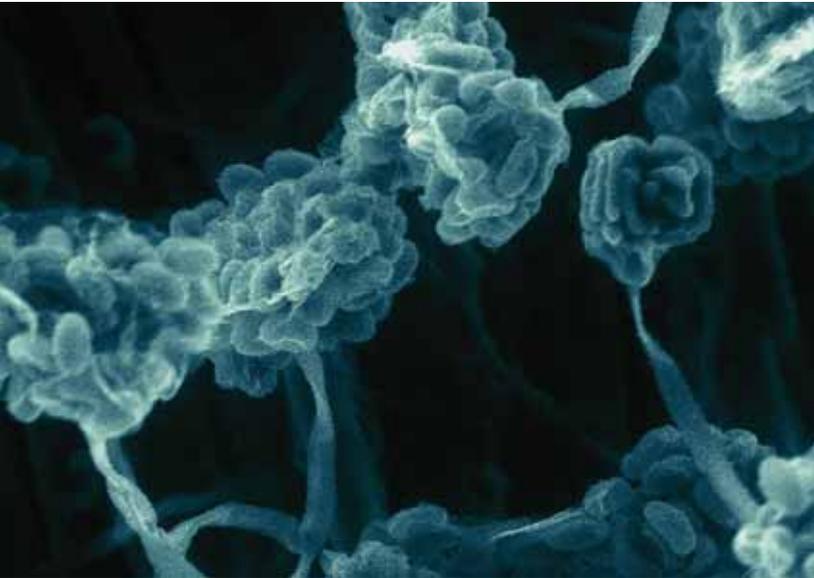


# THE NATIONAL ACADEMIES **INFOCUS**

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Controversy and Care at the National Zoo  
Ensuring Safe Dietary Supplements  
The Truth About Indoor Mold  
Portable Power for Tomorrow's Soldier

Summer 2004

## THE NATIONAL ACADEMIES

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## Looking at Diseases in New Ways

How do we mobilize science to protect us from future biological and medical disasters — including those caused by terrorists? In this critical endeavor, our nation must make a special effort to use the full range of pertinent resources. Prominent among these are many top biological researchers who do not ordinarily study pathogens yet who could significantly augment the expertise that virologists and microbiologists bring to combating microbial threats.



As a test case, National Academy of Sciences President Bruce Alberts and I recently convened a diverse group of scientists to focus on strategies to discover new antivirals against smallpox. We chose smallpox because the variola virus that causes this disease ranks at the top of CDC's list of high-threat agents, due to its extreme lethality to humans and ease of transmission. While naturally occurring smallpox has been eradicated, the world needs effective, new countermeasures in case of a terrorist-directed outbreak.

Our exercise began with a handful of experts on poxviruses and antiviral drugs educating 25 invited specialists from other fields of research, including cellular, structural, computational, and biochemical biology. The group was limited to about 30 to give everyone a chance to engage actively in focused discussion groups during a two-day workshop.

The results — published in the July 12th issue of the *Proceedings of the National Academy of Sciences* — were remarkable. Specialists who previously knew very little about variola or other poxviruses found the exercise invigorating and productive. The virologists revealed a set of scientific puzzles that seem ripe for new discoveries. In particular, the intricate, highly specialized process of variola replication provides numerous openings for new drugs that can stop viral infection without damaging healthy human tissue.

We believe that leading investigators from diverse fields should be more routinely invited and inspired to seek new means of counteracting infectious diseases. Progress that is made on controlling pathogens like those a terrorist might use can also have a spillover benefit to research on other important, naturally occurring diseases — including HIV, influenza, the SARS-associated coronavirus, monkeypox, West Nile virus, and avian flu. By creating opportunities for collaboration among scientists who normally do not interact or know of each others' work, the National Academies can help promote innovative strategies to solve critical problems in infectious disease, and thereby improve health and enhance our national security.

A handwritten signature in black ink that reads "Harvey V. Fineberg". The signature is fluid and cursive, with the first name being the most prominent.

HARVEY V. FINEBERG  
President, Institute of Medicine

## Putting Research to the **TEST**



### Improvements Needed in Clinical Studies Involving Children

**S**ociety wants kids to benefit from many of the dramatic medical advances that stem from scientific research. But herein lies the dilemma: No one wants to put children at risk from research participation — even when their involvement may help improve children’s health and health care overall.

It is possible to strike an appropriate balance, protecting those kids who take part in clinical research today while helping tomorrow’s children reap more benefits from biomedical science, says a new report from the Institute of Medicine. For starters, an effective and adequately funded system for protecting all human

research participants is a must. However, safeguarding child participants requires extra attention and resources because kids lack the intellectual and emotional maturity, and usually the legal right, to consent to experiments on their own behalf.

The federal government should play a major role in this balancing act. Existing federal rules to protect children from risky or unethical clinical research should be extended to cover all pediatric research in both the public and private sectors, the report says. Currently, the rules apply primarily to studies that are supported by the U.S. Department of Health and Human Services or regulated by the Food and Drug

Administration, although many research institutions voluntarily apply them to all of their studies.

The government also should offer better guidance — and in more accessible formats — to clinical researchers and institutional review boards (IRBs) to help them interpret federal rules, which are more stringent for children than adults. IRBs — the bodies responsible for approving human research — should be more thorough and explicit in judging whether research involving children meets the highest ethical and scientific standards, the report adds.

In recent years, Congress, the National Institutes of Health, and FDA have expanded pediatric research, especially studies that test the safety and efficacy of drugs for infants, young children, and adolescents. In medical circles, these groups have been called “therapeutic orphans” because drug companies have been reluctant to conduct tests involving them after medications have been approved for adults. Physicians often have to choose not to prescribe particular medications for children, or must extrapolate drug doses based on data from studies with adults, the report notes.

But such practices may come with a high price. Physiologically, children are not just “little adults.” Extrapolation may lead to children getting too much or too little of a drug, or suffering adverse effects not seen with adults. Plus, this type of calculation cannot generate a reliable knowledge base for future clinical care, said the committee that wrote the report.

In weighing possible harm from pediatric research protocols, reviewers of clinical studies involving children should compare potential risks with those commonly

encountered by healthy, average children, the report says. Research should not expose participants to higher levels of risk simply because they are already imperiled by illness, unsafe neighborhoods, or other aspects of their daily lives.

Parents must be in the loop, too. Discussions with them and, when appropriate, children should allow sufficient time for questions and explanations of the research, the report emphasizes. In addition, IRBs should adopt explicit written policies that define ethical payment arrangements for children’s participation in research.

The report points out numerous holes in the knowledge base regarding pediatric research and protection programs for research involving children. HHS should develop and carry out a plan for collecting and reporting data on pediatric research and its oversight, the report says. Also, IRBs that review protocols for pediatric clinical studies should include at least three members with expertise in pediatric research, research ethics, children’s health care, and child development — or the boards should consult with people who have this knowledge. — *Vanee Vines*

■ ***The Ethical Conduct of Clinical Research Involving Children.*** Committee on Clinical Research Involving Children, Board on Health Sciences Policy, Institute of Medicine (2004, 448 pp.; ISBN 0-309-09181-0, available from the National Academies Press, tel. 1-800-624-6242; \$47.95 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10958.html](http://books.nap.edu/catalog/10958.html)>).

