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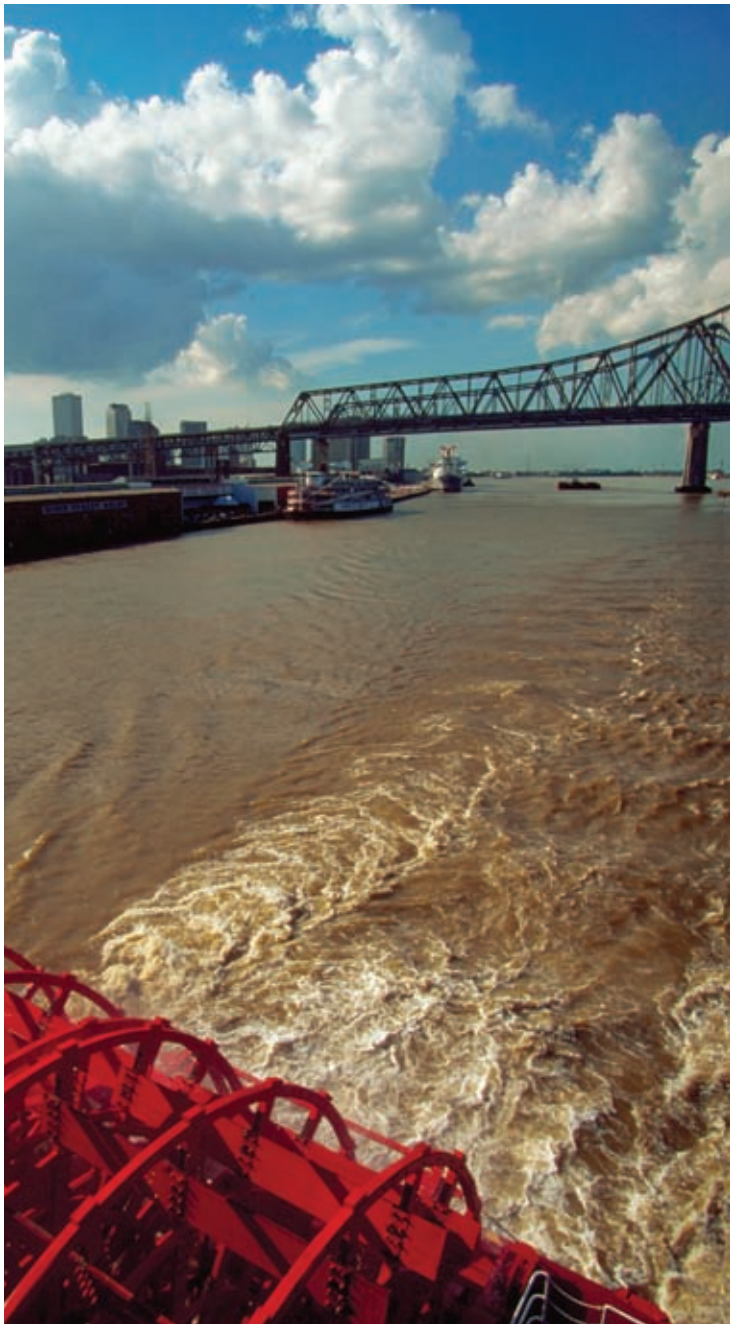

Balancing Science and Security

Mississippi River Water Quality

The Search for Life in the Universe

Fall 2007
vol. 7 number 3

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

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In Focus (ISSN 1534-8334) is published three times a year by the National Academies, 500 Fifth St., N.W., Washington, DC 20001. Subscription (three issues): $10; Canada and foreign, $12 (U.S. currency only). Subscription address: *In Focus,* P.O. Box 665, Holmes, PA 19043. Bulk-rate U.S. postage is paid at Washington, D.C. Back issues and back volumes can be ordered in microform from National Archive Publishing Company, 300 North Zeeb Road, Ann Arbor, MI 48103.

Postmaster: Send address changes to In Focus, P.O. Box 665, Holmes, PA 19043.

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Our International Reach

Most of our studies focus on issues of importance to the U.S. and our federal and state governments. But, as highlighted in this issue of *In Focus,* the National Academies also undertake a wealth of activities and initiatives with positive impacts well beyond our own borders.

More than a billion people in developing areas of Africa, Asia, and Latin America lack access to safe drinking water, a fundamental requirement for human health. Our Marian Koshland Science Museum, working with the National Research Council and the Global Health and Education Foundation, recently inaugurated a new Web resource called *Safe Drinking Water Is Essential* (see page 18). The Web site provides free information on sources of drinking water, contaminants, distribution problems, and treatment options directly to citizens and local officials.

Since 2002, we have also provided free access to our journal *Proceedings of the National Academy of Sciences* in more than 140 developing nations. This year, an equally ambitious initiative by the National Academies Press to provide our reports and books free of charge to developing countries passed an exciting milestone. After four years of operation, more than a half million users have downloaded in excess of 600,000 publications (see page 21).

And, as you will read on page 20, an Academies delegation that was led by former NAE President Bill Wulf and included Professor Joseph Taylor and NAS Foreign Secretary Michael Clegg recently returned from a visit to several cities and scientific institutions in Iran, continuing a program of scientific exchange and cooperation established in 1999. Our group was greeted enthusiastically, especially by young Iranian students. Next year we will continue this program with bilateral workshops and other cooperative efforts.

This is just a sampling of our many international activities. As I write, Chinese and American experts on air pollution are sitting down in Beijing to consider "next steps" following a recent joint study on lessons China can draw from the successes and failures of U.S. efforts to improve urban air quality. And in Senegal, the African Science Academy Development Initiative — funded by the Bill & Melinda Gates Foundation and administered by the National Academies — has just completed its third international conference focused on building the ability of science academies in Africa to inform policymaking and public debate.

We are committed to international engagement and cooperation because, first and foremost, we believe it is important to the scientific enterprise. But we also believe scientists can and should play a leadership role in building "people-to-people" bridges between nations. It is a long-term effort by which we and our scientific peers around the world hope to foster international openness and collaboration.

RALPH J. CICERONE
President, National Academy of Sciences

An Orphan River

Closer Care Needed for Mississippi's Water Quality

No river has played a more central role in American literature and history than the Mississippi, the river that carried Huckleberry Finn's raft and serves as the symbolic dividing line between east and west. And the Mississippi's economic and ecological importance continues to be enormous. Tens of millions of people in 10 states depend on it for drinking water and recreation, and hundreds of millions of tons of grain and other goods are shipped along the waterway every year. The rivers of about 40 percent of the continental United States drain into the Mississippi, which is also home to the longest river wildlife and fish refuge in the lower 48 states.

Despite its significance, however, the Mississippi is an "orphan" in terms of efforts to monitor its water quality and reduce pollution, says a new report from the National Research Council that evaluates efforts to implement the Clean Water Act on the Mississippi. Currently there is no single system to monitor pollution levels along the river's entire length, the report observes. And though states on the Mississippi have assumed most authority for implementing the Act, the resources they dedicate to monitoring the river vary widely, as do their standards for water quality.

