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Water Management in Colorado River Basin

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Building a Robust Earth Information System

Winter/Spring 2007
vol. 7 number 1

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.

Credits:

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An Interesting Time Indeed

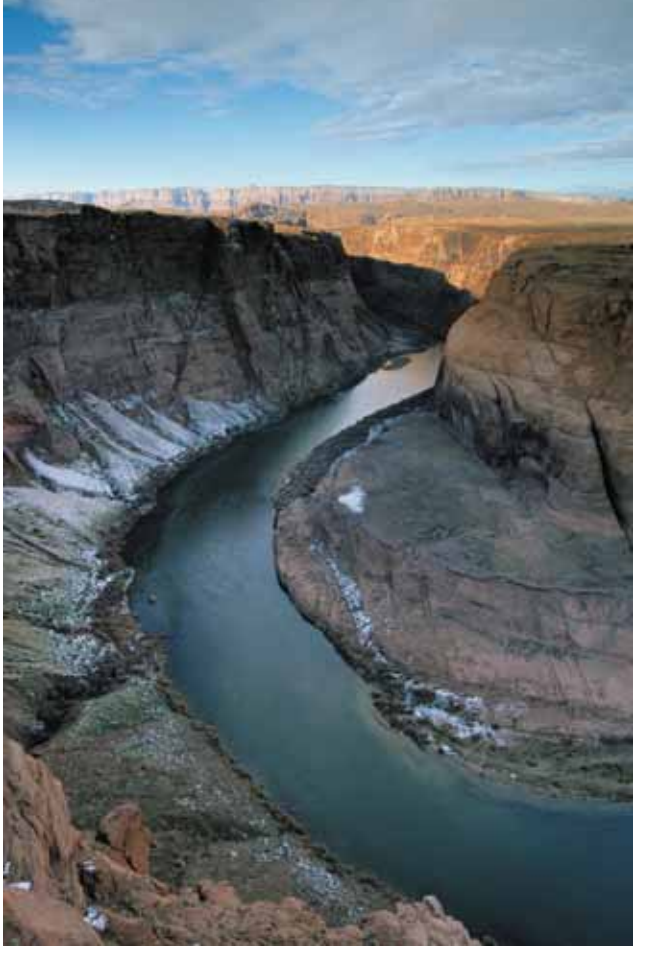
On completing my second term this June 30th, I will step down as president of the National Academy of Engineering. It has been an incredible pleasure to have the privilege to work with my counterparts in the NAS and IOM, and indeed, with all the staff, the members of the National Academies, and the volunteers who serve on our committees. It's been a stimulating time!

As president, I did a lot of traveling outside the U.S., and as a result came to understand at a much deeper level the value of our Academies. Similar academies in other countries don't generally provide their nations with the kind of independent, fact-based, peer-reviewed analysis and advice that we do. Perhaps that was all right in a simpler time, but as societies worldwide become more technologically dependent, it's inevitable that more public policy issues will need to be resolved with a full and balanced understanding of the available scientific and technical options and their implications. The contents of this issue of *In Focus* are an excellent example of this. Issues covered range from explosives detection, to risk assessment, to "smart" prosthetics, to capacity-building of academies in other nations, and more. All these areas need the kind of input and guidance that the National Academies provide.

The last 11 years have been an "interesting time" to be at the Academies. One of the first things that happened after I arrived was that we lost a court case that removed our ability to operate outside the jurisdiction of the Federal Advisory Committee Act, or FACA, seriously endangering our independence. Had this ruling stood, the Academies would have been put out of business. Fortunately, enough members of Congress understood the value of the National Academies that a special section was added to FACA that applies almost exclusively to us. We had to change our way of doing some things, such as posting proposed committee rosters for public comment and publishing the name of reviewers in our reports. But in the end I believe those changes improved and strengthened our processes.

We also embarked on a capital campaign that helped us gather the resources to do studies on important issues of science and policy without government or foundation support — such as *Rising Above the Gathering Storm*. We also built a new building, the Keck Center, which has enhanced considerably our ability to collaborate internally. We underwent a major reorganization and significantly improved our business practices. And, along the way, we tackled a number of sensitive and controversial issues. I've enjoyed playing a role in the development of this unique set of institutions. Oh yes, it's been quite an interesting time. Thanks to you all.

WM. A. WULF
President, National Academy of Engineering



TROUBLED **WATERS**

New Findings and Regional Trends Are Complicating Colorado River Water Management

For most of the last century, the only information on the Colorado River's streamflow came from a series of gauges that measure flows at various points along the river. Over the years, these gauges provided the data upon which many contentious water-allocation negotiations were based. In fact, measurements from the U.S. Geological Survey's gauging station at Lees Ferry, Arizona, were cited in the 1922 Colorado River Compact, which to this day governs the allocation of water between states in the upper and lower basin.

More recently, scientists have started looking further back in history to get a better idea of the river's average flow. They were able to do so by studying coniferous trees with long life spans across the region. Because moisture availability is reflected in the annual growth rings of trees that grow at low elevations, scientists can use this information to reconstruct past climatic conditions and, in turn, estimate river flows.

What they have learned is that the Colorado River's average flow over the past four to five centuries has fluctuated more than previously assumed, exhibiting periods when average flows were higher and lower than the average measured by gauges during the last century, according to a new report from the National Research Council. In particular, the tree-ring data show that there were several periods when flows were considerably lower than those

measured at Lees Ferry since 1921, and that the period just prior to the signing of the compact was exceptionally wet. Equally important, the tree rings indicate that extended droughts, like the one experienced in recent years, are a recurrent feature of the Colorado River basin.

The new data are prompting much discussion among water managers in many arid parts of the western United States where the Colorado River is the main source of surface water. River management decisions rely heavily on forecasts that assume the instrumental record of past water conditions will generally be replicated in the future. But the tree-ring data call these assumptions into question, the report says.

Further complicating the forecasts is a warming trend in the West that shows no signs of dissipating. The recent drought is not unprecedented, as the tree-ring data show, and could be chalked up to natural climate variability. Droughts in the future, however, are likely to be more severe because of rising temperatures. A preponderance of evidence suggests that warmer temperatures will reduce Colorado River streamflow and water supplies, the report says. Even if precipitation levels remain the same, streamflow could drop because warmer temperatures mean more rain will fall than snow, reducing the snowpack that gradually feeds the river. More water will be lost to evaporation as well.

Higher temperatures will also increase the demand for water from a rapidly growing population across the western United States. Although some of the added stress placed on water supplies by this burgeoning population has been abated through technology and conservation,

demand is rising sharply. Water consumption doubled from 1985 to 2000 in Clark County, Nevada, where Las Vegas is located, for example.

