, Institute of Medicine (2001, approx. 514 pp.; ISBN 0-309-07282-4; available from National Academy Press, tel. 1-800-624-6242; \$49.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10029.html>).

The committee was chaired by **Stuart Bondurant**, professor of medicine and dean emeritus, department of medicine, School of Medicine, University of North Carolina, Chapel Hill. The U.S. Food and Drug Administration sponsored the study.



Illinois, Iowa, and other Midwestern farmers are struggling to maintain their competitiveness in the feisty export market for corn and soybeans. In addition to rich soil and a favorable climate, they need cheap transportation to get their grain to far-off destinations — principally Asia. The Upper Mississippi River-Illinois Waterway serves as the gateway; in fact, some 120 million tons of cargo, mostly grain, are shipped each year by barge on this vast inland artery that includes a series of locks and dams through which each towboat proceeds. Since the locks were built nearly 60 years ago, traffic has swelled and the number of barges in a tow has doubled, increasing congestion and shipping costs.

At the urging of farmers and other shippers, the Army Corps of Engineers spent 12 years and \$55 million studying whether to spend the approximately \$1 billion needed to enlarge the locks. But in March, the Corps put its study temporarily on hold to take into account the findings of a new study from the National Research Council.

Last year, the U.S. Department of Defense called on the Research Council to review the Corps' study after controversy erupted over the assumptions and methods it had used. Indeed, analyzing whether the social benefits of a waterway project justify the costs and the environmental disruption is an extremely complicated exercise.

The Research Council's report concludes that while the Corps' study encompasses some important conceptual advances, it is flawed in key areas. More importantly, the committee noted that enlarging the locks would take more than a decade, during which congestion would actually increase.

"The Corps apparently considered lock extensions the only remedy for reducing congestion, ignoring a range of less expensive, nonstructural alternatives that offer immediate relief," said Lester Lave, professor of economics at Carnegie Mellon University, Pittsburgh, and chair of the committee that wrote the report.

Lock extensions represent a large investment decision that, once made, cannot be



adjusted easily to changing economic and environmental conditions, the report says. But, as farmers stressed during the committee's information-gathering meetings, there also are drawbacks to waiting for more information before deciding whether to build. If river traffic continues to increase on the upper Mississippi, so will congestion — leading to higher shipping costs, and a weakened ability to compete in international markets.

The Corps could, however, do a variety of things to lessen congestion immediately and lower shipping costs, the committee said. For example, a scheduling program could be implemented, improving the flow of traffic from one lock to the next. Better equipment could help reduce the time it takes to hook barges together. And permits could be distributed, allowing towboat captains to pass through locks at certain times; these permits could be traded among towboat operators as needed. In addition to relieving current problems, these nonstructural approaches would allow more time to assess the need for construction, as well as manage congestion during construction.

Since the Corps' final report was delayed and has not been completed, the committee based its findings on draft documents. It commended the Corps for developing models superior to those used in the past, but found weaknesses in the data and assumptions on which they were based. Among the errors were incorrect forecasts of commodity supply and demand. For example, the Corps' model predicted increases in grain exports between 1995 and 2000, when in fact, export levels remained steady or dropped slightly during that time. The results from the economic models should not be used until these, and other, problems are fixed, the committee stressed.

In addition, the committee questioned the feasibility study's environmental analysis, finding it "insufficient." The committee called on Congress to provide funding for comprehensive environmental studies conducted by multiple agencies. And it suggested that Congress require the Corps to have its environmental and lock-extension studies periodically reviewed by an interdisciplinary group of outside experts.

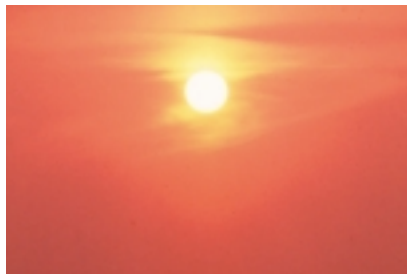
—Susan Turner-Lowe

■ **Inland Navigation System Planning: The Upper Mississippi River-Illinois Waterway.** Committee to Review the Upper Mississippi River-Illinois Waterway System Feasibility Study; Water Science and Technology Board, Division on Earth and Life Studies; and Transportation Research Board (2001, 130 pp.; ISBN 0-309-07405-3; available from National Academy Press, tel. 1-800-624-6242; \$29.75 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10072.html>).

