

THE NATIONAL ACADEMIES **IN FOCUS**

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Reconstructing Past Surface Temperatures
Science & Technology at USAID
Alternatives to Indian Point Energy
Hispanics in the United States

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THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

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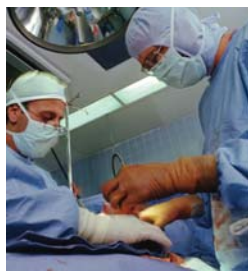
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Getting the Right Answers to the Right Audiences

Every facet of our lives today — where and how we live, our daily work and entertainment, how we move from one place to another, our health and well-being — is bound to science and technology. It is no wonder that the nation turns so frequently to the National Academies for scientific, evidence-based advice. This issue of *In Focus* features a typically varied sampling of topics from our recent reports, ranging from organ donation to energy production.



Our job is to advise — to inform public debate and responsible decision makers. Occasionally, this means providing perspective on broad social transitions, as in the report on Hispanics in America. Other reports make the case for the role of science and technology in particular policy domains, such as international development. More broadly, the recent report *Rising Above the Gathering Storm*, which garnered such wide attention, emphasized the vital role of science and technology in society as a whole and recommended investments in education and research that will promote jobs, progress, and a scientifically literate populace.

Many reports tackle policy questions and must assess a technical standard or review scientific evidence that bears on the question, as our reports on the safety of naturally occurring fluoride in drinking water, the reconstruction of historic surface temperatures, and the reusability of facemasks to reduce the spread of flu do. These focused studies may carry major policy implications in such critical areas as setting environmental and health standards, apprehending and dealing with climate change, and preparing for possible pandemics.

Fulfilling our mission as adviser to the nation requires two things: developing the advice and communicating the results. To communicate successfully, we must be attuned to the needs and interests of our audiences. This is no small requirement because the relevant audiences for different reports range widely across elected officials, agency directors, civic and business leaders, academic researchers, professionals and professional organizations, institutional leaders, parents and families, and the public at large. The reports on organ donation and on vehicle tires and fuel economy illustrate that a spectrum of lay, professional, business, and government actors may be relevant recipients of our advice. Over time, the National Academies will have its greatest impact if we can both get the right answers in the right way and reach the right audiences in the most effective way.

A handwritten signature in black ink that reads "Harvey V. Fineberg". The signature is fluid and cursive, with the first name "Harvey" and last name "Fineberg" clearly legible.

HARVEY V. FINEBERG
President, Institute of Medicine

THE GIFT OF LIFE



Motivating
More Americans
to Become
Organ Donors

Every year, thousands of terminally ill patients are given a new lease on life thanks to donated organs. Yet, the need for these vital organs far exceeds the current pace of donation. Just over 28,000 organs were donated in the United States last year; more than 90,000 people started 2006 waiting for a transplant.

The expanding gap between supply and demand has generated several proposals for increasing the number of organ donations. Some suggest that hospitals presume everyone is a willing donor unless they explicitly opt out or their next of kin do so on their behalf. Others say that the situation warrants experimenting with financial incentives, such as cash payments to donors or contributions to the charity of the donor's or family's choice. Or, people who carry donor cards could be moved to the top of waiting lists for organs if they ever need a transplant.

The best ways to boost organ donation in America are to strengthen efforts to educate the public about the benefits of donation, expand opportunities for people to record their decisions to become donors, and continue to enhance donation systems, said a committee convened by the Institute of Medicine to evaluate the various proposals. The committee also supported initiatives to increase donations from people whose deaths are the result of irreversible loss of heart function, adding to the pool of potential donors whose deaths are determined by permanent loss of essential brain functions.

However, given the amount of apathy, reluctance, and even apprehension about organ donation among a significant proportion of the American public, the United States is not yet ready to enact policies that presume consent to donate or mandate that people record a choice, the committee determined. Nor should financial incentives be used, even on a trial basis.

“Evidence shows that raising awareness about the benefits of donation and improving the way health care providers and administrators interact with potential donors and their families can increase willingness to donate,” said James F. Childress, chair of the committee. Without greater awareness and acceptance of organ donation among Americans, more radical reforms “could backfire,” he noted.

Individuals who have declared their willingness to be organ donors should not be given preferential status as recipients, the

report adds. Inequities in access to health care, information about organ donation, and opportunities to sign up as donors led the committee to conclude that this approach should not be adopted. Moreover, everyone has an equal stake: The fact that we are all potential organ recipients as well as potential donors can be a powerful motivator to donate, Childress added.

The report also addressed donation by living individuals, which reduces recipients’ waiting times and, in some cases, improves the chances for a successful transplant outcome. However, these operations place otherwise healthy people at risk, and government oversight of the living donation process is limited. To ensure that every-

one’s decision to donate is fully informed and voluntary, hospitals should provide an independent advocacy team to each person who volunteers to be a living donor, the report says. The committee recommended further scrutiny of the process and additional assessments of living donors’ risks.

— *Christine Stencel*

■ **Organ Donation: Opportunities for Action.**

Committee on Increasing Rates of Organ Donation, Board on Health Sciences Policy, Institute of Medicine (2006, approx. 390 pp.; ISBN 0-309-10114-X; available from the National Academies Press, tel. 1-800-624-6242; \$55.00 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11643.html>).

The committee was chaired by **James F. Childress**, professor of ethics and medical education, and director, Institute for Practical Ethics and Public Life, University of Virginia, Charlottesville. The study was funded by the U.S. Department of Health and Human Services and the Greenwall Foundation.





Facing the Next FLU PANDEMIC

Whether looking at photos taken during the influenza pandemic of 1918 or watching news footage about the 2003 SARS outbreak, one common feature stands out in all the images: medical masks. Wearing some kind of face covering seems to be a given during the outbreak of a respiratory disease.

Now that the specter of a new flu pandemic has nations across the globe scrambling to develop response plans, government agencies, corporations, and individuals are stockpiling basic, disposable medical masks and respirators. Concerned that supplies would be depleted if a pandemic does strike in the near future, the U.S. Department of Health and Human Services asked the Institute of Medicine to convene a panel of experts to determine if there is a way facemasks designed for one-time use could be reused.

The answer in the case of medical masks is no. And in the case of government-certified N95 respirators, it is a qualified yes. A person could extend the use of an N95 respirator by wearing it covered with a medical mask or a face shield to protect against external surface contamination and by handling and storing it very carefully. There are no data on how long these measures would be effective.

