

# THE NATIONAL ACADEMIES **INFOCUS**

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The Danger of Deep Space Radiation | Integrating Transit Into Evacuation Plans

Health Care for an Aging Population | Forest Management Critical to Water Supplies

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# THE NATIONAL ACADEMIES

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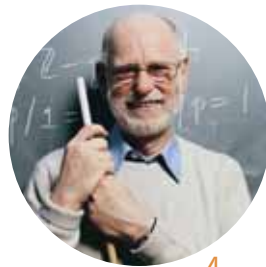
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- Pages 16-18: Speakers and participants who gathered at the National Academies' two-day summit on America's energy future, held March 2008, photos by William Geiger

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## A National Conversation on an Aging Society

As we edge toward 2011 — the year that the first baby boomers turn 65 — our concept of “old age” is being upended. These boomers, on average, can expect to live to age 83, longer than any previous generation. Currently about 13 percent of the U.S. population is over 65; by 2030, one in five of us, or 71 million Americans, will be 65 or older — and we will be a far more diverse society. This profound demographic transformation presents us with many choices and challenges about how our society will age.



Many Americans moving into the “new old age” may need to postpone retirement by necessity. Those approaching the previously routine retirement age of 65 have saved less for their later years, and Social Security can provide only a measure of economic security. The likelihood of staying in the workplace longer or even launching second (or third) careers late in life is high. We will face increasingly intense issues of training and retention, workplace health, safety and design, and age discrimination as growing numbers of older Americans elect to stay in the labor force.

A 2008 Institute of Medicine report, *Retooling for an Aging America*, featured in this issue of *In Focus*, highlights a health care work force that is insufficient in both numbers and skills to care for an aging population. Medicare, the federal program of health insurance for the elderly, now exceeds \$400 billion in annual expenditures. The burden is projected only to grow as an older population ages — by age 80, a person can expect to have two or more chronic illnesses.

On a macroeconomic level, the shifting demography will affect our economy as well. Sustained economic growth and security will pose both national and cross-national challenges as aging becomes a worldwide phenomenon in developed and developing countries. Those societies that make aging a source of productivity rather than a drag on growth will have a decided advantage in the decades ahead.

Our academies have embarked on a new initiative to stimulate a national conversation on the complex policy issues facing an aging society, building on our previous work related to the demography of aging, retirement policies, private wealth and income security, the labor force and future skills demands, the health of aging populations, cognitive research on the aging mind, racial and ethnic differences in health in later life, technologies for adaptive aging, and the biodemography of longevity. An integrated, evidence-based approach to our rapidly aging world can help redefine “old age” as a time for creative engagement, health, and prosperity.

A handwritten signature in black ink that reads "Harvey V. Fineberg". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

HARVEY V. FINEBERG  
President, Institute of Medicine



## Are Board-Certified Teachers More Effective?

Every year over 11,000 American teachers apply to the National Board for Professional Teaching Standards in hopes of gaining the distinction of becoming a board-certified teacher. Applicants take a computer-based exam and amass portfolios that demonstrate how their teaching meets NBPTS standards for good teaching — a demanding process that typically takes about 400 hours and spans a year or more. What are the rewards for successfully making it through this marathon? For one, the knowledge that one has joined an elite group of teachers, and — in some states — a heftier paycheck. From 1993 through 2007, 99,300 teachers applied for certification and 63,800 of them earned it — which works out to

about three board-certified teachers for every five schools in the U.S.

But does the process actually identify teachers who are better at helping students learn? And does the certification process itself make teachers stronger in the classroom? Congress asked the National Research Council to examine these questions, and to look at NBPTS' broader effects on the education system.

As for whether board-certified teachers improve student learning, the answer is yes, the report concludes. Students taught by board-certified teachers make greater gains on achievement tests than students taught by other teachers. And students taught by teachers who tried to get certified but failed make lower gains on achievement

tests than either board-certified teachers or teachers who had never pursued certification. The jury is still out on whether the process itself improves teachers' classroom performance, the report says, and it recommends further research on this important question.

While certification identifies good teachers, this "signal" of quality does little good unless it's used, the report observes. For example, administrators could encourage board-certified teachers to teach in challenging schools or classrooms or to mentor their colleagues. Yet there is little evidence that school systems are using board-certified teachers in these ways.

This failure may be in part because singling out some teachers as "better" goes against the egalitarian grain of the profession, according to studies noted in the report. For example, some administrators downplay the importance of certification for fear of creating division among teachers. And some board-certified teachers have reported being given the cold shoulder by their colleagues who are not board certified. Others hide their certification so that they don't seem to be showing off. The report says board-certified teachers are unlikely to have the effects hoped for without broader endorsements by states, districts, and schools, and unless schools use them in leadership roles.

One of NBPTS' goals was to inspire good teachers to stay in teaching and reduce the attrition rates that plague the

profession; nearly half of new teachers leave this career within their first five years. Limited research suggests that board-certified teachers remain in the teaching profession longer, the report says, though it is unknown whether certification affected

their decisions to do so. They also appear to switch jobs more often and move to schools with greater advantages. Still, it's unclear whether that is more true of board-certified teachers than any other highly qualified teachers. NBPTS should put greater effort into tracking the career paths of teachers who earn board certification and those who don't, the report says.