The committee was chaired by **Richard E. Behrman**, executive chair, Education Steering Committee, Federation of Pediatric Organizations, Palo Alto, Calif.; and clinical professor of pediatrics at both the University of California, San Francisco, and George Washington University, Washington, D.C. The study was sponsored by the National Institute of Child Health and Development.

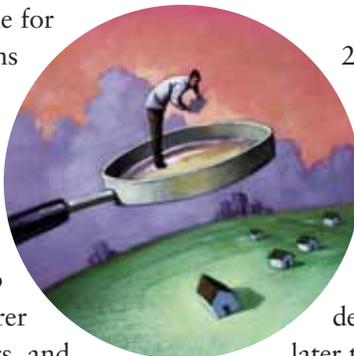
# Making the Census Count

## Lessons From 2000

Uncertainty set the scene for the 2000 census. Questions lingered about perceived failures of the 1990 census, which saw a substantial decline in public cooperation and — despite higher costs per household to conduct it — resulted in poorer coverage of minorities, renters, and children than of other population groups.

To address these problems in 2000, the Census Bureau designed a plan to rely more on statistical techniques than on mailings and house-to-house visits for the enumeration. That approach sparked opposition, however; some members of Congress questioned it, raising concerns about the accuracy of such techniques and their possible effects on the composition of voting districts. As a result of this opposition and further debate, the Census Bureau faced last-minute changes in the design of the census, delayed budget decisions, and more revisions in the plan, leaving insufficient time for test runs. In turn, these problems increased both the costs of the 2000 census and the risks of serious errors.

Despite the challenges, the last census was generally well-executed, says a new report from the National Research Council. There were some significant problems, such as duplicate addresses and missing data on the “long form” version of completed questionnaires, but the effort achieved a higher mail-response rate than the 1990 census and better coverage of minorities. The bureau’s measures to enhance advertising and outreach programs and information-processing procedures also were successful.



Based on its evaluation of the 2000 count, the panel that wrote the report recommended some ways to improve the next census. Foremost, Congress, the administration, and the Census Bureau should reach final agreement on the basic design of the 2010 census no

later than 2006, to leave sufficient time for careful planning and testing. And development of a more accurate address file, which is the basic starting point of the national headcount, must begin early. In addition, a large survey to evaluate coverage itself should be a part of the next census, the report says. The Research Council’s related study, *Reengineering the 2010 Census: Risks and Challenges*, offers policy-makers further guidance on that topic.

The decennial census is the federal government’s largest and most complex peacetime operation. Census data are used for a range of purposes, from redrawing congressional and state legislative district boundaries and allocating funds for public programs to informing everyday people about the characteristics of their localities. Having objective and accurate census information is an important component of good government, the panel said. — *Vanee Vines*

■ **The 2000 Census: Counting Under Adversity.** Panel to Review the 2000 Census, Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2004, 621 pp.; ISBN 0-309-09141-1, available from the National Academies Press, tel. 1-800-624-6242; \$59.00 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10907.html](http://books.nap.edu/catalog/10907.html)>).

The committee was chaired by **Janet L. Norwood**, a counselor and senior fellow at the New York City-based Conference Board, and a former U.S. Commissioner of Labor Statistics. The study was sponsored by the U.S. Bureau of the Census.



Taking advantage of today's advances in communications and computer technologies, the U.S. Army has started outfitting its troops with the latest devices to give soldiers a real-time picture of the battlefield and enhance their tactical effectiveness. But these capabilities come at a cost. Besides adding to the dismounted soldier's current physical load — sometimes in excess of 100 pounds — the new equipment will need to be powered long enough for soldiers to accomplish their missions independently without being resupplied.

## Powering Up the HIGH-TECH SOLDIER of the Future

**T**hrough a program called “Land Warrior,” the Army is acquiring high-tech gear that will greatly increase the soldiers' awareness of the combat environment, such as helmets with visual sensors, chemical and biological sensors, digital radios, and hand-held computer displays. A new report from the National Research Council examines various portable energy sources and technologies that could ensure enough power for well-equipped missions lasting up to three days, and for other future soldier applications that would require higher levels of energy. These power sources will be key in enabling what the Army calls the Future Force Warrior, successor to the Land Warrior program.

“Ensuring adequate power for dismounted soldiers is by no means a simple problem,” said Patrick Flynn, chair of the committee that wrote the report and retired vice president for research at Cummins Engine Company Inc. “The Army needs to consider not only energy sources, but also different types of equipment and efficient management tools and techniques. But here’s the good news: Solutions are currently available on the market, and no major breakthroughs will be necessary to develop these energy sources.”

The computers, sensors, and communication devices that will equip soldiers’ future gear have different energy requirements, so the committee examined a variety of technologies that would meet the Army’s needs. For example, standard military batteries can provide enough power for computer displays, radios, sensors, and electronics for a 12-hour mission, but for missions lasting up to 72 hours, other technologies — such as rechargeable batteries, sophisticated software to manage power, and hybrid energy systems — will be needed, the report notes.

Some of the applications requiring higher power — an average of 100 watts — are portable battery rechargers, laser devices used to guide a rocket, missile, or bomb to its target, and individual cooling systems for protective garments. The cooling gear, which provides ventilation near the skin to allow sweat to evaporate, would be a blessing to soldiers deployed in hot regions but it is particularly power-intensive. For such applications, the committee concluded that fuel cells



would perform better than rechargeable batteries.

Performance-enhancing devices, such as the “exoskeleton,” which literally takes the load off of one’s back to support large or heavy packs without reducing agility, use even more power and require 1 to 5 kilowatts. To power such energy-intensive equipment, the Army should consider use of fuel cells and small engine generators, the report says.

Among all possible energy sources, hybrid systems provide the most versatile solutions for meeting the diverse needs of the Future Force Warrior, the committee said. The key advantage of hybrid systems is their ability to provide power over varying extremes of usage by combining advantages of two power sources — such as a battery and a fuel cell or an engine and a battery.

“Products historically have evolved to become more portable, mobile, and wearable,” Flynn said. “By integrating components and minimizing the energy they consume, tomorrow’s military equipment will help soldiers operate in various conditions, extend the range and duration of their operations, and minimize their vulnerability.”

— *Patrice Pages*

■ **Meeting the Energy Needs of Future Warriors.** Committee on Soldier Power/Energy Sources, Board on Army Science and Technology, Division on Engineering and Physical Sciences (2004, 136 pp.; ISBN 0-309-09262-0; available from the National Academies Press, tel. 1-800-624-6242; \$26.25 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu](http://www.nap.edu)>).

**Patrick Flynn**, retired vice president for research at Cummins Engine Company Inc., Columbus, Ind., chaired the committee. The study was funded by the U.S. Department of Defense.

# The Engineer of Tomorrow

## ADAPTING TO A CHANGING WORLD

**T**echnologies developed by engineers have helped lengthen the human life span, enabled people to communicate nearly instantaneously from anywhere on Earth, and created tremendous wealth and economic growth. But other engineering applications, such as transgenic food or technologies that affect personal privacy, raise complex social and ethical challenges.