Technology and conservation will not provide a panacea for coping with water shortages in the long run, the report warns. It also notes that the practice of transferring agricultural water rights to municipalities — often a preferred method for meeting urban water demand in the basin — may have undesirable effects on "third parties," such as downstream farmers or ecosystems. The agricultural water supply is also not unlimited. Cooperation among basin states, informed in part by a comprehensive basin-wide study of water practices, will be essential in managing future droughts, as will better communication between scientists and water managers. — *Bill Kearney*

Colorado River Basin Water Management: Evaluating and Adjusting to Hydroclimatic Variability. Committee on the Scientific Bases of Colorado River Basin Water Management, Water Science and Technology Board, Division on Earth and Life Studies (2007, approx. 218 pp.; ISBN 0-309-10524-2; available from the National Academies Press, tel. 1-800-624-6242; $44.75 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11857.html>).

The committee was chaired by **Ernest T. Smerdon,** emeritus dean of the College of Engineering and Mines, University of Arizona, Tucson. The study was funded by the National Academies, U.S. Bureau of Reclamation, California Department of Water Resources, Metropolitan Water District of Southern California, and the Southern Nevada Water Authority.

Back to the Drawing Board

PROPOSAL TO STANDARDIZE RISK ASSESSMENTS SHOULD BE PULLED

A White House Office of Management and Budget draft bulletin proposing new technical standards for federal risk assessments should be withdrawn, according to a National Research Council committee.

Risk assessments, which gauge the threat posed by such things as exposure to a chemical or the potential failure of a nuclear power plant, underpin many federal regulations. OMB issued the draft bulletin in January last year and soon after requested that the Research Council review the document. The bulletin's stated goal was to improve the quality and objectivity of federal risk assessments, but the review committee said that the bulletin was "fundamentally flawed" and would not meet this goal if implemented.

"We began our review figuring that we would only be recommending modifications to the bulletin, but the more we dug into it, the more we realized it should be withdrawn altogether," said committee chair John F. Ahearne, director of the ethics program at Sigma Xi, The Scientific Research Society, Research Triangle Park, N.C.

In particular, the bulletin's new definition of risk assessment was too broad — "one size does not fit all" when it comes to risk assessments, the committee said — and many of the document's proposals were inconsistent with past expert recommendations on risk assessments.

OMB also erred by focusing too heavily on human health risk assessments and neglecting assessments of technology and engineered structures, critical to agencies like NASA. Too little attention also is paid to the importance of risk communication and to the risks faced by sensitive populations such as children and pregnant women. And the bulletin's definition of an adverse health effect implies that only clinically apparent effects should be considered adverse, ignoring a fundamental public health tenet to control exposures before they cause functional impairment.

The committee also criticized OMB for not having established a baseline of each agency's proficiency at conducting risk assessments, making it difficult to measure the success of any changes to current practice. Nor was the cost of implementing the bulletin estimated, even though it would likely be significant.

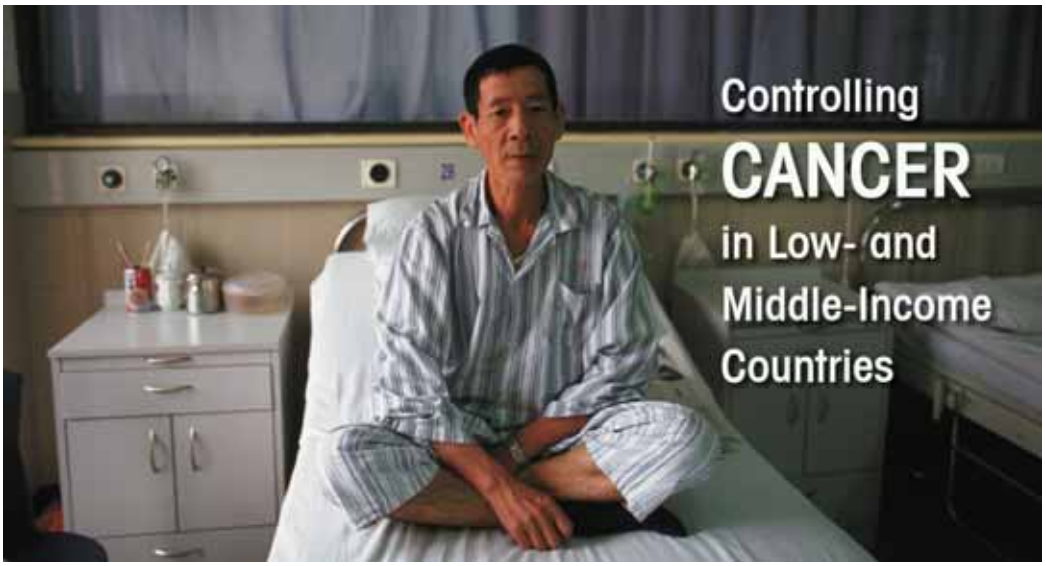
The committee agreed with OMB that there is room for improvement in federal risk assessments. It recommended that after further study of agency practices and needs, OMB should issue a new type of bulletin with goals and general principles for risk assessments, but the development of technical guidelines to meet those goals and principles be left to the agencies.

Following release of the committee's review, an OMB spokesperson said that the bulletin would not be finalized in its current form. — *Bill Kearney*

Scientific Review of the Proposed Risk Assessment Bulletin from the Office of Management and Budget. Committee to Review the OMB Risk Assessment Bulletin, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, approx. 324 pp.; ISBN 0-309-10477-7; available from the National Academies Press, tel. 1-800-624-6242; $62.75 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11811.html>).

The committee was chaired by **John F. Ahearne,** director, ethics program, Sigma Xi, The Scientific Research Society, Research Triangle Park, N.C. The study was funded by the U.S. Environmental Protection Agency; U.S. departments of Agriculture, Defense, Energy, Health and Human Services, and Labor; and NASA.

An Overlooked Killer



Nutritional deficiencies and infectious scourges rightfully demand significant shares of the attention and resources available in low- and middle-income nations where they claim so many lives. But cancer exacts a ruthless toll on these nations as well — countries ranging from the poorest in Africa and Southeast Asia, to nations such as Brazil and India that have growing middle and upper classes. Four million deaths from cancer — 1 million more than deaths from HIV/AIDS — occur annually in this group of countries.

Even as these nations struggle with basic public health problems, they and the larger global community should be directing resources to developing effective cancer control programs. But cancer is generally low on or absent from the health agenda in these nations, says a new report from the Institute of Medicine. The report calls for national governments, health professionals, and the global health community to begin taking steps to develop such programs in low- and middle-income countries.

"We do not suggest a single prescription that would work in all these diverse countries, nor do we envision comprehensive cancer control being possible without significant improvements in the health care systems in these nations," said Frank A. Sloan, chair of the committee that wrote the report. "But there are global priorities and approaches to cancer control and planning that are feasible at low resource levels, and they should be applied starting now."

Prevention often is the most effective approach to cancer control. The biggest cause of cancer in low- and middle-income countries — tobacco — is also one of the most avoidable. Evidence is available to help curb rising smoking rates. Target countries also need financial and technical support to provide vaccinations against viruses linked to cancer, which could reduce liver and cervical cancer deaths.

Cancer care in low- and middle-income countries must be guided to a large extent by the level and type of resources available for prevention, diagnosis, and treatment. For example, early-stage breast cancer can be treated by lumpectomy and radiation therapy alone. However, radiation treatment may not be available in some nations

because of cost or lack of equipment. But mastectomy and chemotherapy can still save lives in these places.