The board should also devote extra effort to continuously evaluating and improving its tests. And to be a trusted institution that can have widespread influence, the board should be careful to distinguish between objective research and advocacy, and follow scholarly standards in reporting on its own research and that of others. — *Sara Frueh*

■ **Assessing Accomplished Teaching: Advanced-Level Certification Programs.** Committee on Evaluation of Teacher Certification by the National Board for Professional Teaching Standards, Board on Testing and Assessment, Center for Education, Division of Behavioral and Social Sciences and Education (2008, 340 pp.; ISBN 0-309-12118-3; available from the National Academies Press, tel. 1-800-624-6242; \$45.00 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12224.html](http://www.nap.edu/catalog/12224.html)>).

The committee was chaired by **Milton Hakel**, Ohio Board of Regents Eminent Scholar, Bowling Green State University, Bowling Green, Ohio. The study was funded by the U.S. Department of Education.



# Gauging the Growth of DEMOCRACY

**T**he U.S. Agency for International Development has supported democracy-building programs in about 120 countries and territories, spending nearly \$8.5 billion since 1990. The programs' goals range widely, from nurturing online debate about democracy issues in Morocco to strengthening political parties in Peru to training civil servants in Iraq.



Despite the substantial budgets and key foreign-policy priorities at stake in many cases, relatively little is known about which democracy-building initiatives work best, and why they succeed in some situations and fail in others. That's because few programs have been effectively evaluated, observes a new report from the National Research Council. In recent years, USAID has also reduced its institutional mechanisms for collecting and disseminating research on what's working — all of which means there is a lack of data to help the agency target programs where they're most likely to be effective.

USAID should evaluate its programs more systematically and rigorously, the report says. The agency should start a pilot program of evaluations that try to separate the impacts of a specific democracy-building program from the wide range of other factors that affect the process of democracy in a country. When appropriate, these evaluations should use control groups to discern whether a program is having an impact. For example, an evaluation might look at whether more people participate in elections in a region with a particular voter-education program than in similar regions without it.

USAID also needs a better way to measure democracy, the report says. Yardsticks used by groups such as Freedom House or Polity work well for categorizing nations roughly as democratic, authoritarian, or mixed, and they can track a country's wholesale movement toward democracy. But they aren't very useful for assessing

smaller changes in the nondemocratic and mixed regimes where USAID does most of its work. Instead, the agency should break the concept of democracy into smaller components. Is there regular turnover in top political leadership, for example? Is participation in elections unconstrained and extensive? Is there an independent judiciary? It is easier to measure a program's effects on a single component than on a nation's overall level of democracy.

The challenges that need solving in USAID's democracy programs are not just technical, the report adds. The agency needs to take steps to foster a learning culture — for instance, through ongoing discussions of relevant academic research and case studies of programs. — *Sara Frueh*

■ **Learning From USAID Experience in Democracy Assistance: Building Knowledge Through Evaluations and Research.** Committee on Evaluation of USAID Democracy Assistance Programs, Development, Security, and Cooperation, Division on Policy and Global Affairs (2008, 336 pp.; ISBN 0-309-11736-4; available from the National Academies Press, tel. 1-800-624-6242; \$67.75 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12164.html](http://www.nap.edu/catalog/12164.html)>).

The committee was chaired by **Jack Goldstone**, professor of public policy, George Mason University, Fairfax, Va. The study was funded by the U.S. Agency for International Development.



# A SALTY SITUATION



**A**merica's thirst for water is leaving regions of the country parched. Atlanta is struggling to find resources to support its expanding urban areas, while Florida is working to maintain adequate flows from the same watershed to protect its ecosystems and wetlands. The Colorado River's water is continually disputed among seven western states and Mexico, and California faces perennial water problems. Such regional water management dilemmas are becoming commonplace, and the overall pressure on the nation's limited fresh water resources to satisfy demands for domestic, agricultural, and environmental purposes will only continue to intensify.

For a nation that has two vast oceans as bookends, the solution seems simple

## Is Desalination the Answer to Increasing the Nation's Fresh Water Supplies?

enough: Why can't we tap the oceans as a resource and produce fresh water by removing the salt? The practice of separating salt from ocean water has been around for centuries, dating back to when salt, not water, was a precious commodity.

Historically, the high cost and energy required for desalination confined its use to places where energy was inexpensive and freshwater was scarce. Nevertheless, advances in technology have reduced its costs and generated new interest in desalination in the United States, and a recent report from the National Research Council explored desalination's potential for boosting future U.S. water supplies.

"To make desalination a more attractive option for communities facing water

shortages, we must better understand and minimize the environmental impacts and develop approaches that lower the financial costs,” said Amy K. Zander, chair of the committee that wrote the report and a professor at Clarkson University, Potsdam, N.Y. “A coordinated and sufficiently funded, long-term research agenda between agencies and the private sector could help reduce costs and ensure environmentally sustainable approaches to desalination.”

Currently, desalination generates less than 0.01 percent of the water used in the U.S., although plants exist in every state. Most use a method called reverse osmosis, which pushes seawater or brackish groundwater through a membrane to separate out the salts.