The next several decades will be full of opportunities as well as challenges for engineers, and they must be prepared for both if the United States is to retain its vibrancy and strength in engineering, says a recent report from the National Academy of Engineering.

The engineering profession needs to adopt a new vision for its future to ensure that engineers are broadly educated, become leaders in the public and private sectors, and represent all segments of society, the report says. These individuals will have to be adaptable, engage emerging problems, and also be capable of informing public policy.

To consider which skills future engineers will likely need, the committee that wrote the report envisioned several scenarios that could conceivably affect the world in 2020 in dramatic ways — such as new breakthroughs in biotechnology, natural disasters triggered by climate change, and global conflicts driven by an imbalance in resources among nations. By that time, engineers must be prepared to accommodate new social, economic, legal, and political constraints when planning projects, the committee concluded.



With the appropriate education and training, the engineer of the future will be called upon to become a leader not only in business but also in nonprofit and government sectors, the report says. People who choose this career path must recognize the importance of public service and help set the nation's policy agenda.

Also, engineers should raise awareness of how an education in engineering provides a solid foundation for careers in other fields, such as law, medicine, and business.

“For too long, engineering has been controlled by external events, changing only after circumstances dictated it,” said Wayne Clough, committee chair and president of the Georgia Institute of Technology in Atlanta. “Our project recognized that the pace of change today puts us at risk if we passively wait for what is to come. We need to prepare for the future now so that engineers who graduate in 2020 will not only be capable of implementing the most advanced technology, but also be ready to serve as leaders in our society.” — *Patrice Pages*

■ ***The Engineer of 2020: Visions of Engineering in the New Century.*** Committee on the Engineer of 2020, National Academy of Engineering (2004, 118 pp.; ISBN 0-309-09162-4; available from the National Academies Press, tel. 1-800-624-6242; \$32.00 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10999.html](http://books.nap.edu/catalog/10999.html)>).

**G. Wayne Clough**, president of the Georgia Institute of Technology, Atlanta, chaired the committee. The study was funded by the National Science Foundation, NEC Foundation of America, SBC Foundation, Honeywell International, and the National Academy of Engineering Fund.



It sounds like the plot of a science fiction movie. A dark, slimy mold infests a home and releases toxic substances that infiltrate the tissues and nervous systems of unsuspecting occupants, causing them to develop severe illnesses. Yet this is what some homeowners say actually happened to them when mold flourished in damp spaces in their houses.

## Attack of the **Indoor Mold** A SCIENTIFIC LOOK AT MOLD IN DAMP BUILDINGS

In an effort to determine the scientific facts about building dampness and mold, a committee of the Institute of Medicine carefully pored over all the studies that have been conducted to date on the health effects of exposure to visible mold in buildings or, more broadly, to the many factors that are associated with building moisture problems. The committee's findings, detailed in a recent report, cast damp, moldy buildings as bad guys,

though not necessarily villains of the same ilk as horror-movie monsters.

The committee found enough telling evidence to conclude that the presence of visible mold on damp building materials is associated with the flare up of asthma symptoms in some asthmatics, as well as coughing, wheezing, and upper respiratory tract symptoms in otherwise healthy people. The amalgamation of all the factors related to dampness — mold, bacteria, dust

mites, chemical emissions from wet materials, etc. — may be associated with the onset of asthma and shortness of breath, but the evidence is less certain in these circumstances.

Likewise, the presence of either visible mold or damp conditions in general may be linked to lower respiratory tract illnesses in children, but the evidence is not as strong in this case.

The committee found very few studies that have examined whether mold or other aspects of indoor dampness are linked to fatigue, neuropsychiatric symptoms, or other health problems that some people have attributed to fungal infestations of buildings. The little evidence that is available does not support an association, but because of the dearth of well-conducted studies and reliable data, the committee could not rule out the possibility.

Still, the connections between wet or moldy conditions and respiratory problems, plus the widespread prevalence of moisture problems in buildings, make indoor dampness a public health concern that warrants action. “Indoor dampness is not your friend,” said committee chair Noreen Clark, dean, School of Public Health, University of Michigan, Ann Arbor.

The committee urged changes in how buildings are designed, constructed, and maintained. Architects, engineers, building contractors, facility managers, and maintenance staff do not always apply existing technical information on how to control dampness, the report notes. Training curricula and national guidelines on how to prevent moisture problems should be



produced and widely disseminated. Guidelines for these professionals should be developed at the national level to ensure consistency.

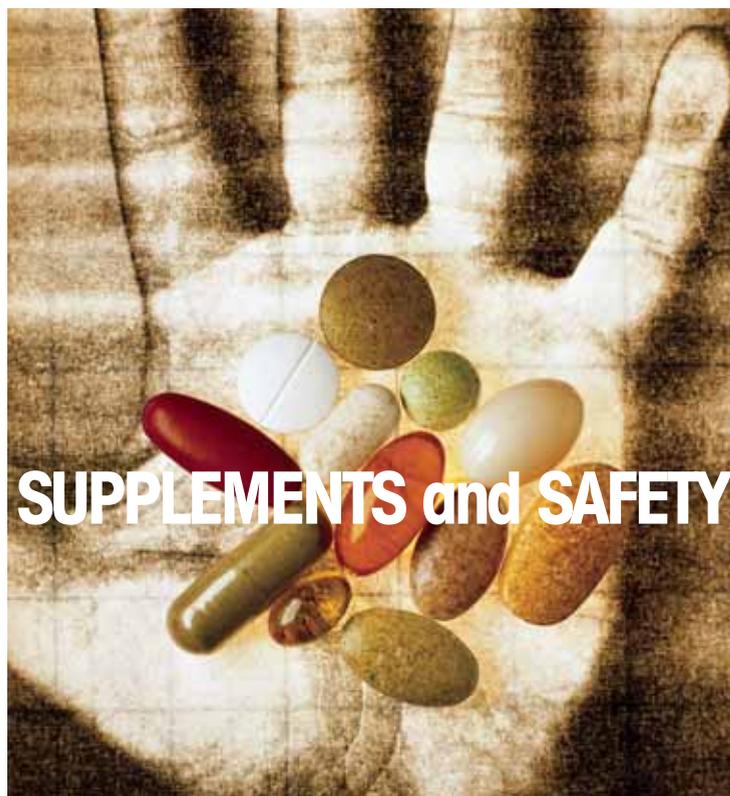
While there is universal agreement that

promptly fixing leaks and cleaning up spills or standing water reduces the potential for mold growth, there is little evidence that shows which forms of moisture control or prevention work best at mitigating health problems associated with dampness. The report calls for more research into cleanup methods.

In the meantime, homeowners should quickly fix the source of any dampness problems that they discover and clean up the wetness as thoroughly as they can. If mold is discovered, it should be removed using equipment and methods that limit building occupants’ and the remediation crew’s exposure to the mold as well as other chemical or biological agents that may be present. Even though it remains to be seen whether moldy, damp environments are associated with stomach problems, memory lapses, arthritis, or other disorders, the links to respiratory problems clearly show a need for appropriate caution. — *Christine Stencel*

■ **Damp Indoor Spaces and Health.** Committee on Damp Indoor Spaces and Health, Board on Health Promotion and Disease Prevention, Institute of Medicine (2004, approx. 380 pp.; ISBN 0-309-09193-4; available from the National Academies Press, tel. 1-800-624-6242; \$42.95 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/11011.html](http://books.nap.edu/catalog/11011.html)>).