Attention should be turned toward palliative care, a crucial element of cancer treatment when patients are diagnosed late, the report urges. It suggests ways that low- and middle-income nations could ease unnecessarily strict limits on strong opioid painkillers such as morphine to make these drugs more readily available to cancer patients, who frequently suffer great pain, especially as they approach death.

Cancer control will not advance in these nations, however, without international support from the health and development communities, the report adds, and more than financial assistance is needed. Public- and private-sector organizations in the United States and other countries should provide information and technical assistance to the target nations. The report urges each low- or middle-income country to develop at least one cancer "center of excellence" that will serve as the nation's focal point of efforts to control cancer and as the international point of contact.

Established medical institutions in industrialized nations should partner with new and developing cancer centers to exchange information, provide training, and engage in other activities to help them improve, the report says. The international oncology community also should help develop programs to promote awareness of cancer and support for control efforts in the target countries. The report cautions high-income countries to resist exporting the latest, most expensive technologies that may be appropriate for wealthy countries, but for which alternatives exist that might be more feasible and cost-effective for low- and middle-income nations. — *Christine Stencel*

Cancer Control Opportunities in Low- and Middle-Income Countries. Committee on Cancer Control in Low- and Middle-Income Countries, Board on Global Health, Institute of Medicine (2007, 340 pp.; ISBN 0-309-10384-3; available from the National Academies Press, tel. 1-800-624-6242; $49.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11797.html>).

The committee was chaired by **Frank A. Sloan,** J. Alexander McMahon Professor of Health Policy and Management, and professor of economics, Center for Health Policy, Law, and Management, Duke University, Durham, N.C. The study was funded by the National Cancer Institute and the American Cancer Society.

FIGHTING FLU at the Community Level

Would closing offices and schools lessen the severity of a flu pandemic, should one strike the United States? Could isolating infected people in their homes slow the spread of a lethal virus?

During a pandemic, public health and government officials could use a range of potential strategies to try to reduce the spread of infection, including quarantines and other containment interventions at the community level. These interventions form the cornerstone of newly released federal guidelines that advise states and local municipalities on how to proceed until more drugs and vaccines become available. In the event of a severe flu pandemic, schools should close for up to three months and all members of any household with an infected person should stay isolated voluntarily for up to 10 days, the guidelines say.

In December, a report by the Institute of Medicine said communitywide interventions have a role in controlling illnesses and deaths during a pandemic, but it cautioned officials to not overstate the certainty of their effectiveness to the public. Given that these strategies would have negative consequences as well as benefits, community leaders should exercise caution in implementing them, the report adds.

These conclusions emerged from examination of computer models that simulate different actions and forecast their implications, in addition to analyses of historical records on past flu outbreaks. Government officials invoked community containment interventions during previous flu pandemics. In 1918, for example, some city and town leaders closed schools and theaters and banned public gatherings in an effort to keep the pandemic at bay.

Early action has been associated with flatter epidemic curves and may have lowered the peak death rate during previous outbreaks. But at the same time, some cities that took such steps still experienced high rates of illness and mortality.

Computer models can help officials organize available information about a pandemic situation and inform discussions about the options available. However, the models are inherently limited and provide only an aid — not a roadmap — for decision-making, the report says.

Reducing exposure to infection through many community interventions will come with a price. For example, closing workplaces could lead to loss of income that would be devastating to families living from paycheck to paycheck. School closures would mean loss of access to free, nutritional meals for some children. The report urged public officials to consider all possible outcomes and use community containment strategies only when the potential benefit outweighs the likely harms.

— *Christine Stencel*

Modeling Community Containment for Pandemic Influenza: A Letter Report. Committee on Modeling Community Containment for Pandemic Influenza, Board on Population Health and Public Health Practice, Institute of Medicine (2006, 47 pp.; available only on the Internet at <www.nap.edu/catalog/11800.html>).

The committee was chaired by **Adel Mahmoud,** former president, Merck Vaccines, Princeton, N.J. The study was funded by the U.S. Department of Health and Human Services.

Detecting **NEW THREATS** in Airports

PROMISING TECHNOLOGY MAY BE THE WAVE OF THE FUTURE

Over the past 30 years, the Federal Aviation Administration, and more recently the Transportation Security Administration, has funded the development of technologies that screen aircraft passengers and their luggage faster and better. But the detectors and screening devices currently in use aren't able to detect nonmetallic concealed objects or small traces of explosives.

Technologies using millimeter and terahertz waves — a spectrum of electromagnetic waves with frequencies between infrared light and microwaves — promise to do just that, according to a new report from the National Research Council. Universities, national laboratories, and the commercial sector are increasingly focusing on the research and development of devices using these waves to secure buildings, ports, and borders, and hopefully airports in the near future. So far, these technologies can detect nonmetallic objects concealed on people or in luggage but not whether they are explosives or weapons.

"Threats have evolved over time to include plastic and ceramic handguns and knives, as well as explosives that are not recognized by metal detectors," said James O'Bryon, chair of the committee that wrote

the report. "Millimeter and terahertz wave technology could allow us to detect such threats in the future, and progress in this area, although limited, is encouraging."

One key advantage of millimeter and terahertz waves over X-rays is that they are nonionizing, making them safer — especially if used repeatedly on the same individual. A device using these waves works like a camera measuring the energy radiated or reflected by an object to create an image.

Two types of imaging techniques are currently being tested: active and passive. Passive imaging systems detect the energy naturally radiated by objects, revealing contrasts between warm and cold areas — such as a cold metal weapon obscuring part of a warmer human body. Active imaging systems scan a subject with a beam of light and then detect the reflected energy, revealing concealed objects.

The resolution of the images from both types of system is still too low to recognize specific explosives or weapons, the report says. One way to solve the problem is to compare the images of objects to those in a database of known dangerous items. A computer program would try to match the object's image with at least one in the database. If a match is found, a security officer would perform a search or ask the person to remove the suspicious item. The database information would also help security officers search only individuals with items deemed suspicious by the computer program.

Another limitation of the imaging techniques is that they reveal anatomical details that a person could find embarrassing or consider a violation of privacy. This issue needs to be addressed rigorously by legal experts and psychologists, the committee said.

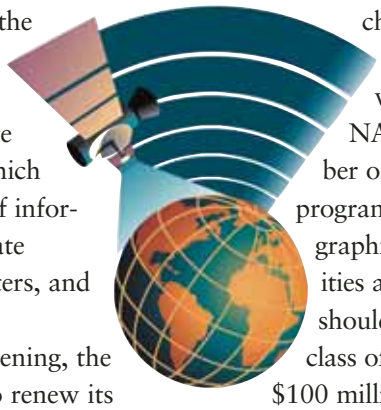
Because of such limitations, these technologies may have to be combined with other screening techniques, the report says. TSA should examine how to mix various screening technologies to enhance the detection of weapons and explosives.