But whether disposable facemasks can be reused raises the question of whether these devices protect against flu viruses in the first place. The committee noted that scientists

have not definitively pinpointed to what extent the flu is transmitted through contact with contaminated surfaces, by inhaling the droplets expelled when infected people cough or sneeze, or via inhalation of viruses floating in the air. Fluid-resistant, loose-fitting medical masks could potentially protect against droplet-borne viruses, while snug-fitting N95 respirators may protect better against aerosolized viruses. No form of face covering has been tested specifically against flu viruses, the committee stressed.

Health care providers in other countries often use washable, woven cotton medical masks as a cost-saving measure. The committee neither recommended nor discouraged the use of these masks or of face coverings improvised from towels, sheets, or other cloth. However, the effectiveness of woven masks and improvised coverings against flu is not known.

The bottom line, committee co-chair John C. Bailar said, is that “the use of face coverings is only one of many strategies that will be needed to slow or halt a pandemic, and people should not engage in activities that would increase their risk of exposure to flu just because they have a mask or respirator.”

— *Christine Stencel*

Reusability of Facemasks During an Influenza Pandemic: Facing the Flu. Committee on the Development of Reusable Facemasks for Use During an Influenza Pandemic, Board on Health Sciences Policy, Institute of Medicine (2006, approx. 112 pp.; ISBN 0-309-10182-4; available from the National Academies Press, tel. 1-800-624-6242; \$26.50 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11637.html>).

The committee was co-chaired by **John C. Bailar III**, professor emeritus, University of Chicago, Chicago, and **Donald S. Burke**, professor of international health and epidemiology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore. The study was funded by the U.S. Department of Health and Human Services.



HISPANICS IN AMERICA

Population Gains Bring Opportunities and Challenges

Hispanics are the nation's largest ethnic group — and its fastest-growing.

They represent 14 percent of the U.S. population, and if current trends continue, that number will grow to nearly 25 percent within two decades. This rapid increase, anticipated across many parts of the United States, will be one of the most important demographic stories of the early 21st century. How that story will play out is uncertain.

As a group, Hispanics are far from monolithic. They vary in national origin, immigrant and legal status, skin color, social and economic background, language use, and political views. Hispanics face the many challenges often confronted by immigrants in a new homeland. But they also face some conditions that other waves of immigrants did not, such as a global marketplace that increasingly relies on well-educated employees. Additionally, U.S. Hispanics as a group are young. In 2000 their median age was 27, compared with 39 for non-Hispanic whites. By 2030, the children of today's Spanish-speaking immigrants will number about 26 million — and most will be part of the U.S. work force.

Education and training are the linchpins that will give the nation's Hispanic workers and their children important tools to contribute to and share in U.S.

prosperity, says a recent National Research Council report that examines the Hispanic experience in the United States. Targeted investments in these areas would benefit not only Hispanics, but also the country as a whole by enhancing U.S. productivity as baby boomers shift into retirement.

Many Hispanics are now on the bottom rungs of the U.S. economic ladder in low-paying service jobs. This is especially true for recent immigrants, most of whom arrive with little formal education. Inadequate English language skills and schooling frequently limit their access to better jobs and impede the upward mobility of their children. English proficiency is key for success in the job market, higher learning, and everyday activities such as navigating health care systems and participating in civic life, the report says.

Failure to complete high school remains a major problem for many Hispanics, leaving them ill-equipped to compete for high-paying jobs in an economy driven by technology and information, says the report, which covers economic, health, education, and other aspects of Hispanics' lives. Although many immigrant students are academically behind when they arrive in this country, both foreign-born Hispanics and Hispanics born in the United States are less likely to be high school graduates than non-Hispanics. Improving the educational attainment of



Hispanics would raise their standard of living. And from a purely economic standpoint, unless tomorrow's Hispanic workers have job skills equivalent to those of retirees, their earnings

will not be enough to replenish dwindling Social Security coffers.

"Although their experiences in some ways mirror those of previous immigrant groups, the size of the Hispanic population, its varied immigration experiences, the global economy, and an aging majority population have created unique challenges and opportunities for the nation," said Marta Tienda, chair of the panel that wrote the report and a professor of demographic studies, sociology, and public affairs at Princeton University in Princeton, N.J.

Much is known about these issues. What is needed, the report says, is the will to use this knowledge, integrating research findings into public policy. — *Vanee Vines*

■ **Multiple Origins, Uncertain Destinies: Hispanics and the American Future.** Panel on Hispanics in the United States, Committee on Population, Division of Behavioral and Social Sciences and Education (2006, 176 pp.; ISBN 0-309-09667-7, available from the National Academies Press, tel. 1-800-624-6242; \$34.95 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11314.html>).

The panel was chaired by **Marta Tienda**, Maurice P. Daring Professor in Demographic Studies and professor of sociology and public affairs, Princeton University, Princeton, N.J. The study was sponsored by the National Institute of Child Health and Human Development, National Cancer Institute, Office of Behavioral and Social Sciences Research, National Institute of Mental Health, and National Institute on Aging at the National Institutes of Health; the National Institute for Occupational Safety and Health; National Center for Health Statistics; U.S. Census Bureau; Andrew W. Mellon Foundation; Robert Wood Johnson Foundation; California HealthCare Foundation; and the California Endowment.

Moving SCIENCE AND TECHNOLOGY Forward at USAID



The last four decades have seen a 50 percent decrease in child mortality worldwide — a drop that can be credited in part to the efforts of the United States Agency for International Development (USAID). Research funded by the agency, for example, determined that 2 cents worth of vitamin A given to a child every six months could reduce the severity of diarrhea and malaria and ultimately cut child mortality by 34 percent. USAID also helped translate those findings into practice, working with more than 50 countries to promote the use of vitamin A supplementation and fortified foods.

The agency's success with vitamin A illustrates how scientific research can be harnessed to solve problems in developing nations, and how the United States can contribute to that effort. But such contributions to child survival and other issues may be harder to come by in the future if trends in science and technology at USAID continue. The agency's capabilities and reputation in these areas have declined in recent years, observes a new report from the National Research Council. The report looks at how USAID can put science and technology to better use in its programs, which range from bolstering health care to aiding economic growth to responding to natural disasters.

The biggest factor in the agency's science and technology downturn has been a loss of staff with technical expertise, the report says. To reverse this development, USAID needs to hire more technically trained personnel and give knowledgeable staffers incentives to stay. The agency should also

appoint a full-time science and technology adviser who can alert the administrator to new opportunities to use S&T in its programs. The goal is to create a culture of science and technology at the agency, integrating these fields deeply into its myriad development efforts.