This lack of coordination has made it difficult to address pollution problems in the river, some of which are significant, the report says. Although the Clean Water Act has successfully reduced direct discharges of pollution from industry and wastewater treatment plants, less-direct forms of contamination — for example, nutrients and sediments that enter the river and its tributaries through runoff — are still a problem in the Mississippi. High levels of nutrients, such as nitrogen and phosphorous from fertilizers used on farm fields, are polluting the river itself and contributing to an oxygen-deficient "dead zone" in the northern Gulf of Mexico. Sediments are a more complex challenge; in the upper Mississippi they often are too plentiful and considered a pollutant, while in the lower river, sediments are too scarce — a shortfall that is contributing to losses of coastal wetlands in southern Louisiana.

Addressing these and other water-quality problems will require the U.S. Environmental Protection Agency to take a stronger leadership role in implementing the Clean Water Act along the Mississippi and in the northern Gulf of Mexico, the report says. For example, EPA should take the lead in establishing a single program to monitor water quality in the entire Mississippi. In addition, the agency should develop water-quality standards that protect the river and Gulf from excessive nutrient pollution. And EPA should develop what is known as a federal Total Maximum Daily Load for these nutrient pollutants; this is a limit set on the total amount of a pollutant that the river and northern Gulf can accept and still meet water-quality standards. The agency has successfully led a multistate effort to better manage nutrient pollution in the Chesapeake

Bay, the report notes, and it should draw upon that experience when stepping up its efforts along the Mississippi.

States should take steps to improve their teamwork as well, the report says. In particular, states along the lower Mississippi should strive to create a cooperative organization similar to one already in place for states along the upper river. And the report calls on the U.S. Department of Agriculture to aggressively apply its conservation programs in order to reduce polluted runoff from agriculture. EPA should work with USDA to ensure that these programs are targeted to areas where runoff of nutrients and sediments is most severe. — *Sara Frueh*

Mississippi River Water Quality and the Clean Water Act: Progress, Challenges, and Opportunities. Committee on the Mississippi River and the Clean Water Act, Water Science and Technology Board, Division on Earth and Life Studies (2007, approx. 284 pp.; ISBN 0-309-11409-8; 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/12051.html>).

The committee was chaired by **David A. Dzombak,** Walter J. Blenko Sr. Professor of Environmental Engineering, and director, Steinbrenner Institute for Environmental Education and Research, Carnegie Mellon University, Pittsburgh. The study was funded by the McKnight Foundation.

Minerals

HOT COMMODITIES IN A **GLOBAL ECONOMY**

The energy crisis of the 1970s prompted the U.S. government to keep a better tally of the world supply of key energy resources, especially oil. With energy prices again skyrocketing, the government's regularly updated statistics on energy supply and demand are as important as ever. However, there are several nonfuel mineral resources equally critical to the U.S. economy and national security for which such statistics are unavailable.

Although metallic and nonmetallic minerals are essential parts in Information Age devices such as laptops and cell phones, as well as in thousands of other everyday products, neither the federal government nor industry have an accurate grasp of how secure supplies of these minerals are, says a new report from the National Research Council. This is despite the fact that the same emerging economies that are driving up energy prices are also increasing competition for nonfuel minerals, many of which are not available domestically.

Foreign dependence and global competition are not necessarily a cause for concern, but they do require that the United States be more aware of minerals whose supply could be disrupted by political and economic risks, said the study committee, which developed a matrix for assessing current mineral criticality. Platinum group metals, indium, manganese, niobium, and certain rare earth

elements were all deemed highly critical, meaning there are few or no substitutes for their essential uses and that their supplies are potentially at risk. The committee only had time to assess a limited number of minerals but said that government could use the matrix to make similar classifications which, in turn, should be used to guide a broader data-collection effort. The U.S. Geological Survey's Minerals Information Team collects such data, but the quantity and level of detail of its information has waned in recent years along with a decreasing budget. The USGS team, or another federal entity, needs to be given resources, autonomy, and authority similar to that of the Energy Information Administration if the nation is going to anticipate and attempt to mitigate restrictions in the minerals markets, the committee concluded.

A lack of data on mineral availability also is impeding efforts by the Defense Department to anticipate what materials it needs on hand for a national emergency, says a second Research Council report by a committee that examined the necessity of the National Defense Stockpile. The stockpile, established just prior to World War II, has not kept pace with changes in the global marketplace or modern military needs, the committee found, leading it to deem the materials stockpile "ineffective." The stockpile is required by law to hold strategic and critical materials — 28 at last count — to preclude a dependence on foreign sources in event of war or other national emergency. But there is a disconnect between what's stored and what the military is likely to actually need, the committee said. In fact, billions of dollars worth of materials considered unnecessary

given current military scenarios have been sold from the stockpile in recent years.

Still, growing world demand for minerals and fragmented global supply chains mean threats to assuring an adequate supply of materials for national defense remains. Instead of trying to improve the current stockpile, the committee recommended a whole new approach — not a new bureaucratic organizational structure, but a total system approach that reflects current geopolitics. Stocks may still be needed, but decisions about whether to maintain them should be tied to well-defined defense needs and assessments of risks to supply. — *Bill Kearney*

Minerals, Critical Minerals, and the U.S. Economy. Committee on Critical Mineral Impacts on the U.S. Economy, Committee on Earth Resources, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, approx. 216 pp., ISBN 0-309-11282-6). The committee was chaired by **Roderick G. Eggert,** professor and director, division of economics and business, Colorado School of Mines, Golden. The study was funded by the U.S. Geological Survey and the National Mining Association.

Managing Materials for a 21st Century Military. Committee on Assessing the Need for a Defense Stockpile, National Materials Advisory Board, Division on Engineering and Physical Sciences (2007, approx. 124 pp., ISBN 0-309-11257-5). The committee was chaired by **Robert H. Latiff,** vice president and chief engineer and technology officer, space and geospatial intelligence business unit, Science Applications International Corp., Chantilly, Va. The study was funded by the Defense National Stockpile Center of the Defense Logistics Agency, U.S. Department of Defense.

Both reports are available from the National Academies Press, tel. 1-800-624-6242; also on the Internet at <www.nap.edu>.

TREATING **BODY** AND **MIND**

Cancer Care for the Whole Patient

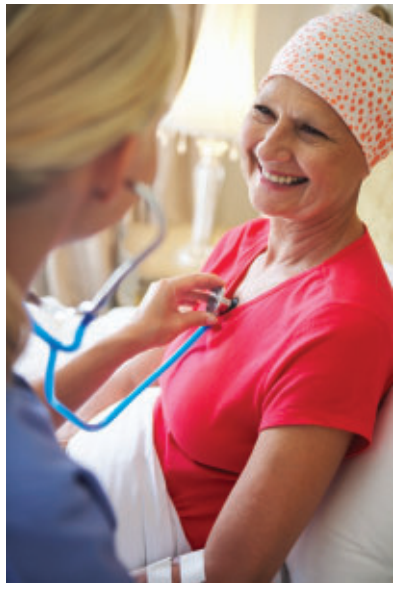
Ask cancer patients about the worst parts of their treatment and they probably will cite physical effects such as nausea and pain, but they also may mention anxiety or depression, strains on their relationships, loss of motivation or the ability to keep up on the job, the financial hit to their savings, and any number of other mental, emotional, and social impacts.

Clinicians and patients would agree that the psychological and social tolls of cancer and its treatments can undermine the gains made in ridding the body of the disease, and that someone should address these effects. Trained to focus on the body, many cancer care providers have assumed that this responsibility rests elsewhere. But a new report from the Institute of Medicine puts the job squarely on the cancer care provider's examining room doorstep.