The committee was chaired by **Noreen Clark**, dean and Marshall H. Becker Professor of Public Health, School of Public Health; and professor of pediatrics, University of Michigan, Ann Arbor. The study was funded by Centers for Disease Control and Prevention.



## A New Process to Enhance the Safety of Dietary Supplements

**G**inkgo biloba to enhance memory. Zinc to boost the immune system. Vitamins to make up for not eating our vegetables. Over the past decade, the dietary supplement industry has ballooned to huge proportions in the United States, with over 29,000 products on the market ringing up more than \$16 billion in annual sales. About 1,000 new products are introduced each year.

Consumers generally assume that all dietary supplements are safe, surveys show. But are they? The U.S. Food and Drug Administration's removal of the herbal supplement ephedra — which was linked to several deaths — from the

marketplace last December highlighted concerns about the current law that governs how supplements are regulated. Does it give the agency sufficient means to deal with problem products?

Although consumers frequently use dietary supplements to enhance their health, these products by law cannot be considered therapeutic. Unlike prescription drugs, which must be proved safe before being allowed on the market, dietary supplements are assumed to be safe for human consumption from the start. Regulated the same way foods are, supplements can be removed from the market only if FDA can determine that they are unsafe.

FDA faces a number of hurdles when it comes to determining the safety of these products, not the least of which is the lack of data on effects in humans. This is usually the case, because manufacturers are not required to conduct clinical studies that establish safety of supplement ingredients and provide the results to FDA. However, it is possible to use other types of data to determine when regulatory action is needed, says a recent report from the Institute of Medicine.

The report provides FDA with a science-based process to gather and weigh the different kinds of available evidence that can shed light on an ingredient's potential to cause harm to consumers. Data from studies on animals, information about the adverse health effects of similar or related substances, and evidence of toxic effects on cell cultures all can be used to assess an ingredient's safety for people.

One of the chief concerns raised by the ephedra case is whether the agency has the authority to take action on a supplement before serious illnesses or deaths occur. The law says that the agency must show that a supplement ingredient poses "an unreasonable or significant risk." The report underscores the agency's ability to act even without direct evidence of injury to consumers. The other sources of data described in the report can be used to determine if an ingredient could cause harm.

While the proposed new process is designed to help FDA carry out safety evaluations even when data are limited, it would be easier for the agency to do its job if it had greater access to data. The report calls on Congress to require supplement manufacturers and distributors to disclose

in a timely fashion to FDA any adverse events related to consumption of their products. Currently, supplement makers are not required to collect or report health problems they discover once their products are on the market, which significantly hampers the agency's ability to actively monitor supplement safety. It has been estimated that FDA receives information on less than half of 1 percent of all adverse events associated with supplements. To further boost reporting, supplement labels should include a toll-free number for consumers and health professionals to call if health problems or concerns related to the product occur, as well include the names and locations of both the distributor and the manufacturer so that any problems can be traced more easily to their source.

Using the framework offered in the report, FDA can meet its responsibility to protect the health of the public within the parameters of the current law on supplement regulation. But changes in the law would allow the agency to do the job more readily, while not subjecting dietary supplement manufacturers to lengthier, more burdensome requirements. — *Christine Stencel*

■ **Dietary Supplements: A Framework for Evaluating Safety.** Committee on the Framework for Evaluating the Safety of Dietary Supplements; Food and Nutrition Board, Institute of Medicine, and Board on Life Sciences, Division on Earth and Life Studies (2004, 370 pp.; ISBN 0-309-09110-1; available from the National Academies Press, tel. 1-800-624-6242; \$59.95 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10882.html](http://books.nap.edu/catalog/10882.html)>).

The committee was chaired by **Barbara O. Schneeman**, professor of nutrition, food science, and internal medicine, University of California, Davis. The study was funded by the U.S. Food and Drug Administration.



## Studying the National Zoo Under the Media’s Microscope

In Washington, it is usually politicians, not veterinarians, who are the subject of congressional inquiries and stories by investigative journalists. But after a series of untimely animal deaths at the National Zoo, Congress and the local media began questioning whether zoo operations were endangering the animal collection.

The first deaths to draw outside scrutiny were a pair of red pandas that died after consuming rat poison that had been buried in their enclosure — a violation of the zoo’s own protocol. Soon it was reported that other large animals had perished under unusual circumstances, including a zebra that died from hypothermia brought on by malnutrition. This prompted the Committee on House Administration,

which oversees the Smithsonian Institution — of which the zoo is part — to hold hearings. Declaring that “the growing cloud over this important institution [the zoo] must be lifted,” the committee’s chairman, Rep. Bob Ney (R-Ohio), asked the National Research Council to investigate.

Meanwhile, given that the zoo attracts more than 3 million visitors annually, it was no surprise that the controversial animal deaths continued to captivate the public and media. Story after story appeared on front pages and on television, filled with the type of intrigue usually accompanying a political scandal — missing and altered records, accusations of a cover-up, who knew what and when, and calls for resignation. In addition, the American Zoo and

Aquarium Association (AZA) delayed renewing the zoo's accreditation. Word that a fox from the surrounding Rock Creek Park had burrowed its way under a cage and killed a bald eagle also helped to keep the zoo's problems in the news. When the Research Council committee charged with studying zoo operations met for the first time, a dozen television cameras were in the room, including two from C-SPAN, which broadcast the daylong proceedings live.

A February news conference attracted just as many cameras when the committee released the findings of an interim report that described several shortcomings in animal care and management at the zoo. Preventive care, such as regular vaccinations, annual exams, and tests for infectious disease, was lacking, according to the committee. Oversight of animal nutrition also was inadequate. Not only had miscommunication among keepers, nutritionists, and veterinarians contributed to the death of the zebra, diets fed to many primate species were inconsistent with established guidelines. Record keeping, pest control, and procedures for ensuring the welfare of animals used in research all required immediate attention as well, the committee said. Incomplete records, in fact, along with differing accounts from zoo personnel, prevented the committee from drawing more conclusions about whether certain animals' deaths were linked to inadequate care or management.



"Some of the problems we found are unique to the National Zoo, but many are common to other zoos as well," committee chair R. Michael Roberts from the University of Missouri told the packed news conference. The media attention only grew, however, particularly after the zoo's director announced her resignation less than two hours after the committee released its report. Roberts said his committee was not asked to comment on the director's position, but that he hoped the final report would help the zoo "look forward" during this period of transition.

The interim report did note some positive steps already being made at the zoo. A strategic plan was being developed, for example, and a new pest-management committee had been established. And less than a month after the committee's interim report was issued, the AZA, citing improvements in areas such as facility maintenance and the hiring of new curators and veterinarians, granted the zoo a full five-year accreditation. — *Bill Kearney*

■ **Animal Care and Management at the National Zoo: Interim Report.** Committee on a Review of the Smithsonian Institution's National Zoological Park, Board on Agriculture and Natural Resources and Institute for Laboratory Animal Research, Division on Earth and Life Studies (2004, 128 pp.; ISBN 0-309-09178-0; available from the National Academies Press, tel. 1-800-624-6242; \$29.25 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10932.html](http://books.nap.edu/catalog/10932.html)>).