The committee was chaired by **Lester Lave**, Harry B. and James H. Higgins Professor of Economics, Carnegie Mellon University, Pittsburgh. The study was funded by the U.S. Department of Defense.

Can Climate Change Make Us Sick?

Throughout history, people have pondered the connection between a change in the weather and a case of the sniffles. Hippocrates taught that specific ailments were tied to



changes of season or temperature. Even the words and phrases used today to describe sickness — “catch a cold,” for example, or “under the weather” — reflect some sort of cause and effect.

And now, with growing concerns that climate variations, such as El Niño, and global warming could trigger outbreaks of disease, a National Research Council committee has taken an in-depth look at the issue.

It found that while many studies show a correlation between climate variations and a higher incidence of disease, such studies generally do not take into account all the factors that play a role in disease transmission — such as sanitation and public health services, population density, and travel patterns — and therefore may not be reliable indicators of whether future climate change will cause illnesses to spread.

Likewise, computer models that have been created to simulate the connection between climate change and infectious diseases are useful tools for testing hypotheses, but at present, should not be used to make predictions.

“While there’s the potential for predicting disease outbreaks based on changes in the weather, the science in this field is just not there yet,” said committee chair Donald Burke, professor of international

health and epidemiology, Johns Hopkins School of Public Health, Baltimore.

Burke added that public health measures and new vaccines and drugs can limit the geographic range of infectious diseases,

regardless of climate. For example, malaria — a mosquito-borne parasite associated with warm climates — was once rampant in some parts of the United States, but officials were able to take steps to eliminate it, such as draining swamps where mosquitoes bred.

Early alarms that tip off authorities to a public health threat stemming from climate changes may be possible someday as our understanding of climate-disease relationships improves and if disease surveillance effort are strengthened considerably, the report suggests. Advances in remote sensing of environmental changes and gene-sequencing techniques should aid such efforts. — *Bill Kearney*

■ ***Under the Weather: Exploring the Linkages Among Climate, Ecosystems, and Infectious Disease.***

Committee on Climate, Ecosystems, Infectious Disease, and Human Health, Division on Earth and Life Studies (2001, approx. 160 pp.; ISBN 0-309-07278-6; available from National Academy Press, tel. 1-800-624-6242; \$37.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/10025.html>).

The committee was chaired by **Donald Burke**, professor of international health and epidemiology, Johns Hopkins School of Public Health, Baltimore. The study was funded by the U.S. Environmental Protection Agency, Centers for Disease Control and Prevention, National Science Foundation, NASA, National Oceanic and Atmospheric Administration, U.S. Geological Survey, U.S. Global Change Research Program, and the Electric Power Research Institute.

Going Without Health Insurance? A New Project Looks at the Consequences

Some 42 million people in the United States have no health insurance to cover their medical needs. Although many of the uninsured are poor, the surprising reality is that the majority who are of working-age are employed, and a large proportion of them work for businesses with more than 500 employees. Eight out of every 10 people without health coverage either work or are children of working parents, according to Cathy Schoen, vice president for research and evaluation at the Commonwealth Fund.

In fact, many small businesses do not offer health insurance at all, and those where at least a third of their workers make less than \$20,000 a year are far less likely to offer it than firms that pay higher wages. And only 64 percent of workers at larger businesses employing 200 or more receive coverage through their employers. Indeed, as the costs of health insurance plans continue to rise, many businesses are incapable of providing insurance to employees without hurting their bottom line.

Schoen was among 21 experts who presented these and other findings to an

Institute of Medicine (IOM) committee during a recent workshop held to review what is known about the uninsured and to identify where research and information gaps persist. The workshop was the first step in a three-year project that is assessing the health, economic, and social consequences of uninsurance.