The report proposes a new standard of care under which all oncology care providers would systematically screen patients for debilitating stress and other problems; connect patients with health care or service providers who have resources to address these issues and coordinate care with these professionals; and periodically re-evaluate patients to determine if any changes in care are needed. It's a standard that would apply equally well to the management of other chronic diseases.

"Eradicating tumors is important, but it's not enough," said Nancy E. Adler, chair of the committee that wrote the report. "This report provides an action plan for ensuring that every patient's oncology team identifies and coordinates the additional psychosocial health services that a patient requires to be as healthy and whole as possible during and after cancer treatment."

Psychosocial health care addresses the emotional challenges that can accompany a serious illness as well as the life challenges that can get in the way of good health care. Cancer care providers do not typically have the knowledge and skills to treat depression, teach anger management, or otherwise handle every psychosocial health need. But elsewhere a wealth of resources already exists, many at low or no cost; cancer care providers could easily make connecting patients to these resources a routine part of care, the report says.



Several leading cancer care providers have taken this more comprehensive tack. Some providers with more resources integrate psychosocial health services with the patient's cancer care in one setting. Psychologists, social workers, and other service providers on staff work with the oncology team to screen patients for problems and ensure that their needs are managed. This "on-site" approach requires substantial resources that not all cancer care practices have. But smaller practices can also provide comprehensive care by tapping psychosocial service providers throughout their communities via referral agreements and partnerships.

Some communities, particularly in rural settings, may have even fewer providers of psychosocial health services in the immediate vicinity. Small or remote oncology practices still can connect patients with a wide range of services through national foundations, nonprofit organizations, online support communities, educational telephone workshops, and many other resources.

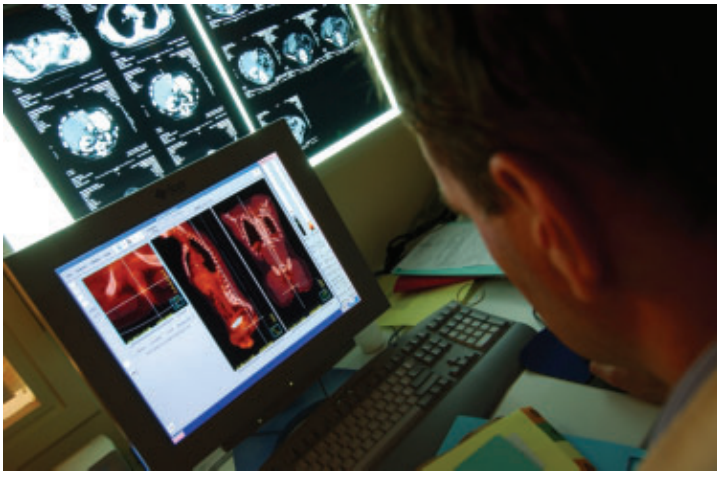
Managing patients' psychological and social well-being will require some oncology providers to change how they supply care, but the good news is that many health insurance plans already reimburse much of this care. Health insurance purchasers and health plans should examine the adequacy of their reimbursement rates for the delivery of psychosocial health care, the report urges.

Of course, cancer care providers can only partially resolve some problems such as limited finances or lack of health coverage among patients, and currently there are not enough resources to meet the needs of all patients. But these realities should not preclude oncology practices from attempting to remedy as many psychosocial problems as possible, the committee stated.

— *Christine Stencel*

Cancer Care for the Whole Patient: Meeting Psychosocial Health Needs. Committee on Psychosocial Services to Cancer Patients and Families in a Community Setting, Board on Health Care Services, Institute of Medicine (2007, approx. 460 pp.; ISBN 0-309-11107-2; available from the National Academies Press, tel. 1-800-624-6242; $46.95 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11993.html>).

The committee was chaired by **Nancy E. Adler,** vice chair, department of psychiatry, and director, Center for Health and Community, University of California, San Francisco. The study was funded by the National Institutes of Health.



The Nuclear Medicine **RENAISSANCE**

Innovation Holds Promise for Improving Health Care

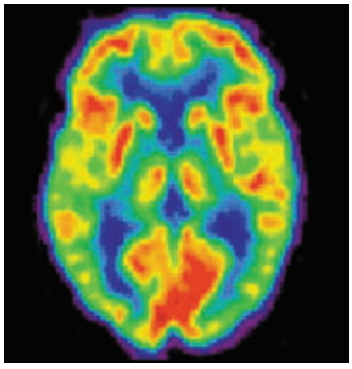
Groundbreaking research over the last few years has opened the door for doctors to tailor individualized treatment to a person's genetic profile, an approach known as personalized medicine. As this fledgling field grows, a key to unlocking its full potential may lie in a discipline that has existed 50 years. It's called nuclear medicine and uses imaging devices and radioactive biochemical compounds to diagnose and treat diseases.

Nearly 20 million nuclear medicine procedures are carried out each year in the United States to diagnose cancers, cardiovascular diseases, and certain neurological disorders — as well as to treat several cancers, like breast and thyroid, by delivering doses of radiation to tumor cells in the hope of eradicating them. Nuclear imaging devices work by tracking radioactive chemicals that are swallowed, inhaled, or injected into the body. One common imaging tool is positron emission tomography (PET), which detects cancer sites anywhere in the body. PET is growing faster than any other imaging procedure and has proved less traumatic to patients who would otherwise require surgery or a biopsy to determine a malignancy.

Although nuclear medicine is routinely used in certain areas of medical treatment, its promise is only beginning to emerge in others, like neuroscience, drug development, and preventive health care.

"We are living during a period of rapid advances in the unraveling of the mechanisms that underlie many diseases such as cancer," said Hedvig Hricak, chair of a committee that wrote a new National

Academies report on the subject. "Nuclear medicine provides some of the most essential tools for the progress of this research."



An area with prospects for growth is the diagnosis of neurological disorders, including addictions, eating disorders, and depression. Nuclear imaging devices could be used to assess a patient's brain functions and detect biochemical changes, thus revealing links between brain chemistry and behavior. They could also visually track the uptake of drugs in a patient, which could help scientists better understand the mechanisms by which new drugs are absorbed and take effect in the body.

More innovations are also budding for cancer treatments, such as targeted radionuclide therapy. Unlike external radiation therapy — which kills cancer cells by beaming high-energy X-rays to the identifiable main tumor — targeted radionuclide therapy functions more like chemotherapy. It delivers toxic levels of radiation not only to primary disease sites but also to adjacent tumor cells, consequently eliminating both the principal tumor and cancer that may have spread elsewhere, including otherwise undetectable malignant cells.

Yet through this glint of promise, more challenges lie ahead. Funding for nuclear medicine has dropped considerably in recent years, and there is currently no commitment by any federal agency to create a long-standing national nuclear medicine research program. The report says the federal government should enhance its commitment to nuclear medicine research.

"If cuts in funding for basic nuclear medicine research are not reversed, progress in personalized medicine will slow down dramatically. There is an especially great need for commitment to core research in chemistry, which underlies many advances emerging in nuclear medicine that could facilitate progress in personalized medicine," Hricak said.

To add to the financial crunch, there is an inadequate domestic supply of medical radionuclides for research. The lack of a dedicated domestic accelerator and reactor facilities for year-round, uninterrupted production of medical radionuclides discourages development and innovation in nuclear medicine.