Building strong scientific institutions abroad should be high on the agency's priority list, the report says. Developing this capacity will enable nations to both create their own new technologies and use existing knowledge more effectively. Currently, for instance, many Central American nations lack the ability to take advantage of satellite data that can predict the paths of hurricanes.

To build this expertise, USAID should sponsor more graduate-level training in various disciplines for students in developing countries. Supporting the founding of schools of public health should also be a priority, the report says, as should helping institutions acquire broadband Internet and other technologies that can help them obtain and use information. — *Sara Frueh*

■ ***The Fundamental Role of Science and Technology in International Development: An Imperative for the U.S. Agency for International Development.*** Committee on Science and Technology in Foreign Assistance; Development, Security, and Cooperation; Division on Policy and Global Affairs (2006, 162 pp.; ISBN 0-309-10145-X; available from the National Academies Press, tel. 1-800-624-6242; \$45.00 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11583.html>).

The committee was co-chaired by **Thomas R. Pickering**, senior vice president for international relations, Boeing Co., Arlington, Va.; and **Kenneth Shine**, executive vice chancellor for health affairs, University of Texas System, Austin. The study was funded by the U.S. Agency for International Development, Bill & Melinda Gates Foundation, Sloan Foundation, and the National Research Council.



Average global surface temperatures rose by about 1 degree Fahrenheit (0.6 degrees Celsius) over the last century, according to data from thermometers stationed around the world. How does this increase, especially the rapid warming in recent decades, compare with temperature swings over the last one or two thousand years?

It's relatively easy to make such comparisons as far back as the middle of the 19th century when meteorologists first started using instruments to collect geographically widespread temperature data. But what



How Confidently Can We Reconstruct the Past 2,000 Years?

climate scientists really want to know is how modern temperature fluctuations compare with natural variations that took place before the Industrial Revolution, when levels of heat-trapping greenhouse gases in the atmosphere were much lower. With limited or no instrumental temperature records, researchers rely on proxy evidence such as tree rings, boreholes, ice cores, corals, and ocean and lake sediments to reconstruct past temperatures. Even the length of glaciers documented in historic paintings is telling.

Like a lot of climate change research, however, using proxy evidence to reconstruct historical temperatures has not been without public controversy, much of it centered on climatologist Michael Mann. He and his colleagues published a thousand-year reconstruction in 1999 that concluded the Northern Hemisphere warming of the late 20th century was unprecedented and that the 1990s was the warmest decade, and 1998 the warmest year. When debate arose in Congress last year over Mann's research, it turned to the National Research Council to weigh in on the matter, and a committee was convened to assess the ability of scientists to reconstruct surface temperatures for the past 2,000 years.

In its report, the committee's first observation was that the warming recorded by instruments in the last century is also reflected in temperature reconstructions derived from borehole measurements, retreating glaciers, and other proxies. The report adds that there are sufficient proxy data from enough places to say with high confidence that the mean surface temperature globally was higher in the last few decades of the 20th century than during any other comparable period in the past 400 years.

The evidence is shakier for the period between A.D. 900 and 1600, however, a time frame for which there is less proxy data and the uncertainties associated with them are larger. Uncertainties are greater surrounding decades and single years especially, because not all proxies record temperatures for such short timescales. So while the committee found Mann's conclusion that the warming during the final decades of the 20th century is unprecedented in the past thousand years to be plausible, it

placed much less confidence in his claims about the 1990s and 1998 in particular.

For periods before 1600, there are fewer proxies in fewer locations to provide temperatures. Nevertheless, the committee noted that proxy data does indicate that many locations were warmer in the last 25 years than during any 25-year period since 900.

In addition, the report finds that surface temperature reconstructions for the last millennium are generally consistent. They show relatively warm conditions around A.D. 1000 and a "Little Ice Age" from roughly 1500 to 1850. The exact timing of the medieval warming is unclear and it may have varied from region to region. None of the reconstructions indicates higher temperatures during the Middle Ages than during the most recent decades, the report notes.

Very little confidence can be put in statements about average global surface temperatures earlier than A.D. 900, the committee added. Proxy evidence that is scarce prior to 1600 — especially in the Southern Hemisphere — gets even scarcer before 900.
— *Bill Kearney*

■ **Surface Temperature Reconstructions for the Last 2,000 Years.** Committee on Surface Temperature Reconstructions, Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2006, approx. 196 pp.; ISBN 0-309-10225-1; available from the National Academies Press, tel. 1-800-624-6242; \$40.00 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11676.html>).

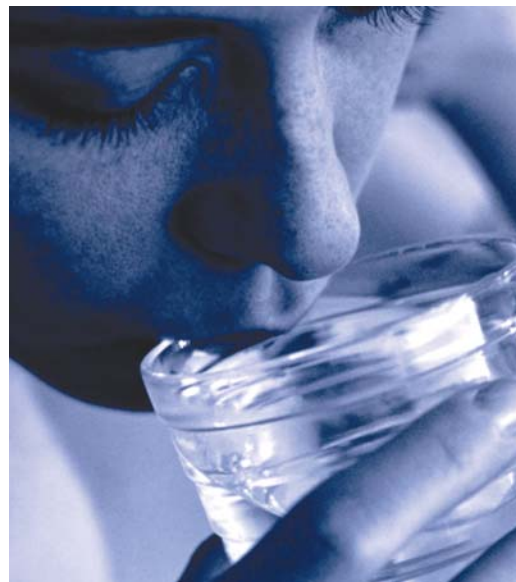
The committee was chaired by **Gerald R. North**, distinguished professor of meteorology and oceanography and Harold J. Haynes Endowed Chair in Geosciences, Texas A&M University, College Station. The study was funded by the National Academies.

TOO MUCH OF A GOOD THING

A National Research Council committee recently considered the issue of fluoride in drinking water. Not whether fluoride should be added to water for the dental health benefits it provides — an issue that has caused much controversy in many communities. Rather, the committee looked at what happens when there is too much naturally occurring fluoride in drinking water.