Despite nearly a decade of national debate on health care reform, little has been done to develop new policies aimed at securing health insurance for all Americans. To help move the discussion closer to action, the committee's study will attempt to raise awareness and improve understanding of the magnitude and nature of uninsurance in the United States.

The facts seem clear. Extensive data exist connecting the lack of insurance with poorer health, lower quality of life, and higher likelihood of premature death. One of the committee's tasks is to consolidate and communicate these and other findings. "The research literature supports what many of us know from clinical practice, that the uninsured often delay medically necessary and life-saving care such as screening and treatment for cancer, high blood pressure, heart disease, asthma, and diabetes," says Steven A. Schroeder, president and chief executive officer of the Robert Wood Johnson Foundation, which is sponsoring the IOM project. "As a



From left: Catherine Hoffman, Kaiser Commission on Medicaid and the Uninsured, and Keith Mueller, University of Nebraska Medical Center; Edward Wagner, University of Washington School of Public Health and Community Medicine; Julie Rovner, National Public Radio.

result, the uninsured are likely to develop more serious health problems.”

And while intermittent coverage may seem better than none at all, even people who only periodically go without health insurance run a higher risk of falling into poor health, said workshop presenter Catherine Hoffman, associate director of the Kaiser Commission on Medicaid and the Uninsured.

Those who have interruptions in health-insurance coverage often fail to receive preventive care and are forced to seek medical attention for emergencies only. Despite the short-term savings that come from not paying for insurance, the overriding consequence for many uninsured families who only receive emergency services is that too much of the family budget ends up being spent on health care.

The Institute of Medicine project will generate six reports on the subject; the first is expected in the fall and will present an overview of who the uninsured are, where they live, and which population subgroups are disproportionately likely to be uninsured. It also will examine the factors that lead to uninsurance. This initial report will offer a conceptual framework for assessing the impact of uninsurance that will be used in the subsequent reports.

— *Cheryl Greenhouse*

(See listing on page 26.)

From top: E. Richard Brown, School of Public Health, University of California, Los Angeles; Jack Hadley, The Urban Institute; Arthur Kellerman (left), Rollins School of Public Health at Emory University, and Reed Tuckson (right), UnitedHealthGroup; Charlotte Yeh (left), National Heritage Insurance Co., Willard Manning (center), University of Chicago School of Medicine and School of Public Policy, and Darrell Gaskin (right), Georgetown University Medical Center.

Photographs by Greg Hadley



BY DONALD A. HENDERSON



Donald A. Henderson is a professor of epidemiology and the director of the Center for Civilian Biodefense Studies at Johns Hopkins University, Baltimore.

A New Strategy for Fighting **Biological Terrorism**

When a terrorist cult released lethal sarin gas in the crowded Tokyo subway system in 1995 — killing 12 people and injuring hundreds of others — police, fire, and emergency rescue teams rushed to the scene to treat and evacuate those who were ill and to contain the threat. These immediate health effects made it apparent that a toxic substance had been released. But what would have happened if the terrorists had released a deadly organism such as that which causes smallpox or anthrax?

A microbe released into the atmosphere would be invisible, odorless, and tasteless. The attack probably would not be discovered until days or even weeks later, when sick people would begin arriving in emergency rooms and doctors' offices. Rather than being contained at the attack site, contagious diseases such as smallpox or plague could spread far beyond those who were originally exposed. Such biological weapons, in terms of their potential destructiveness and the panic and civil disorder that could ensue, are considered now to be equivalent to the large-scale threats once only posed by nuclear weapons.

And yet, to date, there is no agreed-upon national strategy in the United States for dealing with bioterrorism. Policy-makers have only begun to appreciate that the release of a biological agent would result in an epidemic and that the implications would be entirely different from those resulting from the release of a chemical agent or detonation of an explosive device. Unless bioterrorism is tackled with a much greater sense of urgency, the right practical expertise, and far more funding, the nation will continue to remain perilously vulnerable.