Limited studies suggest that desalination may be less environmentally harmful than other ways to supplement water supplies — such as diverting freshwater from sensitive ecosystems — but a definitive conclusion cannot be made without further research. For instance, the extent to which fish and other creatures become trapped in saltwater intake systems is not well-understood.

To help further minimize environmental impacts, researchers should also examine the longer-term ecological effects of disposing of the salt concentrate that remains and develop cost-effective, environmentally sustainable disposal options. The report adds that several detailed environmental evaluations of new desalination plants also should be conducted, including ecological monitoring before and after a plant begins operating. Desalination efforts, however, need not be halted until the research is complete, the report suggests.

Research and development are also needed to continue lowering desalination’s financial costs and energy use, which could occur by making the membranes used in reverse osmosis more permeable and improving pretreatment processes, the report says. However, the energy used at reverse osmosis facilities probably cannot be reduced more than 15 percent below current levels. Even if costs are lowered, conserving water or transferring it from one use to another will, in most cases, remain a less expensive option than adding water through desalination, the report notes.

“A variety of financial, social, and environmental factors constrain the potential for desalination, not necessarily the technology,” said Zander. “There is a common belief that desalination could one day be used to meet all future U.S. water demands, but considering the fundamental energy requirements, desalination is more likely to complement a broad portfolio of water management approaches.”  
— *Jennifer Walsh & Sara Frueh*

■ **Desalination: A National Perspective.** Committee on Advancing Desalination Technology, Water Science and Technology Board, Division on Earth and Life Studies (2008, 312 pp.; ISBN 0-309-11923-5; available from the National Academies Press, tel. 1-800-624-6242; \$45.00 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12184.html](http://www.nap.edu/catalog/12184.html)>).

The committee was chaired by **Amy K. Zander**, professor and director of the interdisciplinary engineering and management program at Clarkson University, Potsdam, N.Y. The study was funded by the U.S. Bureau of Reclamation and U.S. Environmental Protection Agency.



# Through the Woods

## FOREST MANAGEMENT IMPORTANT FOR FRESH WATER SUPPLIES

Upon first guess, most people would think lumber is the most important byproduct of forests, but another output often overlooked is fresh water. Forests process nearly two-thirds of the fresh water supply in the United States by cycling precipitation through the soil, and ultimately delivering water through streams and rivers to larger bodies of water. As demand for water increases, supply managers question whether different approaches to land use in forests can help meet downstream demands.

Research has already produced a solid foundation of knowledge about how water is connected to and moves through forests and how forest structure and composition can alter water quantity and quality. A new report from the National Research Council says, however, that future research should move beyond comprehension to predicting how future changes in landscape will impact forest hydrology.

For example, some effects of climate change on forests and water are already evident — such as changes in the snowmelt and increases in wildfires — and future climate changes are likely to have major effects on forest hydrology. But research should explore the direct and indirect effects of climate change on water yield and quality, as well as the consequences of wildfires and disease. Furthermore, studies should examine how fire and insect outbreaks vary over time and spatial scales and how these affect water quantity, quality, and flooding.

In addition to naturally occurring phenomena, manmade activities such as timber harvesting, chemical applications, and roads also have an impact. Partial or complete removal of the forest reduces the canopy and, in turn, the amount of water the soil absorbs. Replacing these trees with new ones also reduces the water yield, as young trees need ample water to grow to maturity.

Roads and trails that have impervious surfaces affect water timing and quality, but the magnitude of the effect depends upon road design, slope steepness, soils, and the configuration of the road system relative to the stream and river drainage networks. Chemicals such as fertilizers and fire retardants affect water quality, acidify forest soils, and deplete soil nutrients. To better understand implications of human actions, the report recommends scientists develop a next generation of hydrologic models and use remote sensing.

Most importantly, to ensure progress, watershed councils and citizen groups should work with agencies to better protect and sustain water resources. — *Jennifer Walsh*

■ **Hydrologic Effects of a Changing Forest Landscape.** Committee on Hydrologic Impacts of Forest Management, Water Science and Technology Board, Division on Earth and Life Studies (2008, approx. 194 pp.; ISBN 0-309-12108-6; available from the National Academies Press, tel. 1-800-624-6242; \$39.00 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12223.html](http://www.nap.edu/catalog/12223.html)>).

The committee was chaired by **Paul K. Barten**, associate professor of forest resources at the University of Massachusetts, Amherst. The study was funded by the U.S. Forest Service and the Bureau of Reclamation.

# A LOOMING HEALTH **BUST**

## Influx of Older Patients Could Overwhelm Health System

As millions of baby boomers enter their golden years, a huge wave of older patients, who by nature have more complex health conditions and needs, will place significantly more pressure on the U.S. health care system over the next few decades. This impending age shift in the nation's patient population comes at a time when the health system is woefully unprepared to meet the needs of so many older patients.



**A**lready there is a dearth of health professionals who specialize in geriatric care, and most clinicians receive little if any training in even the common conditions associated with aging, such as frailty and sensory impairment. With turnover rates among nursing assistants and personal care aides as high as 90 percent annually, many long-term and home care services can offer patients little staffing consistency.