The committee concluded in a new report that children who are exposed to drinking water containing 4 milligrams of fluoride per liter of water — the maximum allowed by the U.S. Environmental Protection Agency — risk developing severe tooth enamel fluorosis, a condition characterized by ugly discoloration, enamel loss, and pitting of the teeth. In the past, this condition was considered aesthetically displeasing, but not an adverse health effect. But because enamel protects teeth and underlying tissue from decay and infection, a majority of the committee said that the damage caused by severe enamel fluorosis should be deemed a toxic effect. Although two of the 12 committee members maintained that the condition should still be considered a cosmetic problem, the entire committee agreed that EPA should lower its “maximum contaminant level goal” for fluoride in order to prevent it.

About 10 percent of children in communities with water fluoride concentrations at or near 4 mg/L develop severe enamel fluorosis. In areas with 2 mg/L, up to 15 percent of children have moderate enamel fluorosis, which causes discoloration but no enamel loss or pitting. The committee said that discoloration by itself does not constitute an



adverse health effect. Moderate enamel fluorosis is rare in populations exposed to water containing less than 2 mg/L of fluoride.

Children are not the only ones at risk of adverse health effects. Most of the committee concluded that a population with lifetime exposure to water with 4 mg/L or higher of fluoride is at increased risk for bone fractures. Three committee members said that more evidence was needed before drawing such a conclusion. The data on fluoride's potential to cause bone cancer is tentative and mixed, and more research is needed, the committee added.

The good news is that not many people have public drinking water supplies or wells with high levels of naturally occurring fluoride. About 200,000 Americans have water sources containing fluoride at 4 mg/L or higher, while another 1.4 million have water with 2 mg/L of fluoride. Artificially fluoridated water contains between 0.7 and 1.2 mg/L of total fluoride. — *Bill Kearney*

■ **Fluoride in Drinking Water: A Scientific Review of EPA's Standards.** Committee on Fluoride in Drinking Water, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, approx. 576 pp.; ISBN 0-309-10128-X; available from the National Academies Press, tel. 1-800-624-6242; \$56.00 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11571.html>).

The committee was chaired by **John Doull**, professor emeritus of pharmacology and toxicology, University of Kansas Medical Center, Kansas City. The study was funded by the U.S. Environmental Protection Agency.



Alternatives to **Indian Point Nuclear Plant**

After the Sept. 11 terrorist attacks, many New York state residents became concerned that the Indian Point nuclear power plant, located 40 miles north of New York City, might be vulnerable to attack as well, with some calling for the plant to be shut down. This, in turn, prompted Congress to ask the National Research Council if it would be possible to replace the energy lost by closing Indian Point — which provides one-quarter of the electricity in New York City and the lower Hudson Valley.

An expert committee concluded that Indian Point's energy supplies could be replaced with non-nuclear power plants, additional transmission lines, and new efforts by consumers to save energy, but the state would need to overcome many political, regulatory, and financial hurdles.

"There are no insurmountable technical barriers to replacing the energy lost by shutting down Indian Point, but we are less confident that government and financial mechanisms are in place to facilitate implementation of alternatives," said Lawrence T. Papay, a consultant in electric power and energy and member of the National Academy of Engineering who chaired the committee that wrote the report.

The operating licenses of the two nuclear reactors at Indian Point expire in 2013 and 2015. Closure would remove 2,000 megawatts from the region, which already is growing increasingly short of electric

capacity. Even if Indian Point remains in operation, the region will need an additional 3,000 megawatts by 2015 to meet increases in demand and replace scheduled retirements of other power plants. In addition, congestion on the transmission lines

prevents additional power from being imported during periods of peak demand.

Not all of Indian Point's 2,000 megawatts would need to be replaced, though, if consumers use electricity more efficiently, the report notes. The committee estimated this could be reduced by at least 850 megawatts if more consumers switch to energy-efficient appliances and shift some of their energy usage to off-peak hours, especially during hot summer days.

The most readily available way to replace the rest of the energy is plants fueled by natural gas — the current fuel of choice for future electric power plants in New York state. But the committee is concerned over possible shortages and high gas prices. New supply sources would have to be found, which will probably include imported natural gas.

Building a new coal plant along with a new transmission line would be the cheapest alternative to Indian Point, the report says, but this option is unlikely to be ready by 2015 unless planning starts very soon. Also, burning more coal would complicate the state's efforts to reduce greenhouse gas emissions. Coal plants release about twice as much carbon dioxide per kilowatt-hour as natural gas plants, and nuclear plants release



none. Renewable sources of energy — from wind, the sun, or biomass — also look promising to the committee, but they could be deployed only on a small scale by 2015.

A complex web of environmental regulations must be considered with any alternative to Indian

Point, the report says. In particular, the expiration in 2003 of New York's siting law — which provided an efficient process for reviewing environmental permits — will delay permit reviews in the future.

Indian Point is a relatively low-cost power generator, so any new energy source is likely to raise electricity costs, the committee pointed out. Also, security measures would be needed to protect radioactive spent fuel — whether the plant shuts down or not — requiring expenses for an unknown period of time.

The committee did not discuss whether Indian Point is vulnerable to a terrorist attack or if it should be closed, although high oil and natural gas prices and concerns about global warming have renewed interest in nuclear power. — *Patrice Pages*

■ **Alternatives to the Indian Point Energy Center for Meeting New York Electric Power Needs.** Committee on Alternatives to Indian Point for Meeting Energy Needs, Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2006, approx. 376 pp.; ISBN 0-309-10172-7; available from the National Academies Press, tel. 1-800-624-6242; \$71.50 plus \$4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11666.html>).

Lawrence T. Papay, consultant, La Jolla, Calif., chaired the committee. The study was funded by the U.S. Department of Energy.

WIN AT THE PUMP *WITH THE RIGHT TIRES*

A growing number of Americans are buying fuel-efficient cars such as hybrids to cope with skyrocketing gas prices. Another way to save money at the pump — even if you own a gas-guzzler — is a different set of tires. According to a new report from the National Research Council, greater use of fuel-efficient tires could save U.S. car drivers 1 billion to 2 billion gallons of gas per year.

Unfortunately, information on a tire's fuel-efficiency is not readily available to the consumer. During the past 10 years, the National Highway Traffic Safety Administration proposed the creation of a fuel economy rating for tires and similar proposals have been put forward in Congress without success.

"Consumers should be able to choose among tires not only for their price and performance but also for their fuel-efficiency," said Dale F. Stein, chair of the committee that wrote the report and retired president of Michigan Technological University. "Fuel-efficient tires are sold by tire dealers, but people can't identify them."

To make information on tire fuel-efficiency more widely available and understandable, NHTSA and tire manufacturers should work together in developing an information program for tire buyers and sellers, the report says.