As demonstrated by the Tokyo attack, the first on the scene of an attack using a chemical agent is typically law enforcement and emergency medical teams. If an epidemic resulted from a biological agent, however, physicians, nurses, and public health officials would be the first to respond to the needs of acutely ill patients. They would be the ones to diagnose the disease, identify the origin of the epidemic, and organize control measures. But planning and research activities related to bioterrorism, until recently, have been heavily dominated by those with little knowledge of infectious diseases and no experience in epidemic control.

Although well-intentioned, the planners have launched programs appropriate to the threats with which they are familiar — chemical and nuclear weapons. It is now apparent that the challenge presented by biological terrorism is very different in all respects, including research, surveillance, arms-control initiatives, and intelligence gathering.

Federal funding for biological terrorism control efforts had gone almost entirely to the departments of Defense, Justice, and Energy, rather than to agencies equipped for handling public health threats and conducting biomedical research, such as the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health.

Now, in a partial mid-course correction, an effort is being made to recast domestic preparedness programs to also focus on biological threats. However, those directing the efforts are primarily emergency rescue, police, and fire personnel who have had no experience identifying or combating epidemics. Even more difficult to understand is the fact that little has been done to incorporate hospitals into the planning process. A recent meeting of hospital executives concluded, in fact, that no U.S. hospital is prepared today to deal with a large epidemic for a host of financial, legal, and staffing reasons.

The first tentative steps have been taken to develop a more focused and rational national strategy. In 1999, CDC received funding to strengthen state and local epidemic detection and control programs. The effort is designed to bolster our public health infrastructure and to re-establish effective working relationships between the public health and medical communities. The plan calls for developing appropriate state and local plans, educating primary caregivers and public health staff about agents that might be used, implementing surveillance systems for early detection of outbreaks, building a laboratory network capable of rapidly identifying biological agents, and stockpiling needed quantities of vaccines and drugs.

The threat of bioterrorism is not going to disappear. Indeed, as our knowledge of biological science advances, so will the opportunity to create more diverse and deadly weapons. Meanwhile, the nation also is threatened by a multitude of new and emerging infections, including West Nile encephalitis, Hanta virus pulmonary infection, new strains of influenza, and a growing number of antibiotic-resistant microbes. Regardless of whether the source is bioterrorism or a naturally occurring outbreak, similar resources are needed for the early detection and control of disease. Without the appropriate resources and expertise, the nation will remain ill-prepared to fight these very real enemies.

Unless bioterrorism is tackled with a much greater sense of urgency, the right practical expertise, and far more funding, the nation will continue to remain perilously vulnerable.

The National Academies Op-Ed Service distributes accessible, compelling, and timely articles written by prominent scientists, engineers, physicians, and other experts. Visit the Service's Web site at national-academies.org/op-ed for a comprehensive collection of authoritative commentary on issues involving science, technology, and medicine.

Whither the Atlantic Salmon?

Maine is home to the last wild, native populations of Atlantic salmon in the United States. Most salmon sold at markets and in restaurants do not come from the wild, but are commercially raised on fish farms. Last year, federal agencies listed wild salmon found in several Maine rivers as endangered, claiming that the species was nearing extinction despite the state's intensive conservation efforts. Regulations under the Endangered Species Act threaten to limit certain land-based activities near these rivers, and may affect the state's aquaculture and blueberry farming industries. Which is why Maine officials oppose the

listing — they argue that new restrictions will harm these important industries while not necessarily saving the salmon.

Less than 10 percent of the population needed for long-term survival of wild Atlantic salmon are returning to spawn in the

Maine rivers, says the U.S. Fish and Wildlife Service. The complex

life cycles of salmon subject them to a variety of environmental factors. These include climate change, disease, and predation by other fish and mammals, but it is difficult to determine exactly why the fish are disappearing at such an alarming rate. Interbreeding and competition with escaped farm-raised salmon also may have disrupted wild populations.

At the request of Congress, a new Research Council committee is reviewing the status of Atlantic salmon in Maine, assessing causes of population decline, principal threats to survival, and actions that could increase the likelihood of

long-term salmon survival. An interim report is expected later this year, and a full report will follow in 2002.