Moreover, there is a critical shortage of personnel in all nuclear medicine disciplines, with an impending generation gap of leadership in the field. For a "renaissance" in nuclear medicine to occur that could potentially improve health care, the report emphasizes that these challenges need to be addressed. — *Jennifer Walsh*

Advancing Nuclear Medicine Through Innovation. Committee on State of the Science of Nuclear Medicine; Nuclear and Radiation Studies Board, Division of Earth and Life Studies, and Board on Health Sciences Policy, Institute of Medicine (2007, 176 pp.; ISBN 0-309-11067-X; available from the National Academies Press, tel. 1-800-624-6242; $48.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11985.html>).

The committee was chaired by **Hedvig Hricak,** chairman of the department of radiology at Memorial Sloan-Kettering Cancer Center, New York City. The study was funded by the U.S. Department of Energy and the National Institutes of Health.

To Secure Both Nation and Scientific Freedom

STRIKING A BALANCE

In the years since 2001, federal agencies have become more vigilant about the scientists and students they allow into the country, the technologies they allow out of it, and the type of research they permit to be published. The fear is that terrorists or rogue nations will take some of the country's greatest strengths — its scientific and technological tools and knowledge — and use them to launch future attacks on the U.S. and other nations.

Concerns about certain types of research falling into the wrong hands are legitimate, says a new report from the National Research Council, and safeguards are needed. But if extreme measures are enacted that curtail the flow of information or the movement of skilled people, these restrictions could significantly hinder the nation's scientific and technology enterprise. This interference could in turn slow the development of tools needed to defend against terrorism — technologies to better detect radioactive materials, for example, or vaccines to protect against biological or chemical agents — and undermine the nation's long-term economic strength.

As part of its study, the Research Council held a series of regional meetings on university campuses to hear from the scientific and national security communities. The

report that emerged recommends a more enduring partnership to make sure that both security and research interests are protected. It calls on the federal government to establish a standing commission — one that includes representatives of both communities — to review policies on the exchange of scientific information and the participation of foreign-born scientists and students in research.

One task the commission should perform is ensuring that National Security Decision Directive 189 stays in force. Put in place over 20 years ago, the directive says that basic research should be open to publication and to participation by foreign scientists. Many government policies and practices in recent years have effectively reversed this directive, the report says. For example, when federal agencies and corporations award research grants or contracts to universities, they sometimes include clauses that prevent the publication of research or the participation of foreign scientists or students. And participants at the regional meetings expressed concern that research was increasingly — and inconsistently — being categorized by federal agencies as "sensitive but unclassified" and therefore restricted. Research considered too risky for publication by one agency is sometimes seen as acceptable by another. The report calls for an annual survey to examine how frequently this designation and similar restrictions are being used.

The new commission should also monitor restrictions placed on the entry of foreign-born students and scholars into the U.S., which were tightened shortly after the 2001 terrorist attacks. Meeting participants observed that initially there were some overly restrictive reviews of student visas and travel, but the situation seems to be improving. Foreign-born students and scientists are an integral element of the U.S. research enterprise, accounting for more than half of graduate students and postdocs in some fields. Universities and the U.S. government should continue to welcome talented students and scholars from around the world, the report says. In addition, Congress should consider creating a new nonimmigrant visa category for doctoral-level graduate students and postdoctoral scholars.

The free flow of equipment and technologies needs to be protected as well, the report says. Export controls are designed to keep advanced technologies from being shipped to people or countries that might misuse them. But many items restricted by the current list are outdated or already widely available in other countries. These lists should be reviewed regularly to make sure that items in wide use are not being needlessly restricted.

— *Sara Frueh & Molly Galvin*

Science and Security in a Post 9/11 World: A Report Based on Regional Discussions Between the Science and Security Communities. Committee on a New Government-University Partnership for Science and Security, Committee on Science, Technology, and Law, Division on Policy and Global Affairs (2007, 138 pp.; ISBN 0-309-11191-9; available from the National Academies Press, tel. 1-800-624-6242; $30.75 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12013.html>).

The committee was co-chaired by **Jacques Gansler,** vice president for research, University of Maryland, College Park; and **Alice P. Gast,** president of Lehigh University, Bethlehem, Pa. The study was sponsored by the National Science Foundation and National Institutes of Health.

Combating Climate Change

HOW FAR HAVE WE COME?

When the U.S. Climate Change Science Program (CCSP) was established in 2002, the goal was to efficiently coordinate climate change research across all federal agencies. Several years after the program's formation, its former director asked the National Research Council to develop a process for reviewing the entire program and to assess its strengths and weaknesses. The report, CCSP's first review since being established, reveals that the program has made some progress, but in certain areas, more work remains.

On the plus side, the program has clarified understanding of how and why climate is changing, especially at the global scale. Furthermore, scientists have improved their ability to predict future climate changes. Part of these successes is attributed to satellite and *in situ* observing systems, which have collected a substantial amount of data that has provided a baseline of climate trends.

However, cancellation and delays of several planned satellite missions are the single greatest threat to any future progress of CCSP, the report says. The degradation of observing capability could impact the ability to understand how climate change affects local communities and regions. Better observations, more accurate models, and the development of impact scenarios are needed to improve regional predictions.

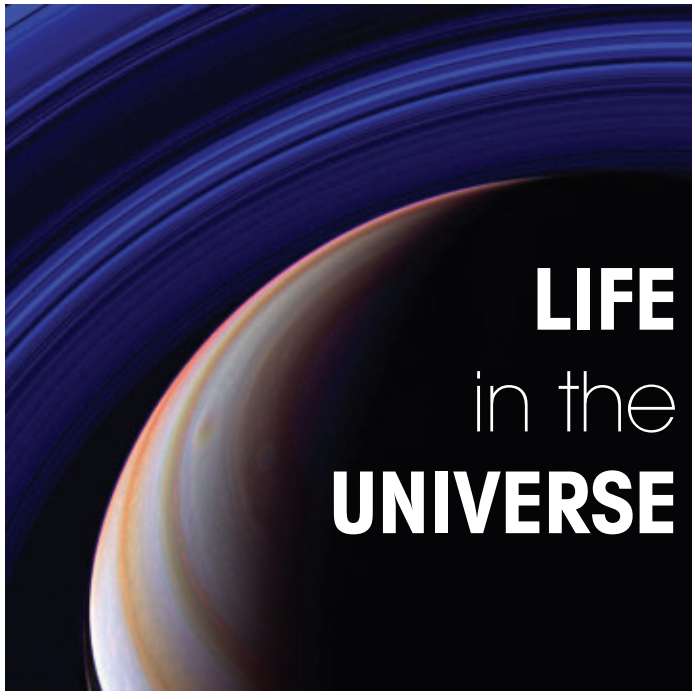
Although research on the natural climate system has advanced, CCSP has made limited progress on research in the area of social sciences, including human drivers of climate change such as energy consumption and the impact on human systems like political institutions and economies. In addition, synthesizing and sharing new knowledge to help policymakers make decisions on mitigation and adaptation strategies has been slow. For instance, although CCSP's temperature trends assessment was influential in this year's report by the Intergovernmental Panel on Climate Change, 19 other synthesis and assessment products that were scheduled for release by now are still in production.

A major hurdle has been CCSP's lack of authority to allocate or prioritize funding across participating agencies. Likewise, many of the members of CCSP's interagency working groups have little budgetary authority to implement the program's research agenda. As a result, progress tends to occur only when the priorities of the 13 participating agencies coincide with CCSP's goals.