The committee was chaired by **R. Michael Roberts**, Curator's Professor of Animal Sciences, Biochemistry, and Veterinary Pathology, University of Missouri, Columbia. The study was funded by the Smithsonian Institution.

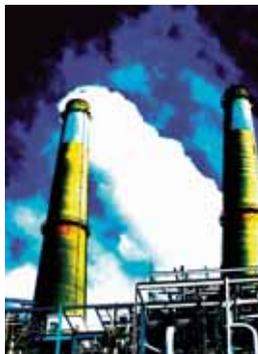
# A Foundation of Evidence

## HOW SCIENCE IS SUPPORTING AIR POLLUTION REGULATION

**W**hen the U.S. Environmental Protection Agency proposed tougher regulations seven years ago for tiny soot and smog particles known as airborne particulate matter, it knew solid research would be needed to back up the new rules. Not only did the Clean Air Act require EPA to review the current knowledge on air pollution every five years, the agency was also sure to face — as is often the case with new regulations — opposition from groups crying foul. Already, EPA had estimated from epidemiological studies that more than 15,000 premature deaths a year would be prevented by targeting smaller-sized particles. Still, much uncertainty remained about the relationship between particles and human health.

Agreeing that more research was needed, Congress directed the agency to seek guidance from the National Research Council on the matter, which convened a committee to issue a series of reports that EPA has relied upon to help set its particulate matter research priorities.

Recently issuing the fourth and final report of the series, the committee said that research confirms asthmatics and others with pre-existing respiratory ailments are more susceptible to complications caused by exposure to particulate matter — in fact, studies have shown more particles deposit in their lungs than in those of healthy individuals. And new findings suggest that other groups may be at increased risk as well, including diabetics, seniors, and people with heart conditions.



“It’s time to shift the focus from studying whether particulate matter causes adverse health effects to studying how the particles trigger injury, how people are exposed, and how much particulate matter is inhaled before adverse effects occur,” said committee chair Jonathan Samet from the Bloomberg School of Public

Health at Johns Hopkins University in Baltimore. Doing so will require EPA and others to develop better ways of tracking and characterizing the particles being emitted by different sources — electric power plants, cars and trucks, industrial manufacturing, forest fires, and soil erosion are all culprits. Computer models that link pollution sources to atmospheric particulate matter levels in specific regions are needed too. EPA also should sponsor research aimed at understanding which chemical components of particulate matter are most hazardous, especially when mixed with other airborne pollutants.

“A lot has been learned in recent years,” said Samet. “We can build upon that to reduce uncertainties further, keep decision-makers informed, and complete the foundation of evidence needed to protect public health.” — *Bill Kearney*

■ **Research Priorities for Airborne Particulate Matter: IV. Continuing Research Progress.** Committee on Research Priorities for Airborne Particulate Matter, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2004, approx. 256 pp.; ISBN 0-309-09199-3; available from the National Academies Press, tel. 1-800-624-6242; \$42.00 plus \$4.50 shipping for single copies; also on the Internet at <[books.nap.edu/catalog/10957.html](http://books.nap.edu/catalog/10957.html)>).

The committee was chaired by **Jonathan Samet**, professor and chair, department of epidemiology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore. The study was funded by the U.S. Environmental Protection Agency.



## Science Museum Opens With a Celebration

The new Marian Koshland Science Museum opened to a crowd, acrobats, and big-band music in April. The centerpiece of the celebration was a 30-foot-long backdrop and stage, a humorous Rube Goldberg-inspired device with 10 consecutive actions from a symbolic warming of the Earth to flooding the Statue of Liberty, culminating with a grand finale of rocket-fireworks that signaled the official opening of the museum.

“It was wonderful to witness how eager people were to see the museum — there were admission lines throughout the day,” said

Patrice Legro, the museum’s director. “Our first visitors’ reactions to the exhibits were very positive and encouraging.”

The museum’s mission is to increase public understanding of the nature and value of science, and to make National Academies reports more accessible to the public. Through interactive displays, the exhibits bring to life scientific advancements that impact daily life.

The first gallery explores the *Wonders of Science* with a short video that looks at the frontiers of scientific research, reviewing topics such as dark matter and dark energy.

The *Global Warming Facts & Our Future* gallery reveals the science behind global warming and examines the possible implications of this phenomenon for the quality of life around the world. By sliding

large plasma screens along timelines, visitors can see how temperatures around the world shifted during the 20th century. Another screen shows temperature projections for the next century. The exhibit also features various interactive displays that encourage visitors to consider what role they play in the planet’s warming.



The *Putting DNA to Work* exhibit details various applications of DNA sequencing and their benefits. Here one can “catch” a criminal and discover the genetic origin of the SARS virus, as well as learn about other uses for genetic sequencing.

After making their debut at the Marian Koshland Science Museum, these and future exhibits will travel to other science museums across the country. Topics for the museum’s next exhibits are already under consideration.

Each weekend, visitors can join local student interns from Banneker High School for free hands-on science experiments on DNA and nanotechnology. For more information, visit <[www.koshland-science-museum.org](http://www.koshland-science-museum.org)>.

— Maureen O’Leary

BY MARY SUE COLEMAN AND  
ARTHUR KELLERMANN

## ***Uninsurance***

### *Is Bad for Your Health*

**M**edicine today has the ability to prevent many diseases, alleviate symptoms, and extend life, especially when conditions are detected early. People without health insurance often miss these benefits because they cannot afford regular visits to a doctor. This situation is clearly bad for the more than 43 million uninsured people in this country, but what may not be so readily apparent are all of the associated effects of being uninsured.

Between September 2000 and February 2004, a 16-member committee of the Institute of Medicine attempted to uncover these problems and issued six reports on the health, social, and economic consequences of the lack of health care coverage for individuals, their families, entire communities, and the nation as a whole. In commissioning the series of reports, our sponsor, the Robert Wood Johnson Foundation, emphasized the importance of not only consolidating what is known about uninsurance and its consequences, but also communicating this knowledge in an unbiased, nonpartisan way to mobilize debate. Generous funding of the project furthered our communications objective by allowing IOM to print thousands of copies of each report and its executive summary, and shorter products in both English and Spanish for dissemination to audiences across the country, from congressional and state legislative staff to health care advocates at the grass-roots level and hospital and clinic administrators.

Each of the reports built on the one before it. Our first — *Coverage Matters: Insurance and Health Care* — was an overview of the issues, followed by two reports that addressed the health consequences of uninsured status and its psychosocial and economic impacts on families — *Care Without Coverage: Too Little, Too Late* and *Health Insurance Is a Family Matter*. The next two reports — *A Shared Destiny: Community Effects of Uninsurance* and *Hidden Costs, Value Lost: Uninsurance in America* — looked at uninsurance as a type of population risk factor affecting the health care system at the community level and the national economy. Our final report — *Insuring America's*

*Health: Principles and Recommendations* — called on the president and Congress to implement universal health insurance coverage by the year 2010 and recommended five principles to guide reform efforts.