— *Shelley Solheim*

(See listing on page 26.)

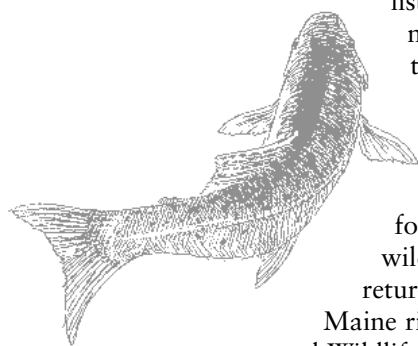
Juvenile Crime & Punishment

When communities across the country saw large jumps in the number of violent crimes committed by juveniles during the late '80s and early '90s, policy-makers reacted, supporting measures to transfer youthful offenders at younger ages from the juvenile-justice system to adult court. States also made sentencing more punitive for a broader range of offenses, which led to more youths being detained and incarcerated.

The juvenile arrest rate for violent crime began to drop in 1994 and by 1999, it had returned to levels seen before the attention-grabbing increases. Although many have attributed the improvement to various get-tough strategies, the actual cause remains uncertain. Indeed, some of these policies were enacted after crime trends had already begun to turn around.

What has grown clear, however, is that treating juvenile offenders as adults may do more harm than good, concludes a new report from the National Research Council and the Institute of Medicine. A growing body of evidence suggests that even juveniles who commit serious offenses can be treated more effectively — and without risking public safety — in well-designed, community-based rehabilitation programs than in secure detention.

Increasingly, correctional facilities have grown crowded, often impairing their ability to provide adequate educational or support services to juveniles. Furthermore, crowded conditions raise the risk of injury to both staff members and young inmates,



said the panel that wrote the report. For these reasons, the federal government should provide states with funds and other incentives to develop community-based alternatives for juvenile offenders and move away from institutionalization.

In addition, federal and state funds should be used to create treatment and intervention options that avoid grouping aggressive young people together, the report says. Group rehabilitation for troubled kids may inadvertently fuel antisocial behavior because such programs concentrate negative influences.

Given the overrepresentation of minorities in the juvenile-justice system, policy-makers also should set aside new funds to support a comprehensive, long-term research agenda aimed at fully investigating the issue and rooting out any sources of institutional bias, the report adds. Likewise, all publicly supported intervention programs should be closely monitored and routinely evaluated — using valid scientific methods — to ensure youngsters' safety and determine whether goals are being met.
— *Vanee Vines*

■ **Juvenile Crime, Juvenile Justice.** Panel on Juvenile Crime: Prevention, Treatment, and Control; Committee on Law and Justice, Division on Behavioral and Social Sciences and Education; and Board on Children, Youth, and Families, National Research Council and Institute of Medicine (2001, approx. 400 pp.; ISBN 0-309-06842-8; available from National Academy Press, tel. 1-800-624-6242; \$39.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/9747.html>).

The panel was co-chaired by **Joan McCord**, professor, criminal justice department, Temple University, Philadelphia, and **Cathy Spatz Widom**, professor, psychiatry department, New Jersey Medical School, University of Medicine and Dentistry of New Jersey, Newark. The study was sponsored by the U.S. departments of Justice and Education, the John D. and Catherine T. MacArthur Foundation, and the Harry Frank Guggenheim Foundation.

Technology in the Classroom

Every day, somewhere in an American classroom, a teacher is discovering that students can use interactive software to develop much more than game-playing skills. Computers equipped with high-quality instructional programs can expand student understanding, such as helping them to visualize abstract ideas in ways that were once hard to imagine. Likewise, having Internet access means potentially bringing students around the globe together into communities of learners. While the possibilities for using information technology (IT) as a learning tool seem endless, school leaders and policy-makers have been cautious about embracing it for instructional purposes. Nevertheless, enthusiasm is building for how the education community might work with the IT industry to create applications best suited for improving learning in the nation's schools.