But it's not too late to make needed changes in how health care is delivered and financed to ensure that older Americans get the quality care they need to live robustly and independently for as many years possible, says a new report from the Institute of Medicine. The report outlines a three-prong solution that includes boosting the recruitment and retention of geriatric specialists and caregivers, enhancing the

abilities of all care providers to respond to older patients' social and medical needs, and making fundamental changes in the way health care is delivered.

Geriatrics languishes behind other specialties in the number of providers it attracts. Currently there is just one geriatrician for every 2,500 older Americans and less than 1 percent of nurses and pharmacists pursue geriatric specialties. Low pay is a big reason. A geriatrician earned an annual salary of \$163,000 compared with \$175,000 for a general internist in 2005, and some specialties offer \$300,000 a year or more. To mitigate this disparity, Medicare — the principal payer for medical care provided to older patients — should reimburse more for services when they are delivered by geriatric specialists, the report urges. Similarly, states need to boost pay for nursing assistants and other direct-care workers whose median wages of \$9.95 per hour fall below the poverty level in some regions.

Geriatric specialists are crucial not only for treating patients with complex health problems but also for training other health care providers to handle the conditions associated with aging. Virtually all health care providers treat older patients to some extent during their careers — and likely will do so even more frequently given that one in five Americans will be 65 or older by 2030. The report calls for competency in basic geriatric care as a requirement for health care workers to get and maintain their licenses and certifications.

Simply having more and better trained health care providers isn't enough, however. The way care is currently delivered — with a focus on treating acute symptoms rather

than management of chronic conditions, and providers working solo rather than as teams — needs to change as well, the report says. Health plans need to reimburse providers for services not currently covered, such as educating patients on managing their chronic problems. Also, given the shortage of health care workers, it's time to consider expanding the roles and responsibilities of providers. For example, if a certified nursing assistant is able to administer certain medications, a professional nurse would have more time to concentrate on more complex patient needs.

If current trends continue unchanged, the United States will fail to ensure that high-quality care is available to every older American, the report says. The dramatic demographic shifts in the patient population demand similar transformations in the health care work force and models of care delivery. — *Christine Stencel*

■ **Retooling for an Aging America: Building the Health Care Workforce.** Committee on the Future Health Care Workforce for Older Americans, Board on Health Care Services, Institute of Medicine (2008, 316 pp.; ISBN 0-309-11587-6; available from the National Academies Press, tel. 1-800-624-6242; \$29.95 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12089.html](http://www.nap.edu/catalog/12089.html)>).

The committee was chaired by **John W. Rowe**, professor of health policy and management, Mailman School of Public Health, Columbia University, New York City. The study was funded by the 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, and Commonwealth Fund.

# Exploring the FINAL FRONTIER

## The Danger of Deep Space Radiation

In 2004 President Bush proposed an ambitious space exploration plan that envisioned sending astronauts back to the moon and eventually to Mars. Such missions into deep space will involve risks not seen by astronauts in low Earth orbit, in particular increased radiation levels. A recent report from the National Research Council concludes that a better understanding of space radiation and improved protection is needed, or it's unlikely astronauts can make long stays on the moon or travel to Mars anytime soon.

The two main forms of radiation in space are galactic cosmic radiation (GCR) — background radiation present at all times — and solar particle events (SPEs), which are short bursts of solar radiation. GCR contains heavy, high-energy particles that penetrate spacecraft. SPEs generally involve low-energy particles that can be blocked using shielding. They can be sudden and intense, however, creating a danger for crewmembers working outside the spacecraft. To protect its astronauts, NASA monitors the amount of radiation to which they are exposed and imposes strict lifetime limits.

In the past, astronauts avoided reaching their radiation limits either by staying within the safety of Earth's atmosphere, which blocks most space radiation, or by keeping the amount of time spent outside Earth's atmosphere short. Longer stays on the moon, or eventual trips to distant destinations like Mars, will mean exposure to more radiation, though. If crews hit their lifetime limits midmission, they'd have to turn



around and come home or else risk the possibility of radiation sickness or even cancer.

James van Hoften, a former crew member on *Discovery* and *Challenger* who chaired the study committee, encountered space radiation during a spacewalk outside *Challenger*. “I saw

what looked like a white laser line go right through my eyes,” he said. “I thought, ‘Well this can’t be good...having high-energy particles fly through your head.’ ”

The biological effects of radiation exposure vary and are not entirely understood. Much of what is known comes from the study of accidental occupational radiation exposure, and from atomic bomb survivors, who received massive doses of gamma rays instantaneously. An atomic bomb is very different than what astronauts would experience, although the committee pointed out that, despite years of study, we don't know exactly what to expect in deep space.

Safely pushing the boundaries of human space exploration, said the committee, will require a better understanding of the deep space environment and shielding that can protect against all possible forms of radiation exposure. — *Rebecca Alvania*

■ **Managing Space Radiation Risk in the New Era of Space Exploration.** Committee on the Evaluation of Radiation Shielding for Space Exploration, Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2008, 132 pp.; ISBN 0-309-11383-0; available from the National Academies Press, tel. 1-800-624-6242; \$33.00 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12045.html](http://www.nap.edu/catalog/12045.html)>).