The culmination of our years of work took place on Jan. 14, 2004, when we released our final findings to a standing-room-only crowd at the National Press Club. This release was intended to galvanize public discussion at the beginning of a presidential election year by bringing new and trustworthy information to bear on the issue of health insurance reform. Our guests of honor, retired Senator Bob Dole and retired Representative Paul Rogers, spoke enthusiastically about the need for bipartisan cooperation to identify practical solutions. A video news release disseminated information about the report series to an estimated 6.6 million viewers across the country. Dozens of editorials and op-eds in the national and regional press further highlighted the importance of addressing uninsurance without delay.

In the weeks and months since the release of *Insuring America's Health*, print, radio, and television journalists have reported on many of the committee's conclusions and

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**"As an emergency physician, I routinely deal with the human costs of uninsurance. Nonetheless, I was surprised by both the magnitude and pervasiveness of the ill effects we observed. Lack of health insurance not only harms the uninsured and their families — it is threatening the integrity of the health care system on which everyone depends."**



— Arthur Kellermann, M.D., M.P.H.  
Co-Chair, Committee on the  
Consequences of Uninsurance

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**"I have become convinced that the persistence of a large proportion of our population under 65 without health insurance is undermining the very fabric of health care in this country. As medical interventions become ever more effective in determining health status and quality of life, the consequences of uninsurance will only pose greater risk to our nation."**



— Mary Sue Coleman, Ph.D.  
Co-Chair, Committee on the  
Consequences of Uninsurance

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recommendations. This has brought our work into the mainstream and increased public awareness about the difficulties that the uninsured face obtaining health care and the threat that uninsurance poses to individuals. For example, an estimated 18,000 working-age adults who are uninsured die prematurely each year because they lack access to effective health services. The word has also spread about the impact that uninsurance has on health care institutions and providers at the community level, and the costs to society of poor health for tens of millions adults without coverage — an estimated \$65 billion to \$130 billion a year.

After analyzing the extensive evidence about the adverse health, economic, and societal effects of uninsurance, it is clear that our nation can no longer afford to ignore the problem. We must insure everyone, and achieve this goal by 2010. Nothing less will do.

## Cicerone Nominated for NAS President

The Council of the National Academy of Sciences has unanimously approved the nomination of Ralph J. Cicerone, chancellor of the University of California, Irvine, for election as the next president of the Academy.

“I am very pleased that Ralph Cicerone has accepted our Council’s nomination,” said Bruce Alberts, whose second six-year term as NAS president ends June 30, 2005.



“I have known and worked with Ralph for many years. He has been an energetic and thoughtful leader for many of our academy’s efforts, as well as for the larger science community.”

An atmospheric chemist, Cicerone was elected to the Academy in 1990 and has served on more than 40 committees at the National Academies. In 2001, he chaired the landmark Research Council study *Climate Change Science: An Analysis of Some Key Questions*, conducted at the request of the White House.

A nominating committee of 28 NAS members, chaired by Peter H. Raven, director of the Missouri Botanical Garden, selected Cicerone after a six-month search. Under the institution’s bylaws, the committee puts forward a single candidate for the approval of the NAS governing council. Although the bylaws permit additional nominations from the membership, this mechanism has never been used. In the absence of another nomination, Cicerone’s name will be presented to the full membership on Dec. 15 for formal ratification. — *William Skane*

## Free Information for Developing Nations

Current, reliable scientific information could help make headway against hunger, disease, and other problems besetting developing countries. Recognizing the need for wider access to this knowledge, the National Academies now offer the wealth of information found in their reports to more than 140 developing nations, free of charge.

“Elevating global science and technology capacity is critical,” said Bruce Alberts, noting the growing gap between rich and poor countries. “As industrialized nations with financial resources and a trained scientific work force exploit new knowledge and technologies more intensively, developing countries that lag in science and technology capacity fall further and further behind.”

Internet users in most developing countries can obtain Academies reports in portable document format (PDF) at [www.nap.edu](http://www.nap.edu). In January through May 2004, National Academies Press gave away nearly 40,000 books and 20,000 individual chapters to people in eligible nations. And soon the NAP site will feature “subject portals” to information on drought, water sciences, and other topics relevant to the needs of developing countries.

Articles from the *Proceedings of the National Academy of Sciences* (PNAS), one of the world’s most-cited scientific journals, are available as well. PNAS has offered its content free to scientists and others in more than 140 nations since January 2002. Both NAP and PNAS have designed their systems so that these users can download materials immediately and seamlessly.

Ensuring equitable access to scientific information is one of the priorities outlined by the InterAcademy Panel on International Issues, a worldwide network of 90 science academies of which the U.S. National Academy of Sciences is a part. Goverdhan Mehta, former president of the Indian National Science Academy and co-chair of the InterAcademy Council, considers the National Academies' outreach efforts to be invaluable. "Developing nations in particular cannot afford to be without access to credible, independent scientific and technological information," he said.

— *Sara Frueh & Vaneé Vines*

## Building the Power of Science in Africa

The African continent faces many serious health challenges that are expected to become even more intractable over the next decade. Health problems such as malnutrition and HIV/AIDS aggravate one another, creating a vicious cycle of illness, say international relief organizations. For example, AIDS reduces peoples' ability to work and feed their families, and in turn bodies weakened by hunger become more vulnerable to disease.

Science could help African governments find ways to reverse these trends and save lives, but few nations have effective systems to harness the knowledge of their scientific communities. A new National Academies initiative, funded by a \$20 million grant from the Bill & Melinda Gates Foundation, aims to change that. The 10-year effort will help African academies of science boost their ability to provide credible, useful advice to their governments — with the ultimate goal of improving human health. "Every country

needs an organized way to call upon its own scientific and medical communities for guidance," said Bruce Alberts.

Over the course of the decade, the National Academies will work closely with three African science academies, training staff members to conduct advisory activities



and helping the organizations build effective relationships with their governments. A series of regional symposia will engage all of the continent's science academies in discussions about the best ways to provide advice to policy-makers.

While the National Academies will draw on their own experience to mentor the African academies, the objective is to help each nation develop an advisory framework suited to its particular needs and conditions. Also a priority will be ensuring each new advisory system's staying power; the U.S. and African academies will collaborate to find ways to financially sustain these activities — and build awareness of the benefits of evidence-based guidance — long after the project ends.

"We hope that this important initiative will help achieve the goal of better health for all by engaging the African scientific community in critical African policy decisions," said Richard Klausner, executive director of the Gates Foundation's Global Health program. — *Sara Frueh*

## Projects

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

### **Assessment of Options for Extending the Life of the Hubble Space Telescope.**

Space Studies Board and Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences. Project director: Sandra Graham. Chair: Louis J. Lanzerotti, Distinguished Research Professor, Center for Solar-Terrestrial Research, New Jersey Institute of Technology, Newark; and consultant, Bell Labs, Lucent Technologies, Murray Hill, N.J. Sponsor: NASA.

### **Genomics and Public Health in the 21st Century.**

Board on Health Promotion and Disease Prevention, Institute of Medicine. Project director: Lyla Hernandez. Chair: Larry O. Gostin, John Carrol Research Professor of Law, Georgetown University, Washington, D.C.; professor of law and public health, Johns Hopkins University, Baltimore; and director, Center for Law and the Public’s Health at Georgetown and Johns Hopkins universities. Sponsor: Centers for Disease Control and Prevention.