A new study by the National Research Council will assemble a committee of experts to explore how both learning and instruction could be enhanced through the creative use of information technology. The committee will examine new paradigms for combining technology and knowledge of the learning process, and explore opportunities for K-12 educators, software and hardware developers, and cognitive scientists to collaborate on improving education with new applications of technology. A final report is expected in 2002.

— *Mark Chesnek*

(See listing on page 26.)



BY MAY BERENBAUM



Jump-starting an ***Appreciation for Science***

May Berenbaum heads the department of entomology at the University of Illinois at Urbana-Champaign, and has written several books on the subject. She is a member of the National Academy of Sciences, a fellow of the American Association for the Advancement of Science, and a fellow of the American Academy of Arts and Sciences.

As an entomologist who is a dyed-in-the-wool supporter of science literacy, I've made it a point never to refuse an invitation from the community to speak about insects. Over the past 20 years, I've given presentations for school groups ranging from preschool to college, nature centers, day camps, Brownie and Cub Scout troops, garden clubs, herb societies, and science teachers associations. Perhaps more surprisingly, I've even managed to work insects into talks before groups like ladies' clubs, medical societies, and nursing homes. The key to success is to relate whatever you'd like to say to something that resonates with your audience.

Perhaps the most successful application of this philosophy has been the Insect Fear Film Festival, now in its 18th year at the University of Illinois. The basic idea of the festival has been to showcase Hollywood films featuring fearsome and threatening insects and to explain to our audience why what they see on the screen can't possibly happen. In this way, scientific information can be presented in an entertaining context. At each festival, we show two or three feature-length films interspersed with animated shorts. The audience also is invited to handle a variety of live specimens — kind of a “meet the stars” opportunity — which invariably includes tarantulas (not insects, but crowd-pleasers nonetheless), hissing cockroaches, and tobacco hornworms, among many others, as well as to see displays of preserved specimens. After a few years, the festivals began to be organized around particular themes — spiders, grasshoppers, social insects, cockroaches, and flies. We also began to hold the festival in conjunction with other events like a children's insect art contest and a thematically relevant blood drive during the 1999 mosquito film festival.

All told, we have shown 41 different feature films and more than 40 shorts in the name of public education, routinely drawing crowds of a thousand or more. Today, public outreach activities sponsored by university entomology departments are commonplace and movies are elements of many. Insects remain the one familiar and conspicuous group that seems to be politically correct to hate and Hollywood has shown no inclination to stop producing bad insect science fiction films. These movies present a terrific opportunity to provide people with a learning experience that's nontraditional and fun.

EDITOR'S PICKS



What's new and notable on the National Academies Web site

Engineer Girls, Check This Out

Girls across the United States and Canada helped the National Academy of Engineering (NAE) create "Engineer Girl," a Web site that highlights engineering opportunities for women and girls, in areas such as space, medicine, environment, and communications. Students who visit the site can get homework help, read profiles of real women engineers, and even ask them questions.

"Engineer Girl" is part of the NAE's Celebration of Women in Engineering project, which tries to bring national attention to the opportunities that engineering presents to people at any age, but particularly to women and girls. The Celebration is the first of several projects by NAE focusing on gender and diversity in the engineering workforce and is supported with grants from the AT&T Foundation, Southern Company, and Texas Utilities.

Web Extra! Web Extra!

Read All About It! The National Academies now offer enhanced Web treatments of some of the institution's reports on high-profile, critical issues. These "Web Extra" sites present short, accessible report summaries, a wide array of online resources, and other information to provide a better understanding of complex issues. Recent features look at the potential of new imaging and molecular biological technologies for detecting and diagnosing breast cancer at an early stage; the controversy surrounding products that claim to reduce some of the risks of smoking while still allowing the use

of tobacco or nicotine; and whether the nation's schoolchildren are getting the preparation in mathematics they need to live and work in a world that increasingly is driven by technology, all subjects of new Academies reports. Readers who peruse the Web Extra archive can listen to discussions with the authors, take online quizzes, and access in-depth information.