The committee was chaired by **James van Hoften**, former senior vice president and partner of the Bechtel Corp., San Francisco. The study was funded by NASA.



## A Vital Role

### INTEGRATING TRANSIT INTO LOCAL EMERGENCY EVACUATION PLANS

Transit can play a vital role in an emergency evacuation as demonstrated during the terrorist attacks of Sept. 11, 2001, when people were shuffled out of Lower Manhattan and employees, buses, and equipment were rushed to the World Trade Center site to support emergency responders.

**H**owever, a review of the emergency response and evacuation plans in the 38 largest urbanized areas, along with in-depth case studies of Chicago, Houston, Los Angeles, New York City/northern New Jersey, and Tampa, Fla., revealed that few urban areas have planned for a major disaster that could involve multiple jurisdictions or states and necessitate the evacuation of a large fraction of the population, according to a new report from the National Research Council.

“Transit has a unique role to play in evacuating the carless, elderly, and people with disabilities,” said Richard White, executive vice president, DMJM Harris, and chair of the committee that wrote the report. “These special needs populations are inadequately addressed in most local emergency evacuation plans.”

Local governments are required by law to develop evacuation plans and mass departure routes that include special needs populations. They also have the primary responsibility of responding to emergency incidents and ordering an evacuation; transportation and transit agencies play a supporting role.

The report urges emergency managers to consider the multiple roles transit can perform in the event of a natural or human-caused disaster. It can transport those without a car to area shelters or outside the affected area, bring emergency responders and equipment to emergency incident sites, return evacuees to their original destinations, and restore service as expeditiously as possible.

To ensure transit systems are used to their maximum potential, they need to be part of the emergency management planning process and command structure, linked to emergency planners with real-time communications capability, and participate in annual exercises and drills, the report says. “To the extent transit agencies are asked to take on a major role in an evacuation, they should be considered essential personnel and be eligible with other first responders for cost reimbursement,” White added.

Evacuating special needs populations and the carless requires a special effort to identify those who require assistance, integrate their needs into evacuation plans and sheltering strategies, and communicate these plans in advance of an emergency. The report noted the use of transit and school buses in Tampa for evacuating special needs groups, which could serve as a model for other areas.

Transit is not the silver bullet, however. Emergency managers and the general public should be realistic in their expectations for the use of transit during an emergency, the report says. Transit systems’ capacity to assist depends on the nature of the incident and its location. Damage from an earthquake or other incident, for instance, may prevent the use of affected transit systems. Transit operations could also be hampered by unavailability of drivers and lack of equipment, especially at off-peak times. During peak periods, congestion impedes travel in many urban areas even in normal conditions.

“The report’s recommendations should not be allowed to gather dust,” said Rep. Bill Pascrell D-N.J., who requested this study. He hopes to introduce legislation to enact some of the study’s recommendations.  
— *Maureen O’Leary*

■ ***The Role of Transit in Emergency Evacuation: Special Report 294.*** Committee on the Role of Public Transportation in Emergency Evacuation, Transportation Research Board (2008, approx. 223 pp.; ISBN 0-309-11333-4; available from TRB, tel. 202-334-3213, or the National Academies Press, tel. 1-800-624-6242; \$36.00 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12445.html](http://www.nap.edu/catalog/12445.html)>).

**Richard A. White**, executive vice president and director of project development, DMJM Harris, Arlington, Va., chaired the committee that wrote report. The study was funded by the Federal Transit Administration and the Transit Cooperative Research Program.





## NAE Identifies Messages That Resonate

**R**ocket scientist. Sounds like a very interesting job, but are they really scientists? Most, in fact, are engineers who design and build spacecraft, which may be news to many people.

Research shows that K-12 teachers and students generally have a poor understanding of what engineers do, according to a new report from the National Academy of Engineering on improving the public's understanding of engineering. Even so, most people respect engineers and consider their work important.

"We found that engineers do not have an image problem," said Don Giddens, dean of engineering at Georgia Institute of Technology and chair of the committee that wrote the report. "That is good news, but we have a lot of work ahead of us to communicate to students that engineers are creative problem-solvers and can shape the future."

After examining current data and studies, along with producing and reviewing a survey of some 3,600 people, the committee found that the public sees engineers as being competent in math and science, though, unfortunately, many of them appear to consider this a barrier to pursuing engineering studies.

The report says that challenging young people to make an impact through an engineering career is more likely to attract them than emphasizing the challenge of math and science skills. Continued emphasis on math and science may damage rather than increase the appeal of engineering.

The committee also selected four tested messages that reposition engineering as a satisfying profession involving creativity, teamwork, and beneficial impacts. Those messages are:

- Engineers make a world of difference.
- Engineers are creative problem-solvers.
- Engineers help shape the future.
- Engineering is essential to our health, happiness, and safety.