A tire's fuel-efficiency can be improved by reducing its "rolling resistance," which is the force required to keep a tire moving forward on the highway. As a tire deforms due to reduced air pressure or increased load, the force needed to keep the tire moving

forward increases, thus requiring more fuel. To reduce tire deformation — and decrease rolling resistance — manufacturers can change the tire's shape, size, and construction materials, and the driver can keep the tires properly inflated.

Reducing the rolling resistance of tires sold to consumers by an average of 10 percent could decrease U.S. fuel consumption by 1 percent to 2 percent. The fuel savings would be equivalent to taking 2 million to 4 million vehicles off the road, and consumers could save 6 to 12 gallons per year.

However, motorists should not be lulled into thinking that simply buying tires with lower rolling resistance will improve fuel economy. Keeping tires properly inflated is essential to reducing rolling resistance. They'll also last longer, providing fuel savings over a longer time and decreasing the number of scrap tires generated.

— *Patrice Pages*

■ **Tires and Passenger Vehicle Fuel Economy: Informing Consumers, Improving Performance — Special Report 286.** Committee for the National Tire Efficiency Study; Transportation Research Board, and Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2006, approx. 134 pp.; ISBN 0-309-09421-6; available from the National Academies Press, tel. 1-800-624-6242; \$28.00 plus 4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11620.html>).

Dale F. Stein, retired president of Michigan Technological University, Houghton, chaired the committee. The study was funded by the National Highway Traffic Safety Administration.



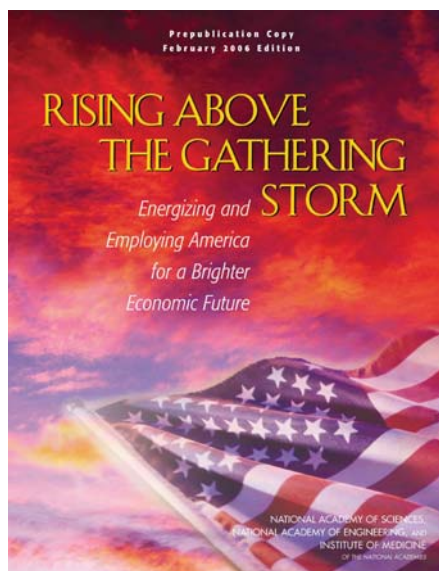
‘Gathering Storm’ Gains Momentum

Today the United States leads the world in science and technology development and enjoys a robust economy derived in large part from scientific and technological innovation. However, there are danger signs that the nation’s historical dominance in these areas is being threatened. U.S. students score below the international average in math and science. The United States now imports more high-technology products than it exports. For the cost of hiring one young professional engineer in the U.S., a company can hire eight engineers in India. In 2005, only four American companies ranked among the top 10 corporate recipients of patents granted by the U.S. Patent and Trademark Office. These and other factors indicate that America’s advantages have begun to erode.

This was the conclusion of a landmark report from the National Academies, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Chaired by Norman Augustine, retired CEO and chair of Lockheed Martin and recent recipient of the National Academy of Sciences’ prestigious Public Welfare Medal, the distinguished committee that wrote the report included Nobel laureates and prominent business, government, and academic leaders. The report sounded a strong warning that the U.S. is losing its global competitive edge in research and technology. Without taking concrete steps now, U.S. prosperity will decline.

These concerns are not new. Similar warnings have been issued in the past, including Thomas Friedman’s best-selling book *The World is Flat*, the Council on Competitiveness report *Innovate America*, and a number of reports from the President’s Council of Advisors on Science and Technology. Concerns were also voiced by Sens. Lamar Alexander and Jeff Bingaman, who requested the National Academies’ report. “We’re now playing in a tougher league,” Alexander said. “China and India are competing for our jobs. The best way to keep those jobs in America is to maintain our brainpower edge in science and technology.”

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Rising Above the Gathering Storm stressed two major challenges that are tightly coupled with U.S. pre-eminence in science and engineering: creating high-quality jobs for Americans and responding to the nation's need for clean, affordable, and reliable energy. The report makes four recommendations and identifies 20 actions to implement those recommendations, including providing federal incentives for promising students to pursue careers in science and math or to teach these subjects in the K-12 system; funding professional development for today's math and science teachers; and increasing federal funding of basic science research by 10 percent each year for the next seven years. In addition, the

report recommends establishing an organization within the U.S. Department of Energy to sponsor innovative research to meet the nation's long-term energy challenges.

To the excitement of many who have called for government action in the past, the Academies report propelled both the executive and congressional branches into making science and math education and basic science research top priorities. "Sometimes these things sit for years," said Alexander, "and then suddenly they come together in a big way."

In his 2006 State of the Union address, President Bush announced the American Competitiveness Initiative, which incorporates several of the report's recommendations. This presidential initiative further encouraged a flurry of legislative activity. In both the Senate and the House, committees outlined legislation based on the report. One bipartisan package of bills, Protecting America's Competitive Edge Act, introduced by Alexander and Bingaman as well as Sens. Pete Domenici and Barbara Mikulski, implements all 20 of the report's action items. A number of other bills have been introduced that focus on the report's recommendations about teaching and research.

The report's rippling effects continue. Rep. Frank Wolf, chair of the House Appropriations Subcommittee for Science, the Departments of State, Justice, and Commerce, and Related Agencies, strongly supports the increases in basic science research proposed in the report and the presidential initiative. "I don't plan to spend a year talking about it, like we had to do last year," Wolf adds. "We're going to get it done." — *Kristin Bullok*

Kristin Bullok, a science writer based in St. Louis, holds a doctoral degree in chemical biology. She is a former Christine Mirzayan Science and Technology Policy Fellow at the National Academies.



YOU GO, GIRL!

Project Encourages Girls to Chase S&T Careers

They took different paths to careers in science and technology, but the women who discussed their experiences at a National Academies event this spring shared two key traits: a thirst for knowledge and a belief that hard work and determination can overcome barriers. Sometimes the barriers even take the form of teachers or college professors who discourage unconventional dreams — like the high school chemistry instructor who told a teenage Rita Colwell that she would never make it in that class because women couldn't do such work; or colleagues who assume that women scientists can't successfully juggle a family and the demands of the tenure track.

The women emphasized that supportive mentors, parents, and friends can make all the difference.