This report was the first stage of a two-stage evaluation process recommended by the study committee. The second stage, which will need to be completed by CCSP, will diagnose the reasons for weaknesses and identify strategies for improving the program. — *Jennifer Walsh*

Evaluating Progress of the U.S. Climate Change Science Program: Methods and Preliminary Results. Committee on Strategic Advice on the U.S. Climate Change Science Program, Division on Earth and Life Studies and Division of Behavioral and Social Sciences and Education (2007, 174 pp.; ISBN 0-309-10826-8; available from the National Academies Press, tel. 1-800-624-6242; $38.25 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11934.html>).

The committee was chaired by **Veerabhadran Ramanathan,** Distinguished Professor of Atmospheric and Climate Sciences at the Scripps Institution of Oceanography, University of California, San Diego. The study was funded by the U.S. Climate Change Science Program.



Broadening the Search for Extraterrestrial Life

"No discovery that we can make in our exploration of the solar system would have greater impact on our view of our position in the cosmos, or be more inspiring, than the discovery of an alien life form," declares a recent National Research Council report. But what if in our search we weren't able to recognize alien life because we didn't know what we were looking at? Could alien life be entirely dissimilar to life on Earth?

To explore possible variations on how life could operate in the universe, the committee that wrote the report investigated what is known about the limits for life on Earth, as they may help define the limits for life elsewhere. Life can be found virtually everywhere on Earth when water and energy are both present, and the committee found that extreme conditions of water and temperature are the only situations that appear to limit or prevent the growth of organisms. Even if alien life forms differ radically from life on Earth, they may be confined by these same factors. Other conditions taken to extremes, including pH, pressure, radiation, and toxic metals, restrict the existence of many organisms, but as the discovery of a variety of microbes over the last few decades has revealed, certain

organisms have the capacity to adapt to seemingly inhospitable conditions. The bacterium *Deinococcus radiodurans* can even survive radiation levels unknown in Earth's current natural environment.

The committee reviewed the basic requirements for terrestrial life and found several possible alternative biochemistries. For instance, DNA on Earth is composed of four particular chemical compounds called nucleotides, but lab experiments have shown that six or more nucleotides could be bound together in a structure

that can encode genetic material and may support Darwinian evolution, a key requirement to life. The report notes that organisms with such DNA would not be perceived by standard detection systems designed to spot genetic material. Additional evidence also suggests that proteins, an essential constituent of all cells, need not be limited to the form they take on Earth.

Research also indicates that water might not be the only solvent organisms could use, and the committee concluded that there was "no compelling reason" to limit life in general to water. Under the right conditions, other liquids such as ammonia or formamide could serve the same role as water does in biochemical reactions.

Summing up the report's chief findings, committee chair John Baross said, "Our investigation made clear that life is possible in forms quite different than those on Earth. Advances throughout the last decade in biology and biochemistry show that the basic requirements for life might not be as concrete as we thought."

The findings of the report have obvious ramifications for the future search for alien life. NASA has so far focused on finding evidence of past or present water, but with the report's more comprehensive consideration of life, the search criteria should be broader, particularly to embrace the possibility that organisms might thrive with little or no water. Additionally, further research is needed in the area of life detection systems. NASA should also consider exploring areas of the solar system that might support alternative biochemistries earlier than currently planned, such as Saturn's moon Titan. "Nothing would be more tragic in the American exploration of space than to encounter alien life without recognizing it," the report emphasized.
— *Paul Jackson*

The Limits of Organic Life in Planetary Systems. Committee on the Limits of Organic Life in Planetary Systems, Committee on the Origins and Evolution of Life, Space Studies Board, Division on Engineering and Physical Sciences, and Board on Life Sciences, Division on Earth and Life Studies (2007, 116 pp.; ISBN 0-309-10484-X; available from the National Academies Press, tel. 1-800-624-6242; $30.25 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11919.html>).

The committee was chaired by **John Baross,** professor of oceanography at the University of Washington, Seattle. The study was funded by NASA.

50 YEARS IN THE SKY

A Satellite Success Story

Fifty years ago scientists from dozens of countries embarked on International Geophysical Year research expeditions to collect and share data on various planetary phenomena. But it was the Soviet Union's launch of Sputnik that would forever change the way scientists observe the planet. Even then, researchers knew that no matter how far they ventured on ground or by sea, they could never achieve the observational vantage point that satellites were sure to provide.

Indeed, the ability for humanity to see Earth from space was akin to looking at oneself in the mirror for the first time, notes a new National Research Council report that catalogs many of the scientific achievements — and corresponding benefits to society — made possible by the first five decades of the satellite age.

The scientific accomplishment probably most appreciated by the general public is the ability to watch the weather in motion. These weather movies are made possible by "geostationary" satellites that stay over the same point on the equator, taking frequent images from the same vantage point. Geostationary satellites were first launched in the 1960s, and since then, no hurricane anywhere in the world has gone undetected.

Satellites also have been invaluable to climate science. The radiometer aboard Explorer 7, a U.S. satellite in orbit from 1959-1961, provided the first direct measurements of energy entering and leaving Earth. As satellite radiometers improved, fluctuations in this energy "budget" could be measured and linked to particles from volcanic eruptions or atmospheric greenhouse gases, concentrations of which also could be detected. Data from satellites also provided an important record of global ocean and air temperatures, and led to new revelations of ice sheet flow. And it was only because of frequent satellite coverage that the world was able to watch 2,000 square kilometers of an Antarctic ice shelf disintegrate in just two days during 2002.

The report highlights many other scientific triumphs made possible by these eyes in the sky, and how society took advantage of them. Satellites confirmed the extent of ozone depletion above the poles, for instance, which led to the Montreal Protocol banning ozone-destroying chemicals. Images of land-cover changes allowed for the establishment of the Famine Early Warning Systems Network. Satellites also allow geographical positions to be pinpointed with centimeter accuracy, making GPS a part of everyday life.

The report also echoes concerns raised in earlier Research Council studies that current delays and cancellations in U.S. satellite missions are a setback for science.
— *Bill Kearney*

Earth Observations From Space: The First 50 Years of Scientific Achievements. Committee on Scientific Accomplishments of Earth Observations From Space, Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2007, approx. 200 pp.; ISBN 0-309-11095-5; available from the National Academies Press, tel. 1-800-624-6242; $44.50 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11991.html>).

The committee was chaired by **Jean-Bernard Minster,** professor of geophysics, Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, University of California, San Diego. The study was funded by NASA.

New Web Resource Aims to Improve Drinking Water Quality Worldwide

More than 1 billion people — mainly living in Africa, Asia, Latin America, and other parts of the developing world — lack access to safe drinking water, a fundamental need for human health. As much as 80 percent of the world's deadliest diseases are caused by unsafe drinking water and poor sanitation. Contaminated drinking water is also far more than a public health problem. The devastating effects negatively impact everything from economic development to educational attainment in those countries most affected by inadequate or unsafe drinking water supplies.

To take action on this pressing problem, the National Academy of Sciences and the Global Health and Education Foundation joined together with science, engineering, and medical academies around the world to launch *Safe Drinking Water Is Essential* — a new online resource designed to provide decision makers with easily accessible, peer-reviewed scientific and technical information about the options available to enhance the safety and availability of drinking water supplies.

"Americans lose sight of how precious safe drinking water is," said NAS President Ralph J. Cicerone at a public briefing to launch the new Web resource. "The fact that there is so much unsafe drinking water is a critical problem facing most parts of the world now. The world's scientists have been working on and are very committed to addressing this problem. [This tool] can be used by people working in all nations to analyze and find solutions for the treatment and distribution of water locally with their own conditions," he explained.