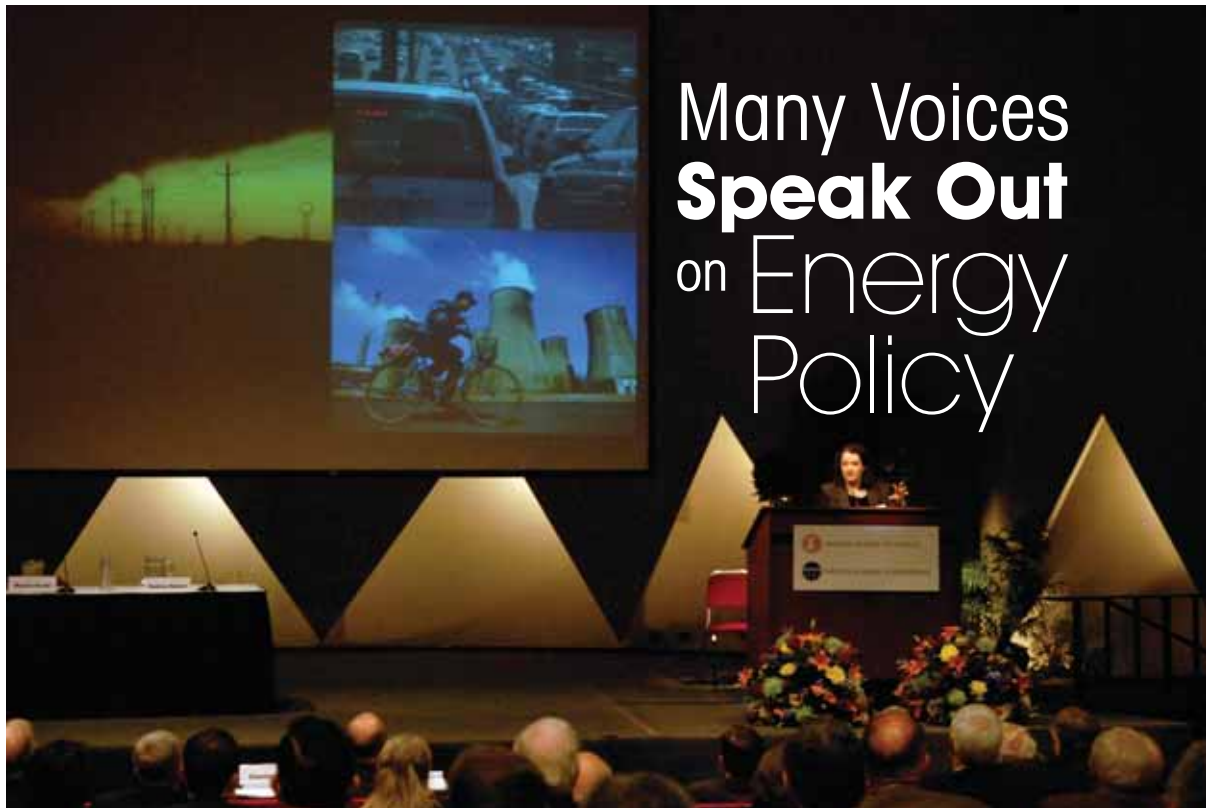
The committee recommends that the engineering community begin using these messages in a coordinated communications strategy to strengthen the image of the engineering profession.

"Improving public understanding of engineering will enable people to make more informed decisions about technology, encourage students to consider engineering careers, and ultimately sustain the U.S. capacity for technological innovation," said Giddens.

— *Maureen O'Leary*

■ **Changing the Conversation: Messages for Improving Public Understanding of Engineering.** Committee on Public Understanding of Engineering Messages, National Academy of Engineering (2008, 164 pp.; ISBN 0-309-11934-0; available from the National Academies Press, tel. 1-800-624-6242; \$34.95 plus \$4.50 shipping for single copies; also on the Internet at <[www.nap.edu/catalog/12187.html](http://www.nap.edu/catalog/12187.html)>).

**Don Giddens**, dean of engineering, Georgia Institute of Technology, Atlanta, chaired the committee that wrote report. The study was funded by the National Science Foundation, with additional support from the Georgia Institute of Technology.



## Many Voices Speak Out on Energy Policy

Every time Americans go to the gas pumps these days, they receive a stark reminder that the nation is facing an energy crisis. Along with fuel prices that have topped \$4 a gallon in many places, other troubling developments are spurring calls for change. Widespread concern about global warming is growing, and political instability in some oil-rich countries has renewed cries for U.S. energy independence.

**B**ut while there is a growing consensus that we have a problem, this is hardly the case when possible solutions are discussed. In an effort to ensure that future energy policy decisions are based on the best available scientific information, the National Academy of Sciences, National Academy of Engineering, and the National Research Council launched a comprehensive study to provide an authoritative analysis of the potential benefits and costs of current and future energy technologies.

As part of that effort, some of the best minds in energy technology and policy from the government, the private sector, and research institutions gathered at a two-day summit this spring to discuss America's energy future. The summit examined current energy trends both in the United States and abroad, as well as the potential benefits and



drawbacks of several different traditional and innovative energy technologies.

### **Getting the Global Picture**

Although the United States and many other countries already are feeling the effects of tightening oil supplies, demand keeps growing, noted several of the summit's speakers. By 2030, global energy use is expected to increase more than 50 percent, with more than half of that growth coming from developing nations. At the same time, oil supplies are not keeping pace with demand, said Reuben Jeffery III, the U.S. Department of State's undersecretary for economic, energy, and agricultural affairs. "The math is very simple. Between 2001 and 2006, the [global] petroleum supply has grown at about 8.9 percent per annum, while demand has increased 9.6 percent."