It can be tough for a girl who may enjoy playing with a homemade chemistry set more than Barbie dolls, said participant Diane France, recalling her childhood experiences. France is now a world-renowned forensic anthropologist and director of the Human Identification Laboratory at Colorado State University in Fort Collins.

The discussion was part of an April event at which the National Academies Press launched a new paperback series for young students called “Women’s Adventures in Science,” about some of today’s outstanding women scientists. The event was designed to encourage middle school girls to pursue S&T careers, and it included hands-on science demonstrations led by France and two other scientists from the series — robot designer Cynthia Breazeal, who directs the Robotic Life Group at the Massachusetts



Institute of Technology; and Adriana Ocampo, a planetary geologist for NASA. About 60 girls took part.

The goal of the series is to raise awareness about the contributions of contemporary women scientists and to help increase the flow of talented students, especially girls, into scientific and technical fields. Researchers and many policymakers say there is a clear need for greater diversity in the ranks. U.S. women with bachelor's degrees, for example, are much less likely than their male peers to have majored in computer science, engineering, and physical sciences.

Colwell, the first woman to head the National Science Foundation, told the audience at the panel discussion that preparing more girls and young women for S&T careers would expand their job options and ultimately increase the nation's economic competitiveness.

And science should not be viewed as the exclusive domain of so-called brainiacs or geeks, said panel member Heidi Hammel, a planetary astronomer who is featured in the book series. "We don't all have to be Einsteins," she quipped. "...We're regular people who just work hard."

The book series and an accompanying Web site — <www.iwaswondering.org> — are underwritten by the National Academy of Sciences, with significant financial support from philanthropist Sara Lee Schupf and her family. Schupf, a member of the New York Academy of Sciences, attended the launch. "If we have visible role models and mentors, then statistics show that you will have more girls and women interested in science," she said in an interview, also



emphasizing the need for parents to encourage girls in these areas.

In one of the interactive sessions for students, two pizza-shaped heaps of white flour were covered with a layer of red seasoned salt to resemble the surface of Mars. Using rubber bands, several girls participating in Adriana Ocampo's demonstration about impact craters gleefully flung sugar cubes onto the surface. The resulting holes from these makeshift asteroids and comets, Ocampo explained, were akin to craters, which scientists study to learn about a host of geological issues.

Zana Holden-Gatlin, a sixth-grader at Hardy Middle School in Washington, D.C., described the session as "interesting" because she previously knew little about craters. And the event itself was worthwhile, said the future autism therapist. "I think it's a really great thing that they're doing, especially for young girls today."

— Vanee Vines

New Digital Library Aids Iraqi Scholars

This spring U.S. government officials and representatives from the scientific community launched the Iraqi Virtual Science Library, providing Iraqi scholars with access to cutting-edge scientific information to foster improvements in the nation's higher education system and research enterprise.

Iraq's ambassador to the United States praised the project at a ceremony at the National Academies. "This provides an important step toward rebuilding our scientific community," said Samir Shakir Mahmud Al-Sumaydi.



A network of Iraqi universities and an Iraqi research institution will eventually make the Internet-based library available to nearly 80 percent of Iraq's scientists, engineers, and university students, organizers said. The project started as a partnership among the U.S. departments of Defense and State and the fellowships program of the American Association for the Advancement of Science.

The two departments asked the National Academies to negotiate with publishers of high-quality scientific and technical literature for reduced-price access to their materials. With a grant of about \$170,000, the Academies assembled a library collection that now has the complete text of more than 17,400 scientific journal titles. Access to major research databases has also been arranged. Sun Microsystems Inc. will provide computer servers, information technology training for Iraqi partners, and a special software package that will make it possible to eventually transfer the digital library from its U.S. government host server to one in Iraq. The U.S. Civilian Research & Development Foundation will help maintain the project, transferring it entirely to Iraqi ownership after the first two years of operation.

The Academies acquired one-year licenses for most of the titles in the library, which alone are valued at more than \$11 million on the open market; publishers have agreed to maintain the partnership thereafter if additional funds are available. Details about the Iraqi Virtual Science Library are available online at <<https://ivsl.org>>.

— Vanee Vines

In Memoriam: Nicholas R. Cozzarelli (1938-2006)

When Nicholas R. Cozzarelli became editor in chief of the *Proceedings of the National Academy of Sciences of the United States of America* (PNAS) in 1995, he inherited a journal that in many ways had remained unchanged since its inception in 1914. Yet in just over a decade, he had — through a combination of visionary leadership and sheer force of will — transformed PNAS and raised it to a higher level. That transformation can be seen throughout the journal, from cover to last page. Since 1995, PNAS has experienced a marked rise in the number of submissions and published papers, an improvement in the quality and variety of published material, and the introduction of an innovative hybrid open access model. And through it all, Cozzarelli orchestrated these changes by simply being himself. “In his role of editor in chief of PNAS, Nick exhibited the same boundless energy, enthusiasm, dedication, and uncompromising standards that characterized his own science,” said Jack Halpern, associate editor of PNAS and Professor Emeritus of Chemistry at the University of Chicago.

Cozzarelli dedicated his career to the passionate pursuit of excellence, whether in research, teaching, or service to the scientific community. He spent 24 years as a professor at the University of California, Berkeley, where he contributed immensely to the understanding of how proteins alter the topology of DNA. He served as chairman of



the molecular biology department from 1986 until 1989, director of the Virus Laboratory from 1986 to 1990, and director of the mathematics and molecular biology program from 1988 to 1996. Cozzarelli was elected to the National Academy of Sciences in 1989, received the CIBA-Geigy/Drew Award in Biomedical Research in 1990, became a fellow of AAAS in 1999, and became a member of the American Academy of Arts and Sciences in 2000.

Cozzarelli's career was cut short when he died on March 19, 2006, at the age of 67, from complications related to treatment for Burkitt's lymphoma. His death is a loss for both the research and publishing communities, but he has left a legacy of uncompromising scientific achievement, advancement toward interdisciplinary and multidisciplinary work, and a revitalized journal positioned to meet the challenges of the 21st century. — *Regina Nuzzo & Nick Zagorski*

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.

An Assessment of Research-Doctorate Programs.

Board on Higher Education and Workforce, Division on Policy and Global Affairs. Project director: Charlotte Kuh. Chair: Jeremiah P. Ostriker, Charles Young Professor of Astronomy and provost emeritus, Princeton University, Princeton, N.J. Sponsors: Andrew W. Mellon Foundation, Alfred P. Sloan Foundation, National Institutes of Health, and National Science Foundation.