Developing an effective millimeter/terahertz-wave screening device can be costly, the report notes. TSA should collaborate with universities, national laboratories, and businesses that have already invested extensively. TSA should also assess whether these technologies can realistically be deployed for transportation security. — *Patrice Pages*

Assessment of Millimeter-Wave and Terahertz Technology for Detection and Identification of Concealed Explosives and Weapons. Committee on Assessment of Security Technologies for Transportation, National Materials Advisory Board, Division on Engineering and Physical Sciences (2007, 88 pp.; ISBN 0-309-10469-6; available from the National Academies Press, tel. 1-800-624-6242; $18.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11826.html>).

James F. O'Bryon, chair of the O'Bryon Group, Bel Air, Md., chaired the committee. The study was funded by the Transportation Security Administration.

A New Look at Planet Earth — **From Space**



By 2010, 40 percent of the scientific instruments on U.S. satellites that collect environmental data are expected to stop working, which will lead to a dramatic loss of information needed to study climate change, predict natural disasters, and monitor shifts in ecosystems.

To prevent this from happening, the U.S. government will have to renew its commitment to earth science research. NASA and the National Oceanic and Atmospheric Administration should replace aging instruments and develop new ones for the next decade and beyond, says a new report from the National Research Council.

In 2005, the Research Council warned that the national system of environmental satellites was "at risk of collapse." Since then, there have been further cancellations and delays of NASA missions and dramatic, deleterious changes in plans for the next generation of NOAA meteorological satellites.

The new report recommends that NASA and NOAA undertake a set of 17 missions of different sizes from 2010 to 2020 that would ensure continuity of several key measurements and develop urgently needed new capabilities. These missions and associated programs will underpin an integrated and robust earth information system to address a broad range of societal needs, such as more reliable weather forecasts, early earthquake warnings, and improved pollution management, benefiting both scientific discovery and the health and well-being of society.

The strategy recommended by the report will provide a global view of the Earth's environment, weather, and climate. However, satellites don't have the ability to detect changes in how the environment affects populations or vice versa. To help fill this gap, NASA should increase the number of its land-based and airborne programs and pursue socio-demographic studies of how human activities affect the environment. NASA should also create a new Venture class of low-cost missions — between $100 million and $200 million — to help foster innovative ideas and test higher-risk technologies, the report says.

The report also discusses a mismatch between agency responsibilities and agency budgets, which has resulted in difficulties that include guaranteeing the continued availability of data from the Landsat spacecraft, a joint initiative of the U.S. Geological Survey and NASA that has provided the best means of examining the relationship between human activities and their terrestrial environment. The White House Office of Science and Technology Policy should develop and implement a plan for achieving and sustaining global observations that recognizes the complexity of differing agency roles, responsibilities, and capabilities. — *Patrice Pages*

Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond. Committee on Earth Science and Applications from Space: A Community Assessment and Strategy for the Future, Space Studies Board, Division on Engineering and Physical Sciences (2007, approx. 400 pp.; ISBN 0-309-10482-3; available from the National Academies Press, tel. 1-800-624-6242; $47.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11820.html>).

Richard A. Anthes, president, University Corporation for Atmospheric Research, Boulder, Colo., and **Berrien Moore III,** director, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, Durham, co-chaired the committee. The study was funded by NASA, NOAA, and the U.S. Geological Survey.

A Lost Bounty

Native Vegetables Could Help Solve Africa's Food Crisis

A greater effort to explore the potential of Africa's native vegetables could make plants such as the bambara bean and the moringa tree as popular as hot dogs and apple pie are in America.

The African continent is home to hundreds of indigenous vegetables and other food plants that fell out of favor as well-known vegetables were introduced from other parts of the world. These native plants provide rich nutrition while surviving harsh conditions, but because they have received little or no scientific investment, they are a lost bounty in a hungry land. Efforts to better understand the potential value of such plants could lead to enhanced agricultural productivity, more-stable food supplies, and higher incomes in rural areas across Africa, says a new National Research Council report.

The report focuses on the exemplary promise of 18 African plants and vegetables to help feed the continent's growing population and spur sustainable development. For example, bambara, locust, and long beans can thrive in very hot, dry climates. The nutritional balance of bambara beans is so outstanding that some consumers claim they could live on this legume alone. Locust and long beans could also be key crops for bolstering Africa's nutritional well-being. And long bean plants in particular can quickly produce a lot of food in small spaces.

Amaranth is among the most widely eaten boiled greens in Africa's humid lowlands. The leaves provide vitamin C and dietary minerals and their protein quality is exceptional. Furthermore, the plant is easy to produce and fast-growing. The leaves of the baobab tree also provide protein, vitamins, and minerals, and they can be dried for storage.

Seeds from cowpea, dika, egusi, and lablab plants would be useful in initiatives

to tackle chronic malnutrition, given their high protein. In addition, egusi can thrive in dry climates where malnutrition among infants is rampant. Lablab is also useful for suppressing weeds.

The resilient moringa tree provides at least four highly nutritious edibles: pods, leaves, seeds, and roots. It also furnishes many raw ingredients for products that make village life more self-sufficient, such as lamp oil, wood, and liquid fuel. The seeds can help purify cloudy water by causing silt and microorganisms to settle out.

Fast-growing and high-yielding okra provides three valuable food products: pods, leaves, and seeds. The plant adapts to many difficult climates and rarely succumbs to disease. Enset, a banana-like herb, is a starchy staple in Ethiopia's highlands. Like okra, many parts of the enset crop are useful.

The egg-shaped nut of shea trees produces a solid, butter-like vegetable fat used to enhance the taste, texture, and digestibility of regional dishes. Many Africans also use it for skin care, and the product has gone global as an ingredient in some cosmetics.

Tubers of the yambean plant have more than twice the protein of sweet potatoes, yams, or potatoes — and more than 10 times that of cassava. The African yambean grows easily and is well-suited to the tropics. The marama plant also produces high-protein tubers. Additionally, Africa's native potatoes, high in carbohydrates, provide calcium, vitamin A, and iron.

The leaves, stems, and flower spikes of the self-reliant celosia plant are used to make a nutritious soup favored across West Africa. Also easy to grow is the African species of eggplant, which is high-yielding and has a storage life of up to three months.

These plants are powerful tools for tackling many basic problems across the African continent, the report concludes. Greater awareness and support of these ancient crops would be a welcome boost to Africa today. A companion report planned for release this year will detail the promise of Africa's native fruits. These two reports will form the second and third volumes of a series that also covers African grains.

— *Vanee Vines*

Lost Crops of Africa: Volume II — Vegetables. Panel on African Fruits and Vegetables, Division on Policy and Global Affairs (2006, 378 pp.; ISBN 0-309-10333-9, available from the National Academies Press, tel. 1-800-624-6242; $59.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11763.html>).

The panel was chaired by **Norman Borlaug,** distinguished professor of international agriculture, Texas A&M University, College Station; president, Sasakawa Africa Association, Washington, D.C.; and senior consultant to the director general, International Maize and Wheat Improvement Center, Mexico City. Funding for the project was provided by the U.S. Agency for International Development's Bureau for Africa, with additional support from their Office of U.S. Foreign Disaster Assistance and the National Academies.