Continued economic growth in large developing nations such as China and India will also increase their dependence on oil, coal, and other fossil fuels at a time when the need for reducing carbon emissions has become critical, noted Kelly Simms Gallagher, director of energy technology innovation policy at the Belfer Center at Harvard's Kennedy School of Government. As a result, the United States will have to not only reduce its own considerable carbon emissions, but also help countries like China reduce theirs.

That could prove to be a critical priority, said Ged Davis, co-president of global energy assessment at the International Institute for Applied Systems Analysis. Based on the most likely emissions scenarios calculated recently by the Intergovernmental Panel on Climate Change, temperatures could climb as much as 5 or 6 degrees Celsius in the decades ahead if China and India continue to burn fossil fuels at their current rates. Such a dramatic increase could lead to massive extinctions, rising sea levels, and serious health problems.

### **Examining the Options**

These dire forecasts for the future do have a positive effect: They increase the political will to achieve greater energy efficiency





and to develop affordable, clean alternative energies, noted many of the speakers. “Perhaps as never before, the American people are calling for action, and taking action themselves,” said Samuel Bodman, U.S. energy secretary. He noted DOE’s commitment to expanding basic research and development, which could lead to major breakthroughs in wind and solar



power, biofuels, and nuclear energy. And according to Sen. Jeff Bingaman, D-N.M., and chair of the Senate Committee on Energy and Natural Resources, two major energy laws passed by Congress recently will cut energy consumption through such measures as tougher fuel-efficiency standards for automobiles, more biofuel use, and better funding for technology research and development.

Much more needs to be done, however, to decrease carbon emissions and increase energy efficiency, the speakers acknowledged. Toward that end, the summit included an in-depth examination of several traditional and alternative energy sources, such as coal, nuclear power, solar power, and biofuels, and their pluses and minuses. In the near term, improving efficiency of existing technologies could make a significant difference, several speakers said.

Long-term solutions are going to require innovative approaches by both the government and the private sector. For example, the Internet giant Google is working on developing renewable energy and plug-in hybrid vehicles. Dan Reicher, Google’s director of climate and energy initiatives, noted that while reducing carbon outputs and increasing energy security are major challenges, they also present tremendous business opportunities.

### **Looking Ahead**

Developing sound energy policies in the United States and abroad to address these urgent issues will be critical in the decades ahead. Speakers at the summit were mostly optimistic that real gains will be made in the future. “We have what I believe to be one of the most important elements of a successful strategy: national imperative to act,” said Bodman. — *Molly Galvin*

**America’s Energy Future** will include a series of reports that examine technologies in energy efficiency, alternative transportations fuels such as biofuels, and renewable electricity generating technologies. A committee of 25 experts will draw on these reports as well as additional consideration of fossil fuels, nuclear power, and the electric transmission grid to produce a final report expected early in 2009. More information and presentations from the summit are available at [national-academies.org/energy](http://national-academies.org/energy).

## Grainger Foundation Expands NAE's Frontiers of Engineering

The National Academy of Engineering announced in July a three-year, \$3 million grant from the Grainger Foundation to support NAE's Frontiers of Engineering symposia. These symposia celebrate excellence in engineering by recognizing outstanding early-career engineers and the cutting-edge work they perform in universities, industry, and government labs.

"The Frontiers of Engineering program brings together young engineers for eclectic symposia on topics that cut across disciplinary boundaries to transfer knowledge and techniques, encourage collaboration, and exchange ideas that can foster U.S. innovation," said NAE President Charles M. Vest. "We are grateful to the Grainger Foundation for their support of this important and exciting program."

Begun in 1995 for U.S.-based engineers, the Frontiers of Engineering program now includes bilateral meetings of U.S. engineers with engineers from Germany, Japan, and India. The Grainger Foundation grant will help sustain these symposia and allow expansion of the program to include symposia with China and additional countries in Europe.

Attendees of the symposia, who are under the age of 45, are competitively selected and represent the engineering leaders of tomorrow. The symposia span 2-1/2 days and provide a unique opportunity for these future leaders to network and learn about cutting-edge developments in fields other than their own. Approximately 100 engineers are invited to attend each year's

U.S. meeting, and 30 from each country attend the two-nation symposia. The bilateral meetings provide a window for U.S. engineers to learn about developments at the forefront of technology in the global marketplace. — *Randy Atkins*

## Sacklers Establish US-UK Scientific Forum

In September, the National Academy of Sciences announced a substantial gift from the Raymond and Beverly Sackler Foundation to endow a bilateral scientific forum to be operated jointly by NAS and the Royal Society in London. The forum will hold scientific conferences and meetings in both the United States and United Kingdom. The topics, participants, activities, and goals of these conferences will be determined by a joint panel of NAS and the Royal Society.

"We understand the importance of supporting scientific endeavors and heritage around the world," said Raymond R. Sackler. "Our hope is that the new Raymond and Beverly Sackler USA-UK Scientific Forum will help the scientific leadership of the United Kingdom and the United States forge an enduring and productive partnership on pressing topics of worldwide scientific concern with benefit to all people."