### **News and Terrorism: Communicating in a Crisis.**

National Academy of Engineering, with the cooperation of other divisions of the National Academies. Project director: Randy Atkins. Chair: Lewis Branscomb, professor emeritus, public policy and corporate management, John F. Kennedy School of Government, Harvard

University, Cambridge, Mass. Sponsors: U.S. Department of Homeland Security and the Gannett Foundation.

### **Review and Assessment of the National Institutes of Health’s Strategic Research Plan to Eliminate Health Disparities.**

Board on Health Sciences Policy, Institute of Medicine. Project director: Brian Smedley. Chair: To be selected. Sponsor: National Institutes of Health’s National Center on Minority Health and Health Disparities.

### **Science and Technology in the National Interest: Ensuring the Best Presidential and Federal Advisory Committee Appointments — 3rd Edition.**

Committee on Science, Engineering, and Public Policy, Division on Policy and Global Affairs. Project director: Debbie Stine. Chair: John Edward Porter, partner, Hogan & Hartson LLP, Washington, D.C. Sponsors: William and Flora Hewlett Foundation, Andrew W. Mellon Foundation, and the National Academies.

### **Standards of Evidence and the Quality of Behavioral and Social Science Research.**

Division of Behavioral and Social Sciences and Education. Project director: Mary Ellen O’Connell. Chair: To be selected. Sponsors: William and Flora Hewlett Foundation, Spencer Foundation, and National Science Foundation.

### **State Practices in Setting Mobile Source Emissions Standards.**

Board on Environmental Studies and Toxicology, Division on Earth and Life Studies. Project director: K. John Holmes. Chair: David T. Allen, Melvin H. Gertz Regents Chair in Chemical Engineering, and director, Center for Energy and Environmental Resources, University of Texas, Austin. Sponsor: U.S. Environmental Protection Agency.

## Publications

*For documents shown as available from the National Academies Press (NAP), write to 500 Fifth St., N.W., Lockbox 285, Washington, D.C. 20055; tel. 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.*

### **Achieving XXcellence in Science: Role of Professional Societies in Advancing Women in Science — Proceedings of a Workshop, AXXS 2002**

Committee on Women in Science and Engineering, Division on Policy and Global Affairs (2004, 112 pp.; ISBN 0-309-09174-8; available from NAP, \$26.50 plus \$4.50 shipping).

### **Adaptive Management for Water Resources Project Planning**

Water Science and Technology Board and Ocean Studies Board, Division on Earth and Life Studies (2004, approx. 102 pp.; ISBN 0-309-09191-8; available from NAP, \$25.00 plus \$4.50 shipping).

### **Advanced Energetic Materials**

Board on Manufacturing and Engineering Design, Division on Engineering and Physical Sciences (2004, 64 pp.; ISBN 0-309-09160-8; available from NAP, \$18.00 plus \$4.50 shipping).

### **Air Quality Management in the United States**

Board on Environmental Studies and Toxicology and Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2004, 414 pp.; ISBN 0-309-08932-8; available from NAP, \$49.95 plus \$4.50 shipping).

**Analytical Methods and Approaches for Water Resources Project Planning**

Water Science and Technology Board and Ocean Studies Board, Division on Earth and Life Studies (2004, approx. 124 pp.; ISBN 0-309-09182-9; available from NAP, \$28.50 plus \$4.50 shipping).

**Assessment of the Army Plan for the Pine Bluff Non-Stockpile Facility**

Board on Army Science and Technology, Division on Engineering and Physical Sciences (2004, 98 pp.; ISBN 0-309-09138-1; available from NAP, \$18.00 plus \$4.50 shipping).

**Bridging the Bed-Bench Gap: Contributions of the Markey Trust Board on Higher Education and Workforce, Division on Policy and Global Affairs** (2004, 134 pp.; ISBN 0-309-09112-8; available from NAP, \$30.25 plus \$4.50 shipping).

**Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate**

Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine (2004, approx. 450 pp.; ISBN 0-309-09169-1; available from NAP, \$37.95 plus \$4.50 shipping).

**Effects of Degraded Agent and Munitions Anomalies on Chemical Stockpile Disposal Operations**

Board on Army Science and Technology, Division on Engineering and Physical Sciences (2004, 82 pp.; ISBN 0-309-08918-2; available from NAP, \$18.00 plus \$4.50 shipping).

**Eliminating Health Disparities: Measurement and Data Needs**

Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2004, approx. 320 pp.; ISBN 0-309-09231-0; available from NAP, \$44.00 plus \$4.50 shipping).

**Endangered and Threatened Species of the Platte River**

Board on Environmental Studies and Toxicology and Water Science and Technology Board, Division on Earth and Life Studies (2004, approx. 336 pp.; ISBN 0-309-09230-2; available from NAP, \$49.00 plus \$4.50 shipping).

**Evaluation of the National Aerospace Initiative**

Air Force Science and Technology Board, Division on Engineering and Physical Sciences (2004, 148 pp.; ISBN 0-309-09175-6; available from NAP, \$38.00 plus \$4.50 shipping).

**Existing and Potential Standoff Explosives Detection Techniques** Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2004, 148 pp.; ISBN 0-309-09130-6; available from NAP, \$32.75 plus \$4.50 shipping).

**Forensic Analysis: Weighing Bullet Lead Evidence**

Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2004, 228 pp.; ISBN 0-309-09079-2; available from NAP, \$47.00 plus \$4.50 shipping).

**Forging a Poison Prevention and Control System**

Board on Health Promotion and Disease Prevention, Institute of Medicine (2004, 316 pp.; ISBN 0-309-09194-2; available from NAP, \$44.95 plus \$4.50 shipping).

**Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2003 NAE Symposium on Frontiers of Engineering**

National Academy of Engineering (2004, 184 pp.; ISBN 0-309-09139-X; available from NAP, \$40.00 plus \$4.50 shipping).

**Fulfilling the Potential of Cancer Prevention and Early Detection: An American Cancer Society and Institute of Medicine Symposium**

National Cancer Policy Board,

Institute of Medicine and National Research Council (2004, 136 pp.; ISBN 0-309-09171-3; available from NAP, \$30.50 plus \$4.50 shipping).

**A Geospatial Framework for the Coastal Zone: National Needs for Coastal Mapping and Charting**

Mapping Science Committee, Board on Earth Sciences and Resources, and Ocean Studies Board, Division on Earth and Life Studies (2004, 168 pp.; ISBN 0-309-09176-4; available from NAP, \$30.00 plus \$4.50 shipping).

**Giving Full Measure to Countermeasures: Addressing Problems in the DoD Program to Develop Medical Countermeasures Against Biological Warfare Agents** Medical Follow-up Agency, Institute of Medicine, and Board on Life Sciences, Division on Earth and Life Studies (2004, 160 pp.; ISBN 0-309-09153-5; available from NAP, \$32.00 plus \$4.50 shipping).

**Health and Medicine: Challenges for the Chemical Sciences in the 21st Century**

Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2004, 76 pp.; ISBN 0-309-08720-1; available from NAP, \$18.00 plus \$4.50 shipping).