Getting **"Residence"** Right

The mechanics of census-taking have changed dramatically since 1790, when marshals set off on horseback to conduct the nation's first headcount. Yet every decennial census has adopted the same basic goal of counting individuals only once, and at their "usual" place of residence.

However, "usual residence" can be extremely difficult to define and measure, especially in today's highly mobile and diverse society. Some people have ties to multiple places, such as children in shared custody arrangements, and others lack connections to any fixed one. In 2000, the Census Bureau used 31 formal residence rules to try to account for all possibilities. But those rules were too complicated — and often hard to apply, says a recent National Research Council report. Instead, the bureau should use core principles to determine residency for the 2010 census, and the bureau should improve how it communicates them to respondents. The agency also should study ways to collect data on how individuals are connected to dwellings that are not their usual residences.

The panel that wrote the report suggested several core principles. Among them, individuals living in the United States, including non-U.S. citizens, should be counted where they live or sleep more than any other place. Also, a person's individual circumstances should be the basis for determining usual residence, instead of family relationships or group labels such as "persons in hospitals."

When living arrangements are not straightforward, the burden of deciding usual residence should be shifted from census respondents to the bureau, the report adds. Under this approach, people would provide information on ties to another residence so the agency could make the most accurate determination possible.

Another persistent challenge is collecting information from people who live in group quarters, including college students in dormitories and prisoners. Such residents should be approached and counted in the same manner as the general household population, the report says. Questionnaires should be distributed to and completed by them, or administered by enumerators. The bureau also should develop a special form to collect responses from a central administrator or from facility records when direct access to people living in group quarters is not possible or allowed.

Census data are used primarily to distribute political power through the drawing of congressional and state legislative district boundaries and to allocate funds for public programs. Having accurate census information is a component of good government, both researchers and policymakers agree.
— *Vanee Vines*

Once, Only Once, and in the Right Place: Residence Rules in the Decennial Census. Panel on Residence Rules in the Decennial Census, Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2006, 376 pp.; ISBN 0-309-10299-5, available from the National Academies Press, tel. 1-800-624-6242; $52.00 plus $4.50 shipping for single copies; also on the Internet at <www.nap.edu/catalog/11727.html>).

The panel was chaired by **Paul R. Voss,** professor emeritus, department of rural sociology, University of Wisconsin, Madison. The study was sponsored by the U.S. Census Bureau.

Smart Prosthetics

Exploring Assistive Devices for the Body and Mind

BY HALEY POLAND

Whether they are helping a blind person see, a deaf person hear, or an amputee walk, prostheses have come a long way. What were once wooden limbs and glass eyes are now man-made electromechanical devices capable of interfacing with the body's systems and communicating, almost intelligently, with the nerves and brain. From joint replacements, cochlear devices, and brain implants to artificial valves, hearts, and limbs, prosthetic devices are beginning to blur the line between technology and biology.

Last November, more than 150 researchers from wide-ranging fields, including biomedical and material engineering, surgery, neurology, and military medicine, converged upon the Beckman Center in Irvine, California, at the fourth annual conference of the National Academies Keck *Futures Initiative*, "Smart Prosthetics: Exploring Assistive Devices for the Body and Mind." The conference challenged participants to determine just what "smart" means and how best to achieve that smartness in the future. Funded by a $40 million grant from the W.M. Keck Foundation in 2003, the *Futures Initiative* is a 15-year effort to enhance communication among researchers, funding organizations, universities, and the general public, with the objective of stimulating interdisciplinary research at the most exciting frontiers.

Because prostheses are man-made structures designed to exist beside or within the human body, the field of prosthetics is inherently interdisciplinary. However, a problem that needs to be confronted to continue the progress being made — aptly stated by Hunter Peckham, who chaired the conference organizing committee — is that "we've grown up in scientific silos." To bridge the gaps, 13 overview tutorials were webcast live prior to the conference, presenting the basics of relevant fields and the state of the science in those fields today.

In one tutorial, Warren Grill, an associate professor of biomedical engineering, neurobiology, and surgery at Duke University, walked conference participants through the fundamentals of neural stimulation and recording. In another, Bradford Bennett, who is the research director of the Motion Analysis and Motor Performance Laboratory and an assistant professor at the University of Virginia, discussed the promise of patient-specific orthotics that record and adapt to a person's unique gait.

Addressing another integral aspect of prosthesis development, Mark Humayan, a professor of ophthalmology at the Keck School of Medicine, and Frances Richmond, director of the regulatory science program at the University of Southern California, outlined the rigorous regulatory process a medical device must go through on its path "from benchtop to bedside."

"If we choose the wrong path," Richmond said, "we greatly delay and make more expensive our ability to get to a commercial market."

In addition to other tutorials on topics such as brain plasticity and biointerfacing electrodes, two researchers recounted their personal experiences with prosthetic devices, giving insight into the life-changing impact such devices can have. Alexander Rabchevsky, an assistant professor of physiology at the University of Kentucky's Spinal Cord and Brain Injury Research Center and a paraplegic since a motorcycle accident in the 1980s, now uses surgically implanted Functional Electrical Stimulation (FES) to stand, if only for a few moments. Hugh Herr, associate professor of media arts and sciences at Massachusetts Institute of Technology, lost both legs below the knee to frostbite in a climbing accident when he was 17. Calling himself a better rock-climber with his specialized prostheses than he was before the accident, Herr now builds cutting-edge limb devices that use technology to harness and even improve upon the abilities of the human body.

With the tutorials as a foundation, small, diverse groups spent eight hours over the course of the conference trying to address a challenge problem or question. The groups contemplated plans to restore sensory perception of limb movement, design a prosthesis that could grow with a child, replace damaged brain tissue, and design a functional tissue prosthesis. Others tackled problems like electrode longevity, the best way for electrodes to interface with the brain, and how hybrid prostheses might exploit electrical processes within nerve cells.

Both during the task group sessions and periods of relaxation at the conference, an invaluable outcome became evident: relationships formed across disciplines. "I definitely met people that I'll be talking to very soon," said one scientist on the last day. "The important stuff happens after the conference."

For this reason, the *Futures Initiative* offers an incentive for collaboration as part of its mission to promote innovative scientific investigation. Each year, $1 million in seed grants, up to $75,000 each, are awarded on a competitive basis to conference participants wishing to pursue interdisciplinary research, learn new skills, or perhaps keep alive a fledgling dialogue begun at the conference.

For thousands of people living with disabilities, such collaborations and the evolution in prosthetics that hopefully will result could mean faster rehabilitation, more effective therapy, and even return to an independent life. With conferences like "Smart Prosthetics," the *Futures Initiative* continues to establish a strong tradition of novel interdisciplinary research and scientific communication.

Haley Poland, a science writer based in Los Angeles, is a master's student in journalism at the Annenberg School for Communication at the University of Southern California. With a background in anthropology and biology from Colgate University, she plans to focus her writing on the intersection of health and human rights following graduation.

For more information on the *Futures Initiative* and this conference, visit <www.keckfutures.org>.