Students Meet Internet 'Fathers'

Listen to Charles Stark Draper Prize winners **Vinton Cerf, Robert Kahn, Leonard Kleinrock, and Lawrence Roberts** — honored for their individual efforts in developing the Internet — in a lively discussion with middle and high school students, an event sponsored by the National Academy of Engineering. The Draper laureates talk on topics ranging from the early days of discovery to current issues surrounding copyright law, security, and the stability of the Internet. Cerf and Kahn are co-inventors of the two protocols that enable computers around the world to communicate with one another. Kleinrock created the basic principles of packet switching — the technology that routes a message from computer to computer until it reaches its final destination, and directed the transmission of the first message ever to pass over the Internet. Roberts led the team that designed and developed the world's first major computer network to implement packet switching.

All items are accessible from <infocusmagazine.org>.

Projects

The following are selected projects undertaken by units of the National Academies. The latest information about all current committee activities — including project descriptions, committee rosters, and meeting information — is now available in “Current Projects” on the National Academies’ Web site.

Assessing the System for Protecting Human Research Subjects.

Board on Health Sciences Policy, Institute of Medicine. Project director: Laura Lyman Rodriguez. Chair: Daniel D. Federman, senior dean for alumni relations and clinical teaching, and professor of medicine and medical education, Harvard University, Cambridge, Mass. Sponsors: U.S. Department of Health and Human Services and the Greenwall Foundation.

The Consequences of Uninsurance.

Board on Health Care Services, Institute of Medicine. Project co-directors: Wilhelmine Miller and Dianne Wolman. Co-chairs: Mary Sue Coleman, president, University of Iowa and University of Iowa Health Systems, Iowa City; and Arthur L. Kellermann, professor and director, Center for Injury Control, Rollins School of Public Health, Emory University, and professor and chair, department of emergency medicine, School of Medicine, Emory University, Atlanta. Sponsor: Robert Wood Johnson Foundation. (See p. 18 in this issue of *In Focus*.)

Improving Learning with Information Technology.

Division on Behavioral and Social Sciences and Education, and the National Academy of Engineering. Project director: Kevin Aylesworth. Co-chairs: Roy Pea, director of the

Center for Technology in Learning, SRI International, Menlo Park, Calif.; and Wm. A. Wulf, president, National Academy of Engineering, Washington, D.C. Sponsor: U.S. Department of Education. (See p. 23 in this issue of *In Focus*.)

Opportunities in Agriculture.

Board on Agriculture and Natural Resources, Division on Earth and Life Studies. Project director: David Meeker. Chair: Franklin M. Loew, president, Becker College, Worcester, Mass. Sponsor: U.S. Department of Agriculture.

Re-conceptualizing Adolescent Risk and Vulnerability.

Board on Children, Youth, and Families, National Research Council and Institute of Medicine. Project director: Michele Kipke. Co-chairs: Baruch Fischhoff, University Professor, departments of social and decision sciences and of engineering and public policy, Carnegie Mellon University, Pittsburgh; and Elena Nightingale, scholar-in-residence, Board on Children, Youth, and Families, National Research Council and Institute of Medicine, Washington, D.C. Sponsor: Carnegie Corp. of New York.

Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction.

Water Science and Technology Board, Division on Earth and Life Studies. Project director: Laura Ehlers. Chair: Kenneth H. Reckhow, professor of water resources, Nicholas School of the Environment, Duke University, Durham, N.C., and director, Water Resources Research Institute, North Carolina State University, Raleigh. Sponsor U.S. Environmental Protection Agency.

The Status and Future of Atlantic Salmon in Maine.

Board on Environmental Studies and Toxicology and Ocean Studies Board, Division on Earth and Life Studies. Project director: David Policansky. Chair: M.T. Clegg, Distinguished Professor of Genetics, department of botany and plant sciences, University of California, Riverside. Sponsor: National Fish and Wildlife Foundation. (See p. 22 in this issue of *In Focus*.)

Understanding and Reducing Racial and Ethnic Disparities in Health Care.