"We've seen the misery in the world that's caused by bad water," added Kenneth Behring, founder of the Global

Health and Education Foundation, which provided funding for *Safe Drinking Water Is Essential*. "When you go to these countries and see the water that people drink, they don't have the background or education to even know that it causes disabilities. [With this Web Resource,] we put together an information center that can be expanded for people who want to know more about how to get water that's pure."

Safe Drinking Water Is Essential — located at <www.drinking-water.org> — is an interactive site that provides in-depth information on the sources of drinking water, common naturally occurring and human-induced contaminants, distribution problems, and treatment options. Users will find case studies on problems and conditions specific to different regions of the world, such as an overview of agricultural and industrial pollution in China or arsenic in Bangladesh. Other case studies

provide details on household water treatment options or distribution solutions such as community pumps in Niger. An atlas provides global and regional views of access to safe water in urban and rural areas.

To ensure that this vital knowledge reaches people who need it most, more than 125 science, medical, and engineering academies worldwide are disseminating information about *Safe Drinking Water Is Essential,* which is available in five languages. In addition, those who don't have easy access to the Internet can obtain a CD-ROM version from the Koshland Science Museum; 1-888-KOSHLAND or ksm@nas.edu. Ten thousand free CDs have been produced for distribution to the Peace Corps and other nongovernmental organizations working to improve water quality.

The Marian Koshland Science Museum of the National Academy of Sciences developed the Web resource in collaboration with the Water Science and Technology Board and Office of International Programs of the National Research Council. A scientific steering committee of experts on drinking water issues was convened to develop the content, which also draws on reports from the Research Council. — *Molly Galvin*

Academies Expand Cooperation With Iranian Researchers

In October, Sharif University of Technology, in cooperation with the Iranian Academy of Sciences, hosted visits in several Iranian cities for a delegation from the National Academy of Sciences and National Academy of Engineering. Following conversations with senior Iranian officials and scientific leaders, the U.S. National Academies announced plans to expand their program of scientific cooperation with Iranian institutions. Important activities have been supported by scientific institutions in both countries, despite continuing U.S.-Iranian political differences that complicate bilateral scientific cooperation.

Former NAE President Wm. A. Wulf, who led the U.S. Academies' team, hailed this "historic opportunity to continue our work with Iranian colleagues on problems of global importance that will not only advance international science and engineering, but also build trust and respect for one another throughout our societies."

Iranian participants enthusiastically welcomed plans for expanded cooperation. A bilateral workshop — the ninth in a series that began in 2000 — will focus on reducing earthquake damage. It will be held in Iran in early 2008 on the topic of adobe and unreinforced masonry structures. Also in 2008, an exchange of science policy specialists will begin between the National Academies and Sharif University with special an emphasis on young professionals. These and other projects that emerged from discussions on topics of mutual interest are part of a program of scientific outreach and cooperation that began in 1999 and has been consistently endorsed by the U.S. Department of State and by the Office of Foreign Assets Control of the U.S. Department of Treasury. Financial support was provided by the National Academies and the Richard Lounsbery Foundation. — *William Skane*

National Science, Technology Medals Awarded to Members

At a White House ceremony in July, President George W. Bush presented the 2005 and 2006 National Medal of Science and National Medal of Technology to 30 recipients, many of whom are members of the National Academy of Sciences, National Academy of Engineering, or Institute of Medicine. The National Medal of Science honors individuals for pioneering research in fields such as physical, biological, mathematical, social, behavioral, and engineering sciences. The National Medical of Technology is given to individuals, teams, and companies for their outstanding contributions to the nation's economic, environmental, and social well-being through technology.

Members who received science medals were Hyman Bass (NAS), Marvin H. Caruthers (NAS), Rita R. Colwell (NAS), Peter B. Dervan (NAS/IOM), Nina V. Fedoroff (NAS), Daniel Kleppner (NAS), Robert S. Langer (NAS/NAE/IOM), and Lubert Stryer (NAS) for 2006; and for 2005, Jan D. Achenbach (NAS/NAE), Gordon H. Bower (NAS), Bradley Efron (NAS), Anthony S. Fauci (NAS/IOM), Tobin J. Marks (NAS), Lonnie G. Thompson (NAS), and Torsten N. Wiesel (NAS/IOM).

Technology medals were awarded to members Alfred Y. Cho (NAS/NAE), Leslie A. Geddes (NAE), Paul G. Kaminski (NAE), Herwig W. Kogelnik (NAS/NAE), Charles M. Vest (NAE), and James E. West (NAE). — *Maureen O'Leary*

Contributing to International Capacity Building

The reach and relevance of the work done by the National Academies frequently extends beyond our nation's borders, providing advice that is as valuable in Uzbekistan, Nepal, and Argentina as it is here at home. To facilitate the availability of National Academies reports, the National Academies Press — publishers for the Academies — provides free access to its complete catalog of publications to readers in developing countries. This program, launched in June 2003, serves up free PDF files in almost 150 countries. Over the course of four years, roughly 577,800 users have downloaded more than 632,000 files.

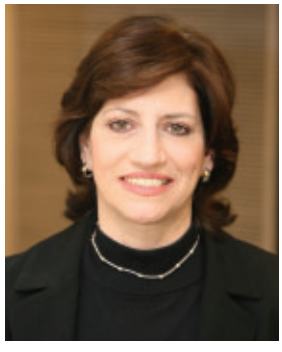
In many developing countries, resources are scarce and high-quality books are often difficult or expensive to obtain. Free Web-based materials can be invaluable sources of information. It is nevertheless rare to find whole collections of authoritative reports freely available. A reader in Pakistan recently wrote to the Academies saying, "I am stunned to see such a great collection of books all at one place on cutting-edge issues faced by the students, researchers, and designers of the 21st century. Hats off to the people who made this possible."

Both searchable and shareable, the PDF files are most frequently downloaded in India, Iran, and China, with Brazil, Uruguay, and Mexico close behind. Indonesia, the Philippines, South Africa, and Egypt round out the top 10 consumers of the free reports. Individual users range from working scientists, researchers, and students to professors, policymakers, and community leaders.

At a time when the world increasingly turns to the scientific disciplines to solve problems and answer questions, the National Academies' PDF program is enabling immediate access to massive amounts of credible advice to readers around the globe. — *Ann Merchant*

IOM President, New Executive Officer Appointed

Harvey V. Fineberg has been appointed to a second six-year term as president of the Institute of Medicine to begin July 1, 2008. In announcing Fineberg's appointment to a second term, NAS President Ralph J. Cicerone said, "Harvey Fineberg's dynamic and purposeful leadership has positioned the IOM to make progressively greater impacts on the U.S. medical care system as well as the health of individual Americans. IOM's strong focus on improving health here and around the world has made it a recognized authority among health policy leaders in both the public and private sectors."



Appointed as the new executive officer of the Institute of Medicine, Judith A. Salerno will begin managing operations for IOM and supporting its governance and membership activities in January 2008. Salerno comes to IOM from the National Institute on Aging, where she serves as deputy director and, together with NIA's director, oversees all aspects of a health research, training, and public education program with an annual budget of more than $1 billion. She is senior geriatrician and serves on numerous national committees concerned with the quality of long-term care and with geriatric work force and veterans' health care issues. She has also served on several management committees and played key roles in NIH activities such as bioethics training strategic planning for obesity research. — *William Skane & Christine Stencel*

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.