Incentives and Test-Based

Accountability in Public Education. Board on Testing and Assessment, Division of Behavioral and Social Sciences and Education. Project director: Stuart Elliott. Chair: To be selected. Sponsors: Carnegie Corporation of New York and William and Flora Hewlett Foundation.

International Capacity Building for the Protection and Sustainable Use of Oceans and Coasts.

Ocean Studies Board, Division on Earth and Life Studies. Project director: Frank Hall. Co-chairs: Mary H. Feeley, geophysics resource manager, technical department, ExxonMobil Exploration Co., Houston; and Silvio Pantoja, associate professor of oceanography, University of Concepción, Concepción, Chile. Sponsors: Gordon and Betty Moore Foundation, National Oceanic and Atmospheric Administration, David and Lucile Packard Foundation, and National Science Foundation.

Role of Public Transportation in Emergency Evacuation.

Studies and Special Programs, Transportation Research Board. Project director: Nan Humphrey. Chair: To be selected. Sponsors: Federal Transit Administration and Transit Cooperative Research Program.

The Scientific Context for the Exploration of the Moon.

Space Studies Board, Division on Engineering and Physical Sciences. Project directors: David H. Smith and Robert L. Riemer. Chair: George A. Paulikas, executive vice president, Aerospace Corp. (retired), El Segundo, Calif. Sponsor: NASA.

Technology for a Quieter America.

National Academy of Engineering. Project director: Richard Taber. Chair: George C. Maling Jr., former managing director, Institute of Noise Control Engineering of the USA Inc. (retired), Harpswell, Maine. Sponsor: National Academy of Engineering.

Training Physicians for Public Health Careers.

Board on Population Health and Public Health Practice, Institute of Medicine. Project director: Lyla Hernandez. Chair: Richard B. Johnston Jr., associate dean for research development and professor, department of pediatrics, University of Colorado School of Medicine; and executive vice president for academic affairs, National Jewish Medical and Research Center, Denver. Sponsors: Health Resources and Services Administration and Association of American Medical Colleges.

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.

Aeronautics Innovation: NASA’s Challenges and Opportunities

Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2006, 112 pp.; ISBN 0-309-10188-3; available from NAP).

Asbestos: Selected Cancers

Board on Population Health and Public Health Practice, Institute of Medicine (2006, approx. 394 pp.; ISBN 0-309-10169-7; available from NAP).

An Assessment of Balance in NASA’s Science Programs

Space Studies Board, Division on Engineering and Physical Sciences (2006, 58 pp.; ISBN 0-309-10221-9; available from NAP or from the board, tel. 202-334-3477 or e-mail <ssb@nas.edu>).

Beyond Mapping: Meeting National Needs Through Enhanced

Geographic Information Science Mapping Science Committee, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2006, 116 pp.; ISBN 0-309-10226-X; available from NAP).

C4ISR for Future Naval Strike Groups

Naval Studies Board, Division on Engineering and Physical Sciences (2006, 300 pp.; ISBN 0-309-09600-6; available from NAP).

Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts
Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2006, approx. 140 pp.; ISBN 0-309-10255-3; available from NAP).

Controlling the Quantum World
Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2006, approx. 224 pp.; ISBN 0-309-10270-7; available from NAP).

Critical Technology Accessibility
Division on Engineering and Physical Sciences (2006, 72 pp.; ISBN 0-309-10146-8; available from NAP).

Decadal Survey of Civil Aeronautics: Foundation for the Future
Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2006, approx. 224 pp.; ISBN 0-309-10158-1; available from NAP).

Developing a National Registry of Pharmacologic and Biologic Clinical Trials — Workshop Report
Board on Health Sciences Policy, Institute of Medicine (2006, 124 pp.; ISBN 0-309-10078-X; available from NAP).

Dynamic Changes in Marine Ecosystems: Fishing, Food Webs, and Future Options
Ocean Studies Board, Division on Earth and Life Studies (2006, 168 pp.; ISBN 0-309-10050-X; available from NAP).

Emergency Care for Children: Growing Pains
Board on Health Care Services, Institute of Medicine (2006, approx. 360 pp.; ISBN 0-309-10171-9; available from NAP).

Emergency Medical Services: At the Crossroads
Board on Health Care Services, Institute of Medicine (2006, approx. 304 pp.; ISBN 0-309-10174-3; available from NAP).

Engineering Studies at Tribal Colleges and Universities
National Academy of Engineering (2006, 71 pp.; ISBN 0-309-10127-1; available from NAP).

Enhancing Philanthropy's Support of Biomedical Scientists: Proceedings of a Workshop on Evaluation
Board on Higher Education and Workforce, Division on Policy and Global Affairs (2006, 146 pp.; ISBN 0-309-10097-6; available from NAP).

Ensuring an Infectious Disease Workforce: Education and Training Needs for the 21st Century — Workshop Summary
Forum on Microbial Threats, Board on Global Health, Institute of Medicine (2006, 238 pp.; ISBN 0-309-10010-0; available from NAP).

Ethical Considerations for Research Involving Prisoners
Board on Health Sciences Policy, Institute of Medicine (2006, approx. 316 pp.; ISBN 0-309-10119-0; available from NAP).

Evaluating the HRSA [Health Resources and Services Administration] Traumatic Brain Injury Program
Board on Health Care Services, Institute of Medicine (2006, 350 pp.; ISBN 0-309-10113-1; available from NAP).

Examining the Health Disparities Research Plan of the National Institutes of Health: Unfinished Business
Board on Health Sciences Policy, Institute of Medicine (2006, 320 pp.; ISBN 0-309-10121-2; available from NAP).

Exploring the Role of Antiviral Drugs in the Eradication of Polio — Workshop Report
Board on Life Sciences, Division on Earth and Life Studies (2006, 82 pp.; ISBN 0-309-10161-1; available from NAP).

Food Chemicals Codex: First Supplement to the Fifth Edition
Food and Nutrition Board, Institute of Medicine (2006, 78 pp.; ISBN 0-309-10073-9; available from NAP).

Food Insecurity and Hunger in the United States: An Assessment of the Measure
Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2006, 156 pp.; ISBN 0-309-10132-8; available from NAP).

Frontiers of Engineering: Reports on Leading-Edge Engineering From the 2005 Symposium
National Academy of Engineering (2006, 202 pp.; ISBN 0-309-10102-6; available from NAP).