Turning **SCIENCE-BASED GUIDANCE** Into Results

African Scientists and Policymakers Meet to Discuss Policy Challenges Related to Food Security

In the 1990s, more than a quarter of the people in Cameroon, West Africa, suffered from goiters — an enlargement of the thyroid gland caused by iodine deficiency that can become a massive swelling around the neck. By assembling detailed evidence of the extent of the problem, Cameroonian scientist Daniel Lantum and his colleagues convinced the nation's public health and commerce officials to mandate salt iodization. As iodization in Cameroon jumped from zero to 90 percent, the prevalence of goiter among the population dropped to around 5 percent today.

As Lantum explained to the audience of scientists and policymakers gathered this past November in Cameroon's capital for the second annual conference of the African Science Academy Development Initiative (ASADI), the goiter reduction effort worked in part because there were people with scientific backgrounds in the government as well as concerned scientists and champions of the cause in the community. It was also important that the researchers compiled evidence to support their case and sought cooperation from industry as well as government ministers.

ASADI aims to build the capacity of African science academies to achieve similar success stories in their nations through a more formal process of bringing together scientific brainpower to sift through the research and generate evidence-based guidance to policymakers on what can be done. Supported by a $20 million grant from the Bill & Melinda Gates Foundation and administered by the U.S. National Academies, the initiative also seeks to foster a deeper appreciation among African policymakers for decision-making that is based on evidence and impartial analyses.

The conference offered an opportunity for academy scientists, government officials, journalists, and others to share their perspectives as they discussed the role of science in addressing food security. About one-third of the population in sub-Saharan Africa lacks the food necessary to meet daily requirements, a 2005 United Nations study found. Though none would

disagree with the goal of ending malnutrition, the ways to do it raise many thorny scientific issues, such as the role that biotechnology may play.

All too often, researchers are doing their own thing, while government ministries do theirs, Kweku Owusu Baah, chief director of the Ministry of Food and Agriculture in Ghana, told conference attendees. His ministry's relationship with the scientific community is often "a firefighting relationship" — officials call on scientists to give information and advice only when they immediately need data on a subject at hand.

The government and academy representatives discussed several strategies to build relationships between the scientific and policy communities. It can be difficult given obstacles such as electoral turnover among politicians, a paucity of funding for scientific research and publishing, and unwillingness to challenge cultural or social factors that may impede acceptance of new scientific evidence. But, the participants agreed, scientists can help governments understand the value of impartial, evidence-based guidance in formulating policies by dispensing with jargon and striving to explain research in clear terms that communicate the advantages both to the public and to the policymakers.

Scientists also must actively demonstrate the value of such guidance. That is what the Academy of Science of South Africa (ASSAf) is hoping to achieve through a comprehensive review of scientific evidence about nutritional influences on human immunity. HIV/AIDS and tuberculosis present serious, immediate challenges to the nation, and studies provide a wealth of data on the interactions between these

pathogens and nutritional status. However, sequestered in scientific journals, these findings remain unknown or incomprehensible to policymakers and the broader public.

The project's ultimate goal is to determine whether the evidence shows a need for changes in the South Africa's nutritional guidelines or for new nutritional guidance for people infected by HIV or tuberculosis, explained ASSAf member Barry Mendelow, a professor of pathology with the University of Witswatersrand in Johannesburg and chair of the study. The scientists hope to present a final, peer-reviewed study to government ministers this year.

More information about the ASADI conference and initiative is available online at <*national-academies.org/asadi*>. Senegal's academy will host the 2007 conference in Dakar. — *Christine Stencel*

U.S. Kicks Off International Polar Year

The U.S. opening ceremony for the International Polar Year 2007-2008 took place at the National Academies in February with a panel of polar scientists discussing the latest research from the poles and providing an overview of polar research projects to go on during the next decade. Government leaders whose agencies play an active role in this important international effort also participated.

IPY is an intense, coordinated campaign of polar observations, research, and analysis. During the two years covered by IPY, scientists from more than 60 nations will collaborate on a wide range of activities, from studying changes in permafrost to conducting a survey of marine life in the polar regions. Scientists will work on land and at sea in both the Arctic and Antarctica, and the work done will likely answer important questions about the changing environment as well as provide a baseline for future research.

This spring, specific projects to receive government and private funding are expected to be announced including proposals to analyze data from research ships, satellites, and ice cores, which will help scientists better understand the role played by polar regions in the global system.

The National Academies' Polar Research Board serves as the U.S. National Committee for the International Polar Year and was tasked with articulating a vision for U.S. participation in the international effort. It also acts as a portal for information about IPY to the U.S. science community. For more information about U.S. IPY activities, visit <*www.us-ipy.gov*>.

— *Maureen O'Leary*

Winners of $1 Million Challenge Announced

The National Academy of Engineering announced the winners of the first Grainger Challenge Prize for Sustainability, a contest that sought innovative solutions for removing arsenic from drinking water that is slowly poisoning tens of millions of people in developing countries. In the United States, most communities with arsenic-laden groundwater have installed expensive, centralized cleanup technologies, but different solutions are required for less developed parts of the world with limited resources.

The prize winners are recognized for the development, in-field verification, and dissemination of effective techniques for reducing arsenic levels in water. The systems had to be affordable, reliable, easy to maintain, socially acceptable, and environmentally friendly. All of the winning systems meet or exceed the local government guidelines for arsenic removal and require no electricity.

Abul Hussam, an associate professor in the department of chemistry and biochemistry at George Mason University, Fairfax, Va., received the Grainger Challenge Gold Award of $1 million for his SONO filter, a household water treatment system that is now being manufactured and used in Bangladesh to remove arsenic from drinking water. The system works by pouring water into a top bucket filled with locally available coarse river sand and a composite iron matrix that together filter coarse particles and remove inorganic arsenic. The water then flows into a second bucket where it again filters through coarse river sand, then through wood charcoal to remove organics, and finally through fine river sand and wet brick chips to remove fine particles and stabilize water flow.

A $200,000 silver award and $100,000 bronze award were also awarded, respectively, for a water treatment system that is

applied at a community's well head and for a system that treats small batches of water in the home or at any source. The three winners were chosen from a field of more than 70 entries.

The Grainger Challenge Prize for Sustainability is supported by the Grainger Foundation and administered by the National Academy of Engineering. For additional information, visit <*www.graingerchallenge.org*>. — *Randy Atkins*

IOM Recognized for *Preventing Medication Errors*

The nation's community pharmacies presented their highest honor — the SafeRx™ Evangelist Award — to the Institute of Medicine in recognition of outstanding leadership on the issue of patient safety and preventable medication errors.

The National Association of Chain Drug Stores, the National Community Pharmacists Association, and SureScripts® — an organization founded to operate the Pharmacy Health Information Exchange, which facilitates the transmission of prescription information between physicians and pharmacists — created the annual SafeRx awards program to recognize state officials and practicing physicians across the country who have helped make prescribing medication as safe and efficient as possible.