Assessing the Current and Future Workforce Needs in Veterinary Medicine.
Board on Agriculture and Natural Resources, Division on Earth and Life Studies; and Board on Higher Education and Workforce, Division on Policy and Global Affairs. Project director: Jim Voytuk. Chair: Alan M. Kelly, professor of pathology and dean emeritus of the School of Veterinary Medicine, University of Pennsylvania, Philadelphia. Sponsors: Association of American Veterinary Medical Colleges, American Veterinary Medical Association, Bayer Animal Health, Burroughs Wellcome Fund, and American Animal Hospital Association.

Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy.
Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences. Project director: John Holmes. Chair: Trevor O. Jones, chairman and chief executive officer, ElectroSonics Medical Inc., Cleveland. Sponsor: U.S. Department of Transportation.

Beryllium Alloy Exposures in Military Aerospace Applications.
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies. Project director: Susan Martel. Chair: Charles H. Hobbs, director, toxicology division, Lovelace Respiratory Research Institute; vice president, Lovelace Biomedical and Environmental Research Institute; and clinical professor, University of New Mexico College of Pharmacy, Albuquerque. Sponsor: U.S. Air Force.

Dietary Supplement Use by Military Personnel.
Food and Nutrition Board, Institute of Medicine. Project director: Maria Ortiz. Chair: M.R.C. Greenwood, professor of nutrition and internal medicine, University of California, Santa Cruz. Sponsors: U.S. Department of Defense, Samueli Institute, and the National Institutes of Health.

Early Childhood Mathematics.
Center for Education, Division of Behavioral and Social Sciences and Education. Project director: Taniesha Woods. Chair: Christopher T. Cross, chairman, Cross & Joftus LLC, Danville, Calif. Sponsors: U.S. Department of Health and Human Services, Ewing Marion Kauffman Foundation, National Institute of Child Health and Human Development, and the National Research Council.

Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communications Devices.
Nuclear and Radiation Studies Board, Division on Earth and Life Studies. Project director: Rick Jostes. Chair: Frank S. Barnes, Distinguished Professor, department of electrical and computer engineering, University of Colorado, Boulder. Sponsors: U.S. Department of Health and Human Services and U.S. Food and Drug Administration.

The National Plant Genome Initiative: Achievements and Future Directions.
Board on Agriculture and Natural Resources and Board on Life Sciences, Division on Earth and Life Studies. Project director: Evonne P.Y. Tang. Chair: Jeff L. Dangl, John N. Couch Professor, University of North Carolina, Chapel Hill. Sponsor: Interagency Working Group on Plant Genomes.

New Opportunities in Solar System Exploration: An Evaluation of the New Frontiers Announcement of Opportunity.
Space Studies Board, Division on Engineering and Physical Sciences. Project director: Dwayne Day. Co-chairs: Reta Beebe, professor, astronomy department, New Mexico State University, Las Cruces; and Warren Buck, adjunct professor of physics, and former chancellor at the University of Washington, Bothell. Sponsor: NASA.

Sustaining Growth in Computing Performance.
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences. Project director: Lynette Millett. Chair: Samuel H. Fuller, vice president of research and development, Analog Devices Inc., Norwood, Mass. Sponsor: National Science Foundation.

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.

2005-2006 Assessment of the Army Research Laboratory
Army Research Laboratory Technical Assessment Board, Division on Engineering and Physical Sciences (2007, 90 pp.; available only online from NAP).

Analysis of Global Change Assessments: Lessons Learned
Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2007, 196 pp.; ISBN 0-309-10485-8; available from NAP).

Applications of Toxicogenomic Technologies to Predictive Toxicology and Risk Assessment
Board on Environmental Studies and Toxicology and Board on Life Sciences, Division on Earth and Life Studies (2007, 300 pp.; ISBN 0-309-11298-2; available from NAP).

Assessment of the NASA Applied Sciences Program
Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, 160 pp.; ISBN 0-309-11075-0; available from NAP).

The Biological Threat Reduction Program of the Department of Defense: From Foreign Assistance to Sustainable Partnerships
Office for Central Europe and Eurasia; Development, Security, and Cooperation; Division on Policy and Global Affairs (2007, 120 pp.; ISBN 0-309-11158-7; available from NAP).

Biosocial Surveys
Committee on Population, Division of Behavioral and Social Sciences and Education (2007, approx. 456 pp.; ISBN 0-309-10867-5; available from NAP).

Building the Road Safety Profession in the Public Sector: TRB Special Report 289
Transportation Research Board (2007, approx. 84 pp.; ISBN 0-309-10442-4; available from NAP).

Cancer-Related Genetic Testing and Counseling — Workshop Proceedings
National Cancer Policy Forum, Institute of Medicine (2007, 134 pp.; ISBN 0-309-10997-3; available from NAP).

Challenges for the FDA: The Future of Drug Safety — Workshop Summary
Board on Health Sciences Policy, Institute of Medicine (2007, 128 pp.; ISBN 0-309-10986-8; available from NAP).

Combined Exposures to Hydrogen Cyanide and Carbon Monoxide in Army Operations — Initial Report
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, approx. 54 pp.; ISBN 0-309-11366-0; available from NAP).

Emergency and Continuous Exposure Guidance Levels for Selected Submarine Contaminants, Vol. 2
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, approx. 306 pp.; ISBN 0-309-11273-7; available from NAP).

Enhancing Professional Development for Teachers: Potential Uses of Information Technology — Report of a Workshop
National Academies Teacher Advisory Council, Center for Education, Division of Behavioral and Social Sciences and Education (2007, 88 pp.; ISBN 0-309-11111-0; available from NAP).

Energy Futures and Urban Air Pollution: Challenges for China and the United States
National Academy of Engineering and Division on Policy and Global Affairs, in collaboration with Chinese Academy of Engineering and Chinese Academy of Sciences (2007, approx. 420 pp.; ISBN 0-309-11140-4; available from NAP).

Health Effects of Beryllium Exposure: A Literature Review
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, 118 pp.; ISBN 0-309-11167-6; available from NAP).

Human Behavior in Military Contexts
Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education (2007, approx. 300 pp.; ISBN 0-309-11230-3; available from NAP).

Improving the Presumptive Disability Decision-Making Process for Veterans
Board on Military and Veterans Health, Institute of Medicine (2007, approx. 985 pp.; ISBN 0-309-10730-X; available from NAP).

Improving the Social Security Representative Payee Program: Serving Beneficiaries and Minimizing Misuse
Center for Economic, Governance, and International Studies, Division of Behavioral and Social Sciences and Education (2007, 182 pp.; ISBN 0-309-11100-5; available from NAP).

India's Changing Innovation System: Achievements, Challenges, and Opportunities for Cooperation — Report of a Symposium
Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2007, 224 pp.; ISBN 0-309-10483-1; available from NAP).

Informing the Future: Critical Issues in Health, Fourth Edition
Institute of Medicine (2007, 120 pp.; available only online from NAP).

International Benchmarking of U.S. Chemical Engineering Research Competitiveness
Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2007, 246 pp.; ISBN 0-309-10537-4; available from NAP).

Is America Falling Off the Flat Earth?
Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (2007, 92 pp.; available only online from NAP).

NASA's Beyond Einstein Program: An Architecture for Implementation
Space Studies Board and Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2007, approx. 220 pp.; ISBN 0-309-11162-5; available from NAP).