Globalization, Biosecurity, and the Future of the Life Sciences
Development, Security, and Cooperation, Division on Policy and Global Affairs; and Board on Global Health, Institute of Medicine (2006, 318 pp.; ISBN 0-309-10032-1; available from NAP).

Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States
Nuclear and Radiation Studies Board, Division on Earth and Life Studies; and Transportation Research Board (2006, 354 pp.; ISBN 0-309-10004-6; available from NAP).

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Institute for Laboratory Animal Research, Division on Earth and Life Studies (2006, 154 pp.; ISBN 0-309-10110-7; available from NAP).

Health Risks From Dioxin and Related Compounds: Evaluation of the EPA Reassessment
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, approx. 240 pp.; ISBN 0-309-10258-8; available from NAP).

Hispanics and the Future of America
Committee on Population, Division of Behavioral and Social Sciences and Education (2006, 502 pp.; ISBN 0-309-10051-8; available from NAP).

Hospital Based Emergency Care: At the Breaking Point
Board on Health Care Services, Institute of Medicine (2006, approx. 420 pp.; ISBN 0-309-10173-5; available from NAP).

Human Biomonitoring for Environmental Chemicals
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, approx. 276 pp.; ISBN 0-309-10272-3; available from NAP).

Identification of Promising Naval Aviation Science and Technology Opportunities
Naval Studies Board, Division on Engineering and Physical Sciences (2006, 112 pp.; ISBN 0-309-09729-0; available from NAP).

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Forum on Microbial Threats, Board on Global Health, Institute of Medicine (2006, 246 pp.; ISBN 0-309-10098-4; available from NAP).

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Instrumentation for a Better Tomorrow: Proceedings of a Symposium in Honor of Arnold Beckman
Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2006, 76 pp.; ISBN 0-309-10116-6; available from NAP).

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Space Studies Board and Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2006, 60 pp.; ISBN 0-309-10217-0; available from NAP).

Is That Real? Identification and Assessment of the Counterfeiting Threat for U.S. Banknotes
Board on Manufacturing and Engineering Design, Division on Engineering and Physical Sciences (2006, 74 pp.; ISBN 0-309-10124-7; available from NAP).

Linking Knowledge With Action for Sustainable Development: The Role of Program Management — Summary of a Workshop Roundtable on Science and Technology for Sustainability,
Division on Policy and Global Affairs (2006, 134 pp.; ISBN 0-309-10185-9; available from NAP).

Managing Coal Combustion Residues in Mines
Committee on Earth Resources, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2006, 272 pp.; ISBN 0-309-10049-6; available from NAP).

Measuring and Sustaining the New Economy: Software, Growth, and the Future of the U.S. Economy — Report of a Symposium
Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2006, 226 pp.; ISBN 0-309-09950-1; available from NAP).

Medicare's Quality Improvement Organization Program: Maximizing Potential
Board on Health Care Services, Institute of Medicine (2006, approx. 500 pp.; ISBN 0-309-10108-5; available from NAP).

Mineral Requirements for Military Personnel: Levels Needed for Cognitive and Physical Performance During Garrison Training
Committee on Military Nutrition Research, Food and Nutrition Board, Institute of Medicine (2006, 512 pp.; ISBN 0-309-10126-3; available from NAP).

New Source Review for Stationary Sources of Air Pollution
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, approx. 300 pp.; ISBN 0-309-10277-4; available from NAP).

Overcoming Challenges to Develop Countermeasures Against Aerosolized Bioterrorism Agents: Appropriate Use of Animal Models
Board on Life Sciences and Institute for Laboratory Animal Research, Division on Earth and Life Studies (2006, approx. 90 pp.; ISBN 0-309-10211-1; available from NAP).

Preliminary Principles and Guidelines for Archiving Environmental and Geospatial Data at NOAA [National Oceanic and Atmospheric Administration] — Interim Report
Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2006, 37 pp.; ISBN 0-309-10227-8; available from NAP).

Preterm Birth: Causes, Consequences, and Prevention
Board on Health Sciences Policy, Institute of Medicine (2006, approx. 570 pp.; ISBN 0-309-10159-X; available from NAP).

Preventing Medication Errors
Board on Health Care Services, Institute of Medicine (2006, approx. 544 pp.; ISBN 0-309-10147-6; available from NAP).

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Roundtable on Environmental Health Sciences, Research, and Medicine, Board on Population Health and Public Health Practice, Institute of Medicine (2006, 116 pp.; ISBN 0-309-10047-X; available from NAP).

Revealing the Hidden Nature of Space and Time: Charting the Course for Elementary Particle Physics
Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2006, approx. 176 pp.; ISBN 0-309-10194-8; available from NAP).

Review of the Department of Energy's Genomics: GTL Program
Board on Life Sciences, Division on Earth and Life Studies (2006, 102 pp.; ISBN 0-309-10133-6; available from NAP).

Review of the Draft Research and Restoration Plan for Arctic-Yukon-Kuskokwim (Western Alaska) Salmon
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Board on Health Sciences Policy, Institute of Medicine (2006, approx. 488 pp.; ISBN 0-309-10111-5; available from NAP).

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Board on Children, Youth, and Families, National Research Council and Institute of Medicine (2006, 66 pp.; ISBN 0-309-10165-4; available from NAP).

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Nuclear and Radiation Studies Board, Division on Earth and Life Studies (2006, approx. 300 pp.; ISBN 0-309-10170-0; available from NAP).

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Board on Chemical Sciences and Technology, Division on Earth and Life Studies; and Transportation Research Board (2006, 152 pp.; ISBN 0-309-09721-5; available from NAP).

To Recruit and Advance: Women Students and Faculty in U.S. Science and Engineering
Committee on Women in Science and Engineering, Division on Policy and Global Affairs (2006, 145 pp.; ISBN 0-309-09521-2; available from NAP).

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Water Science and Technology Board, Division on Earth and Life Studies (2006, 84 pp.; ISBN 0-309-10144-1; available from NAP).

Toward an Integrated Arctic Observing Network
Polar Research Board, Division on Earth and Life Studies (2006, 128 pp.; ISBN 0-309-10052-6; available from NAP).

Trends in Oil Supply and Demand, The Potential for Peaking of Conventional Oil Production, and Possible Mitigation Options — A Summary Report of the Workshop
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Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2006, approx. 246 pp.; ISBN 0-309-09722-3; available from NAP).

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Board on Health Sciences Policy, Institute of Medicine (2006, 292 pp.; ISBN 0-309-10090-9; available from NAP).

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