The SafeRx award annually goes to the governors of the top 10 e-prescribing states in the nation, and three physicians within each winning state who have demonstrated outstanding leadership through their use of this technology. However, acknowledging its landmark contributions through the 2006 report *Preventing Medication Errors,* the nation's pharmacies have decided this year to also recognize the Institute of Medicine with a special SafeRx Evangelist Award. This honor goes to a single person or organization whose achievements have made an exceptional impact on the awareness and prevention of medication errors. — *Valerie Chase*

Koshland Museum Opens New Exhibit

In March, the Marian Koshland Science Museum of the National Academy of Sciences opened "Infectious Disease: Evolving Challenges to Human Health." This new exhibit examines the viruses, bacteria, and parasites that cause some of the world's most deadly diseases, including HIV/AIDS, tuberculosis, and malaria. Using interactive displays, visitors can investigate how vaccines, drugs, and other treatments affect the spread of disease, and explore ways to protect public health in this era of increasing globalization. For more information, visit <*www.koshland-science-museum.org*>. — *Maureen O'Leary*

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.

Assuring the Integrity of Research Data in an Era of E-Science.
Committee on Science, Engineering, and Public Policy, the National Academies. Project director: Debbie Stine. Co-chairs: Daniel Kleppner, Lester Wolfe Professor of Physics Emeritus, Massachusetts Institute of Technology, and co-director, MIT-Harvard Center for Ultracold Atoms, Cambridge; and Phillip A. Sharp, Institute Professor, and founding director, McGovern Institute for Brain Research, Massachusetts Institute of Technology, Cambridge. Sponsor: The National Academies.

Conventional Prompt Global Strike Capability.
Naval Studies Board, Division on Engineering and Physical Sciences. Project director: Charles Draper. Chair: Albert Carnesale, chancellor emeritus and professor, University of California, Los Angeles. Sponsor: Office of the U.S. Secretary of Defense.

Forefronts of Science at the Interface of Physical and Life Sciences.
Board on Physics and Astronomy, Division on Engineering and Physical Sciences; and Board on Chemical Sciences and Technology and Board on Life Sciences, Division on Earth and Life Studies. Project director: Timothy Meyer. Chair: To be selected. Sponsors: National Science Foundation, U.S. Department of Energy, and National Institutes of Health.

Future Health Care Work Force for Older Americans.
Board on Health Care Services, Institute of Medicine. Project director: Megan McHugh. Chair: John W. Rowe, professor, department of health policy and management, Mailman School of Public Health, Columbia University, New York City. Sponsors: John A. Hartford Foundation, Atlantic Philanthropies, Josiah Macy Jr. Foundation, Robert Wood Johnson Foundation, Retirement Research Foundation, California Endowment, Archstone Foundation, AARP, Fan Fox and Leslie R. Samuels Foundation Inc., and Commonwealth Fund.

Prevention of Mental Disorders and Substance Abuse Among Children, Youth, and Young Adults: Research Advances and Promising Interventions.
Board on Children, Youth, and Families, National Research Council and Institute of Medicine. Project director: Mary Ellen O'Connell. Chair: Kenneth Warner, dean, School of Public Health, and Avedis Donabedian Distinguished University Professor of Public Health, University of Michigan, Ann Arbor. Sponsors: Substance Abuse and Mental Health Services Administration, National Institute of Mental Health, and National Institute on Drug Abuse.

Traffic Safety Lessons From Benchmark Nations.
Studies and Special Programs, Transportation Research Board. Project director: Joseph Morris. Chair: Clinton V. Oster Jr., professor and associate dean for Bloomington programs, School of Public and Environmental Affairs, Indiana University, Bloomington. Sponsor: Transportation Research Board.

Understanding and Improving K-12 Engineering Education in the United States.
Board on Science Education, Center for Education, Division of Behavioral and Social Sciences and Education; and Program Office, National Academy of Engineering. Project director: Greg Pearson. Chair: Linda P.B. Katehi, provost, University of Illinois, Urbana-Champaign. Sponsor: Stephen D. Bechtel Jr.

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.

Acute Exposure Guideline Levels for Selected Airborne Chemicals, Vol. 5
Committee on Toxicology, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2007, 292 pp.; ISBN 0-309-10358-4; available from NAP).

Adequacy of Evidence for Physical Activity Guidelines Development — Workshop Summary
Food and Nutrition Board and Board on Population Health and Public Health Practice, Institute of Medicine (2007, approx. 212 pp.; ISBN 0-309-10402-5; available from NAP).

Amyotrophic Lateral Sclerosis in Veterans: Review of the Scientific Literature
Board on Population Health and Public Health Practice, Institute of Medicine (2006, 62 pp.; ISBN 0-309-10254-5; available from NAP).

Assessing the Medical Risks of Human Oocyte Donation for Stem Cell Research — Workshop Report
Board on Health Sciences Policy, Institute of Medicine; and Board on Life Sciences, Division on Earth and Life Studies (2007, approx. 112 pp.; ISBN 0-309-10355-X; available from NAP).

Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users
Board on Health Sciences Policy, Institute of Medicine (2007, approx. 224 pp.; ISBN 0-309-10398-3; available from NAP).

Base Map Inputs for Floodplain Mapping
Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, approx. 186 pp.; ISBN 0-309-10409-2; available from NAP).

Contributions of Land Remote Sensing for Decisions About Food Security and Human Health — Workshop Report
Geographical Sciences Committee, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, 112 pp.; ISBN 0-309-10295-2; available from NAP).

Countering Urban Terrorism in Russia and the United States — Proceedings of a Workshop
Office for Central Europe and Eurasia, Development, Security, and Cooperation, Division on Policy and Global Affairs; in cooperation with the Russian Academy of Sciences (2006, 256 pp.; ISBN 0-309-10245-6; available from NAP).

Earth Materials and Health: Research Priorities for Earth Science and Public Health
Board on Earth Sciences and Resources, Division on Earth and Life Studies; and Board on Health Sciences Policy, Institute of Medicine (2007, approx. 174 pp.; ISBN 0-309-10470-X; available from NAP).

Enhancing Productivity Growth in the Information Age: Measuring and Sustaining the New Economy
Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2007, 164 pp.; ISBN 0-309-10220-0; available from NAP).

Exploring Opportunities in Green Chemistry and Engineering Education — A Workshop Summary to the Chemical Sciences Roundtable
Chemical Sciences Roundtable, Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2007, 56 pp.; ISBN 0-309-10352-5; available from NAP).

Evaluation of the Markey Scholars Program
Board on Higher Education and Work Force, Division on Policy and Global Affairs (2006, 126 pp.; ISBN 0-309-10292-8; available from NAP).

Frontiers of Engineering: Reports on Leading-Edge Engineering From the 2006 Symposium
National Academy of Engineering (2007, 202 pp.; ISBN 0-309-10339-8; available from NAP).

Genes, Behavior, and the Social Environment: Moving Beyond the Nature/Nurture Debate
Board on Health Sciences Policy, Institute of Medicine (2006, 384 pp.; ISBN 0-309-10196-4; available from NAP).

Global Environmental Health in the 21st Century: From Governmental Regulation to Corporate Social Responsibility — Workshop Summary
Roundtable on Environmental Health Sciences, Research, and Medicine, Board on Population Health and Public Health Practice, Institute of Medicine (2007, 126 pp.; ISBN 0-309-10380-0; available from NAP).