Options to Ensure the Climate Record from the NPOESS and GOES-R Spacecraft — A Workshop Report
Space Studies Board, Division on Engineering and Physical Sciences (2007, approx. 88 pp.; ISBN 0-309-11276-1; available from NAP).

Parole, Desistance From Crime, and Community Integration
Committee on Law and Justice, Division of Behavioral and Social Sciences and Education (2007, 114 pp.; ISBN 0-309-11081-5; available from NAP).

Plans and Practices for Groundwater Protection at the Los Alamos National Laboratory: Final Report
Nuclear and Radiation Studies Board, Division on Earth and Life Studies (2007, 104 pp.; ISBN 0-309-10619-2; available from NAP).

Preparing for an Influenza Pandemic: Personal Protective Equipment for Healthcare Workers
Board on Health Sciences Policy, Institute of Medicine (2007, 206 pp.; ISBN 0-309-11046-7; available from NAP).

Protecting Building Occupants and Operations from Biological and Chemical Airborne Threats: A Framework for Decision Making
Board on Chemical Sciences and Technology and Board on Life Sciences, Division on Earth and Life Studies (2007, 152 pp.; ISBN 0-309-10955-8; available from NAP).

Recognition and Alleviation of Distress in Laboratory Animals
Institute for Laboratory Animal Research, Division on Earth and Life Studies (2007, 208 pp.; ISBN 0-309-10817-9; available from NAP).

Reducing Construction Costs: Uses of Best Dispute Resolution Practices by Project Owners — Proceedings Report
Federal Facilities Council, Board on Infrastructure and the Constructed Environment, Division on Engineering and Physical Sciences (2007, 68 pp.; ISBN 0-309-10327-4; available from NAP).

A Research Agenda for Geographic Information Science at the United States Geological Survey
Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, 156 pp.; ISBN 0-309-11154-4; available from NAP).

Research and Networks for Decision Support in the NOAA Sectoral Applications Research Program
Committee on the Human Dimensions of Global Change, Division of Behavioral and Social Sciences and Education (2007, 98 pp.; ISBN 0-309-11202-8; available from NAP).

Review of Chemical Agent Secondary Waste Disposal and Regulatory Requirements
Board on Army Science and Technology, Division on Engineering and Physical Sciences (2007, 92 pp.; ISBN 0-309-10610-9; available from NAP).

Review of the DOD-GEIS Influenza Programs: Strengthening Global Surveillance and Response
Board on Global Health, Institute of Medicine (2007, 248 pp.; ISBN 0-309-11010-6; available from NAP).

A Review of the Final Ocean Research Priorities Plan and Implementation Strategy
Ocean Studies Board, Division on Earth and Life Studies (2007, 148 pp.; ISBN 0-309-11063-7; available from NAP).

The Role of Theory in Advancing 21st Century Biology: Catalyzing Transformative Research
Board on Life Sciences, Division on Earth and Life Studies (2007, approx. 234 pp.; ISBN 0-309-11249-4; available from NAP).

Sediment Dredging at Superfund Megasites: Assessing the Effectiveness
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, 316 pp.; ISBN 0-309-10977-9; available from NAP).

Social Security Administration Electronic Service Provision: A Strategic Assessment
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2007, 174 pp.; ISBN 0-309-10393-2; available from NAP).

Software for Dependable Systems: Sufficient Evidence?
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2007, 148 pp.; ISBN 0-309-10394-0; available from NAP).

State and Local Government Statistics at a Crossroads
Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2007, 184 pp.; ISBN 0-309-11136-6; available from NAP).

The State of Quality Improvement and Implementation Research: Expert Views — Workshop Summary
Board on Health Care Services, Institute of Medicine (2007, 108 pp.; ISBN 0-309-11071-8; available from NAP).

Strategic Management of Information and Communication Technology: The United States Air Force Experience With Y2K
Division on Policy and Global Affairs; and Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2007, 142 pp.; ISBN 0-309-11128-5; available from NAP).

Strategy for an Army Center for Network Science, Technology, and Experimentation
Board on Army Science and Technology, Division on Engineering and Physical Sciences (2007, 98 pp.; ISBN 0-309-10696-6; available from NAP).

Summary of a Workshop for Software-Intensive Systems and Uncertainty at Scale
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2007, 78 pp.; ISBN 0-309-10844-6; available from NAP).

Understanding American Agriculture: Challenges for the Agricultural Resource Management Survey
Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2007, 214 pp.; ISBN 0-309-11092-0; available from NAP).

Understanding the Benefits and Risks of Pharmaceuticals — Workshop Summary
Board on Health Sciences Policy, Institute of Medicine (2007, 98 pp.; ISBN 0-309-10738-5; available from NAP).

Understanding Interventions That Encourage Minorities to Pursue Research Careers — Summary of a Workshop
Board on Life Sciences, Division on Earth and Life Studies (2007, 100 pp.; ISBN 0-309-11226-5; available from NAP).

Veterans and Agent Orange: Update 2006
Board on Population Health and Public Health Practices, Institute of Medicine (2007, approx. 900 pp.; ISBN 0-309-10708-3; available from NAP).

Water Implications of Biofuels Production in the United States
Water Science and Technology Board, Division on Earth and Life Studies (2007, approx. 86 pp.; ISBN 0-309-11361-X; available from NAP).

Ready, Set, SCIENCE!

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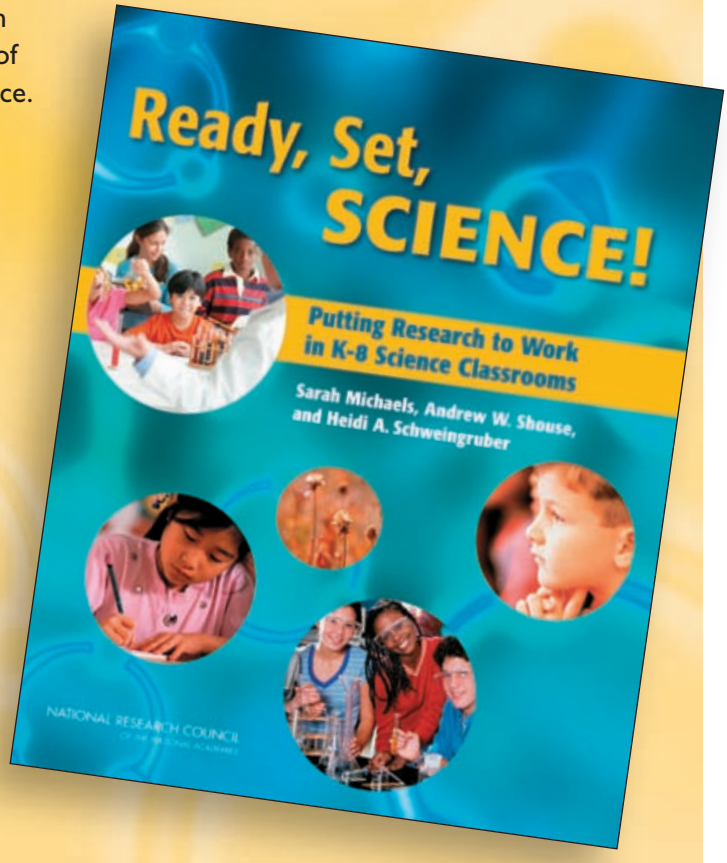

ISBN 0-309-10614-1
$22.95
220 pages
National Academies Press

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