Board on Health Sciences Policy, Institute of Medicine. Project director: Brian Smedley. Chair: Alan Nelson, special adviser to the chief executive officer, American College of Physicians-American Society of Internal Medicine, Washington, D.C. Sponsor: U.S. Department of Health and Human Services’ Office of Minority Health.

Publications

For documents shown as available from National Academy Press (NAP), write to 2101 Constitution Avenue N.W., Washington, D.C. 20418; telephone (202) 334-3313 or 1-800-624-6242; or order on the Internet at <www.nap.edu>. Documents from a specific unit of the National Academies are available from the source as noted. Prices and availability of all documents are subject to change. Charges listed are for single copies; discounts are available for bulk orders.

1999-2000 Assessment of the Army Research Laboratory
Army Research Laboratory
Technical Assessment Board,
Division on Engineering and
Physical Sciences (2000, 86 pp.;

copies available free from the board, 202-334-3311).

2000 Assessment of the Office of Naval Research's Marine Corps Science and Technology Program
Naval Studies Board, Division on Engineering and Physical Sciences (2000, 104 pp.; ISBN 0-309-07138-0; available from NAP, \$25.25 plus \$4.50 shipping).

Acute Exposure Guideline Levels for Selected Airborne Chemicals — Vol. I
Committee on Toxicology, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2000, 220 pp.; ISBN 0-309-07294-8; available from NAP, \$45.00 plus \$4.50 shipping).

America Becoming: Racial Trends and Their Consequences — Vol. I
Division on Behavioral and Social Sciences and Education (2001, 560 pp.; ISBN 0-309-06838-X; available from NAP, \$24.95 plus \$4.50 shipping).

America Becoming: Racial Trends and Their Consequences — Vol. II
Division on Behavioral and Social Sciences and Education (2001, 524 pp.; ISBN 0-309-06840-1; available from NAP, \$24.95 plus \$4.50 shipping).

The American Community Survey — Summary of a Workshop
Committee on National Statistics, Division on Behavioral and Social Sciences and Education (2001, 72 pp.; ISBN 0-309-07315-4; available from NAP, \$18.00 plus \$4.50 shipping).

Basic Research Opportunities in Earth Science
Board on Earth Sciences and Resources, Division on Earth and Life Studies (2000, 168 pp.; ISBN 0-309-07133-X; available from

NAP, \$40.00 plus \$4.50 shipping).
Bioinformatics: Converting Data to Knowledge — Workshop Summary
Board on Biology, Division on Earth and Life Studies (2000, 54 pp.; ISBN 0-309-07256-5; available from NAP, \$18.00 plus \$4.50 shipping).

Building a Workforce for the Information Economy
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences; Board on Testing and Assessment, Division on Behavioral and Social Sciences and Education; and Board on Science, Technology, and Economic Policy, and Office of Scientific and Engineering Personnel, Division on Policy and Global Affairs (2000, approximately 400 pp.; ISBN 0-309-07288-3; pre-publication copies available from NAP, \$40.00 plus \$4.50 shipping).

Cells and Surveys: Should Biological Measures Be Included in Social Science Research?
Committee on Population, Division on Behavioral and Social Sciences and Education (2000, 376 pp.; ISBN 0-309-07199-2; available from NAP, \$49.00 plus \$4.50 shipping).

Crime Victims with Developmental Disabilities — Report of a Workshop
Division on Behavioral and Social Sciences and Education (2001, 104 pp.; ISBN 0-309-07318-9; available from NAP, \$25.25 plus \$4.50 shipping).

Definition of Pain and Distress and Reporting Requirements for Laboratory Animals: Proceedings of the Workshop Held June 22, 2000
Institute for Laboratory Animal Research, Division on Earth and

Life Studies (2000, 132 pp.; ISBN 0-309-07291-3; available from NAP, \$30.00 plus \$4.50 shipping).

Education and Delinquency — Summary of a Workshop
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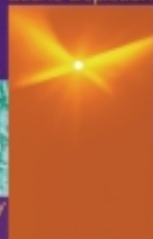


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