Implementing Cancer Survivorship Care Planning — Workshop Summary
National Cancer Policy Forum, Institute of Medicine (2007, 320 pp.; ISBN 0-309-10318-5; available from NAP).

Implementing the Stockholm Convention on Persistent Organic Pollutants — Summary of a Workshop in China
Science and Technology for Sustainability Program, Division on Policy and Global Affairs (2007, 46 pp.; ISBN 0-309-10479-3; available from NAP).

Improving Disaster Management: The Role of IT in Mitigation, Preparedness, Response, and Recovery
Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2007, approx. 126 pp.; ISBN 0-309-10396-7; available from NAP).

Improving the Efficiency of Engines for Large Nonfighter Aircraft
Air Force Studies Board, Division on Engineering and Physical Sciences (2007, approx. 188 pp.; ISBN 0-309-10399-1; available from NAP).

Improving the Nation's Water Security: Opportunities for Research
Water Science and Technology Board, Division on Earth and Life Studies (2007, approx. 158 pp.; ISBN 0-309-10566-8; available from NAP).

Improving the Social Security Disability Decision Process
Board on Military and Veterans Health, Institute of Medicine (2007, approx. 195 pp.; ISBN 0-309-10381-9; available from NAP).

Influence of Pregnancy Weight on Maternal and Child Health — Workshop Report
Board on Children, Youth, and Families, National Research Council and Institute of Medicine; and Food and Nutrition Board, Institute of Medicine (2007, 116 pp.; ISBN 0-309-10406-8; available from NAP).

Innovation Inducement Prizes at the National Science Foundation
Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2007, approx. 76 pp.; ISBN 0-309-10465-3; available from NAP).

Interim Report on Methodological Improvements to the Department of Homeland Security's Biological Agent Risk Analysis
Board on Mathematical Sciences and Their Applications, Division on Engineering and Physical Sciences (2007, 24 pp.; ISBN 0-309-66957-X; available from NAP).

International Human Rights Network of Academies and Scholarly Societies — Proceedings, Symposium and Seventh Biennial Meeting, London, May 18-20, 2005
Committee on Human Rights, the National Academies (2006, 176 pp.; ISBN 0-309-66561-2; available from NAP).

Joint U.S.-Mexico Workshop on Preventing Obesity in Children and Youth of Mexican Origin — Summary
Food and Nutrition Board, Institute of Medicine (2007, 210 pp.; ISBN 0-309-10325-8; available from NAP).

Measuring Respirator Use in the Workplace
Board on Chemical Sciences and Technology, Division on Earth and Life Studies; and Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2007, approx. 156 pp.; ISBN 0-309-10288-X; available from NAP).

Modeling Community Containment for Pandemic Influenza — A Letter Report
Board on Population Health and Public Health Practice, Institute of Medicine (2006, 47 pp.; 0-309-66819-0; available from NAP).

Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and New World Camelids
Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2007, 384 pp.; ISBN 0-309-10213-8; available from NAP).

A Path to the Next Generation of U.S. Banknotes: Keeping Them Real
Board on Manufacturing and Engineering Design, Division on Engineering and Physical Sciences (2007, approx. 240 pp.; ISBN 0-309-10574-9; available from NAP).

A Performance Assessment of NASA's Astrophysics Program
Space Studies Board and Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2007, approx. 30 pp.; ISBN 0-309-10490-4; available from NAP).

Plans and Practices for Groundwater Protection at Los Alamos National Laboratory — Interim Status Report
Nuclear and Radiation Studies Board, Division on Earth and Life Studies (2006, 42 pp.; ISBN 0-309-10391-6; available from NAP).

Preventing Teen Motor Crashes: Contributions From the Behavioral and Social Sciences — Workshop Report
Board on Children, Youth, and Families, National Research Council and Institute of Medicine; and Transportation Research Board (2007, 76 pp.; ISBN 0-309-10401-7; available from NAP).

Prospective Evaluation of Applied Energy Research and Development at DOE (Phase Two)
Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2006, approx. 430 pp.; ISBN 0-309-10467-X; available from NAP).

Review of International Technologies for Destruction of Recovered Chemical Warfare Materiel
Board on Army Science and Technology, Division on Engineering and Physical Sciences (2006, 128 pp.; ISBN 0-309-10203-0; available from NAP).

A Review of the Draft Ocean Research Priorities Plan: Charting the Course for Ocean Science in the United States
Ocean Studies Board, Division on Earth and Life Studies (2006, 74 pp.; ISBN 0-309-66783-6; available from NAP).

Review of the Worker and Public Health Activities Program Administered by the Department of Energy and the Department of Health and Human Services
Nuclear and Radiation Studies Board and Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, 296 pp.; ISBN 0-309-10338-X; available from NAP).

A Review of United States Air Force and Department of Defense Aerospace Propulsion Needs
Air Force Studies Board, Division on Engineering and Physical Sciences (2006, 90 pp.; ISBN 0-309-10247-2; available from NAP).

River Science at the U.S. Geological Survey
Water Science and Technology Board, Division on Earth and Life Studies (2007, approx. 214 pp.; ISBN 0-309-10357-6; available from NAP).

Science and Technology in Kazakhstan: Current Status and Future Prospects
Office for Central Europe and Eurasia, Development, Security, and Cooperation, Division on Policy and Global Affairs (2007, approx. 166 pp.; ISBN 0-309-10471-8; available from NAP).

Scientific Opportunities With a Rare-Isotope Facility in the United States
Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2007, approx. 100 pp.; ISBN 0-309-10408-4; available from NAP).

Spacecraft Water Exposure Guidelines for Selected Contaminants, Vol. 2
Committee on Toxicology, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2006, approx. 664 pp.; ISBN 0-309-10379-7; available from NAP).

Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences
Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2007, approx. 240 pp.; ISBN 0-309-10349-5; available from NAP).

A Strategy for Assessing Science: Behavioral and Social Research on Aging
Center for Studies of Behavior and Development, Division of Behavioral and Social Sciences and Education (2007, 176 pp.; ISBN 0-309-10397-5; available from NAP).

Successful Response Starts with a Map: Improving Geospatial Support for Disaster Management
Mapping Science Committee, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2007, 198 pp.; ISBN 0-309-10340-1; available from NAP).

Third Report of the National Academy of Engineering/National Research Council Committee on New Orleans Regional Hurricane Protection Projects
National Academy of Engineering, Division on Earth and Life Studies, and Division on Engineering and Physical Sciences (2006, 28 pp.; ISBN 0-309-66675-9; available from NAP).

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Office for Central Europe and Eurasia, Development, Security, and Cooperation, Division on Policy and Global Affairs (2007, approx. 130 pp.; ISBN 0-309-10410-6; available from NAP).

Validation of Toxicogenomic Technologies — A Workshop Summary
Board on Environmental Studies and Toxicology and Board on Life Sciences, Division on Earth and Life Studies (2007, approx. 96 pp.; ISBN 0-309-10413-0; available from NAP).

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