**Health and Safety Needs of Older Workers**

Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education; and Institute of Medicine (2004, 320 pp.; ISBN 0-309-09111-X; available from NAP, \$47.95 plus \$4.50 shipping).

**Health Literacy: A Prescription to End Confusion**

Board on Neuroscience and Behavioral Health, Institute of Medicine (2004, 368 pp.; ISBN 0-309-09117-9; available from NAP, \$47.95 plus \$4.50 shipping).

**The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs**

Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2004, approx. 394 pp.; ISBN 0-309-09163-2; available from NAP, \$55.00 plus \$4.50 shipping).

**Immunization Safety Review: Vaccines and Autism**

Board on Health Promotion and Disease Prevention, Institute of Medicine (2004, approx. 175 pp.; ISBN 0-309-09237-X; available from NAP, \$43.00 plus \$4.50 shipping).

**Implementing Climate and Global Change Research: A Review of the Final U.S. Climate Change Science Program Strategic Plan**

Division on Earth and Life Studies, Division of Behavioral and Social Sciences and Education, and Division on Engineering and Physical Sciences (2004, approx. 152 pp.; ISBN 0-309-08865-8; available from NAP, \$30.00 plus \$4.50 shipping).

**Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula**

Board on Neuroscience and Behavioral Health, Institute of Medicine (2004, 168 pp.; ISBN 0-309-09142-X; available from NAP, \$34.00 plus \$4.50 shipping).

**In the Nation's Compelling Interest: Ensuring Diversity in the Health Care Workforce**

Board on Health Sciences Policy, Institute of Medicine (2004, 432 pp.; ISBN 0-309-09125-X; available from NAP, \$49.95 plus \$4.50 shipping).

**Indicators for Waterborne Pathogens**  
Board on Life Sciences and Water Science and Technology Board, Division on Earth and Life Studies (2004, 332 pp.; ISBN 0-309-09122-5;

available from NAP, \$54.00 plus \$4.50 shipping).

**Infant Formula: Evaluating the Safety of New Ingredients**

Food and Nutrition Board, Institute of Medicine (2004, 224 pp.; ISBN 0-309-09150-0; available from NAP, \$36.00 plus \$4.50 shipping).

**Intentional Human Dosing Studies for EPA Regulatory Purposes: Scientific and Ethical Issues**

Science, Technology, and Law Program, Division on Policy and Global Affairs (2004, 226 pp.; ISBN 0-309-09172-1; available from NAP, \$46.00 plus \$4.50 shipping).

**Investments in Federal Facilities: Asset Management Strategies for the 21st Century**

Board on Infrastructure and the Constructed Environment, Division on Engineering and Physical Sciences (2004, 160 pp.; ISBN 0-309-08919-0; available from NAP, \$34.75 plus \$4.50 shipping).

**Learning From SARS: Preparing for the Next Disease Outbreak — Workshop Summary**

Forum on Microbial Threats, Board on Global Health, Institute of Medicine (2004, 376 pp.; ISBN 0-309-09154-3; available from NAP, \$42.00 plus \$4.50 shipping).

**Maintaining High Scientific Quality at Los Alamos and Lawrence**

**Livermore National Laboratories**  
Division on Engineering and Physical Sciences (2004, 58 pp.; ISBN 0-309-09244-2; available from NAP, \$12.00 plus \$4.50 shipping).

**Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival**

Water Science and Technology Board and Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2004, 256 pp.; ISBN 0-309-09155-1; available from NAP, \$35.00 plus \$4.50 shipping).

**Measuring Racial Discrimination**

Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2004, 336 pp.; ISBN 0-309-09126-8; available from NAP, \$44.95 plus \$4.50 shipping).

**Meeting Psychosocial Needs of Women With Breast Cancer**

National Cancer Policy Board, Institute of Medicine and National Research Council (2004, 288 pp.; ISBN 0-309-09129-2; available from NAP, \$45.00 plus \$4.50 shipping).

**Monitoring International Labor Standards: International Perspectives — Summary of Regional Forums**

Division of Behavioral and Social Sciences and Education and Division on Policy and Global Affairs (2004, 122 pp.; ISBN 0-309-09137-3; available from NAP, \$28.25 plus \$4.50 shipping).

**Monitoring International Labor Standards: Techniques and Sources of Information**

Division of Behavioral and Social Sciences and Education and Division on Policy and Global Affairs (2004, 306 pp.; ISBN 0-309-09134-9; available from NAP, \$43.00 plus \$4.50 shipping).

**Monitoring Metabolic Status: Predicting Decrements in Physiological and Cognitive Performance**

Standing Committee on Military Nutrition Research, Food and Nutrition Board, Institute of Medicine (2004, approx. 476 pp.; ISBN 0-309-09159-4; available from NAP, \$47.00 plus \$4.50 shipping).

**New Frontiers in Contraceptive Research: A Blueprint for Action**

Board on Health Sciences Policy, Institute of Medicine (2004, 248 pp.; ISBN 0-309-09107-1; available from NAP, \$39.00 plus \$4.50 shipping).

**NIH Extramural Center Programs: Criteria for Initiation and Evaluation**

Board on Health Sciences Policy, Institute of Medicine (2004, 230 pp.; ISBN 0-309-09152-7; available from NAP, \$43.00 plus \$4.50 shipping).

**On Evaluating Curricular Effectiveness: Judging the Quality of K-12 Mathematics Evaluations**  
Mathematical Sciences Education Board, Center for Education, Division of Behavioral and Social Sciences and Education (2004, approx. 281 pp.; ISBN 0-309-09242-6; available from NAP, \$49.00 plus \$4.50 shipping).

**Opportunities to Improve Airport Passenger Screening With Mass Spectrometry**

National Materials Advisory Board, Division on Engineering and Physical Sciences (2004, 56 pp.; ISBN 0-309-09240-X; available from NAP, \$18.00 plus \$4.50 shipping).

**A Patent System for the 21st Century**

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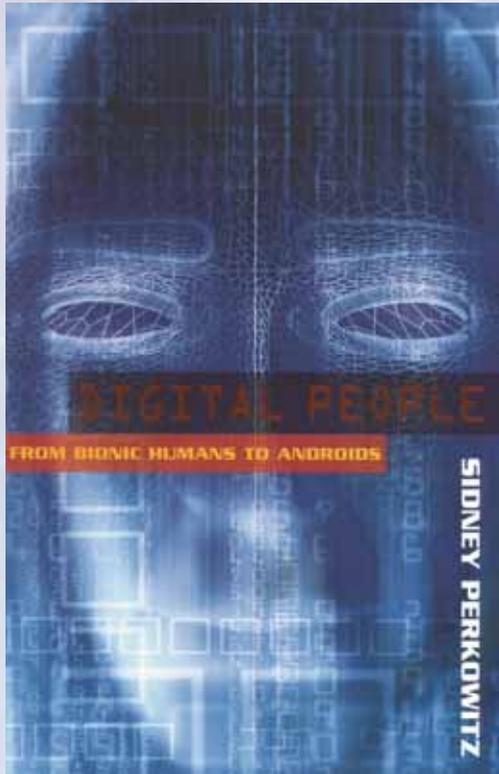
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