Raymond R. Sackler, M.D., is a founder and board member of Purdue Pharma L.P., Stamford, Conn., and a founder and board member of NAPP Pharmaceutical Group Limited in the United Kingdom. Individually and through their foundations, Dr. Sackler and his wife Beverly have sponsored medical research at a number of major U.S. and international academic centers.

“Science is more and more an international undertaking,” said NAS President Ralph J. Cicerone. “Engaging the best scientific minds and research from around the world is key to addressing worldwide challenges such as agriculture, our energy needs, and climate change. We thank Raymond and Beverly Sackler for their foresight in opening new pathways to speed our work.” — *William Skane*

## Convocation Keeps an Eye on Gathering Storm

Americans risk losing their lead in the global marketplace — and ultimately their standard of living — unless the U.S. improves its research enterprise and K-12 education system. That was the warning issued by the National Academies’ 2005 report *Rising Above the Gathering Storm*, which informed a new White House initiative to kick-start U.S. competitiveness, along with a law passed by Congress last year. But how much has actually been done to implement the report’s recommendations, and what work remains?

Hundreds of policymakers, educators, and representatives of nonprofits packed a summit held in Washington, D.C., on April 29 to try to answer those questions. Speakers at the event — which was hosted by the Academies with support from the National Math and Science Initiative — included several U.S. senators and representatives, business leaders, and the secretaries of energy, education, and commerce.

Gathering Storm committee chair Norman R. Augustine pointed out that plenty of steps have been taken to bolster

competitiveness in response to the report — only not by the United States. India has started an initiative to become a global nanotechnology hub, for example, and the U.K. is slated to increase its R&D investment by 25 percent. “It would be a cruel outcome if the Gathering Storm were to motivate others to become more competitive while we did little. ...fortunately, America’s leaders seem very genuinely convinced that action needed to be taken.”

Augustine was referring in large part to Congress’ passage of the 2007 America COMPETES Act, which authorized many of the actions recommended by the report. But as he and other speakers noted, the act’s programs have not been funded — a shortfall that some in attendance hope to help remedy. “We are now in the process of writing the appropriations bills for this year, and this is where the rubber is going to hit the road,” said Sen. Kay Bailey Hutchison of Texas.

Some promising steps have been taken by the private sector — both nonprofits and businesses — to improve K-12 science and math education, other speakers pointed out. But none advocated complacency with the progress made so far.

“We are about to be hit by the full force of global competition. If we continue to ignore the obvious task at hand while others beat us at our own game, our children and grandchildren will pay the price,” said NAE President and Gathering Storm committee member Charles Vest. “Gathering Storm has elevated awareness of our challenge, but we must now establish a sense of urgency ... Urgency because time has run out.” — *Sara Frueh*

## Projects

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

### Heliophysics Performance Assessment.

Space Studies Board, Division on Engineering and Physical Sciences. Project director: Brant Sponberg. Co-chairs: Stephen A. Fuselier, researcher, Lockheed Martin Advanced Technology Center, Palo Alto, Calif.; and Roderick A. Heelis, professor and director, William B. Hanson Center for Space Sciences, University of Texas, Dallas. Sponsor: NASA.

### National Requirements for Precision Geodetic Infrastructure.

Board on Earth Sciences and Resources, Division on Earth and Life Studies. Project director: David Feary. Chair: J. Bernard Minster, professor of geophysics, Institute of Geophysics and Planetary Physics, Scripps Institution of Oceanography, University of California, San Diego. Sponsors: NASA, National Science Foundation, U.S. Geological Survey, National Geospatial-Intelligence Agency, U.S. Naval Observatory, and National Geodetic Survey.

### Options for Strengthening and Expanding the Department of Defense Cooperative Threat Reduction Program.

Development, Security, and Cooperation, Division on Policy

and Global Affairs. Project director: Anne Harrington. Co-chairs: David R. Franz, vice president and chief biological scientist, Midwest Research Institute, Frederick, Md.; and Ronald F. Lehman II, director, Center for Global Security Research, Lawrence Livermore National Laboratory, Livermore, Calif. Sponsor: U.S. Department of Defense.

### Potential Energy Savings and Greenhouse Gas Reductions from Transportation.

Studies and Special Programs, Transportation Research Board. Project director: Thomas Menzies. Chair: Emil H. Frankel, director of transportation policy, Bipartisan Policy Center, Washington, D.C. Sponsor: Transportation Research Board.

### Smoking Cessation in Military and Veteran Populations.

Board on Population Health and Public Health Practice, Institute of Medicine. Project director: Roberta Wedge. Chair: Stuart Bondurant, professor of medicine and dean emeritus, University of North Carolina School of Medicine, Chapel Hill. Sponsor: U.S. Department of Veterans Affairs.

### Sustaining and Improving the Nation’s Nuclear Forensics Capabilities.

Nuclear and Radiation Studies Board, Division on Earth and Life Studies; and Committee on International Security and Arms Control, Division on Policy and Global Affairs. Project director: Micah Lowenthal. Chair: Albert Carnesale, chancellor emeritus, University of California, Los Angeles. Sponsors: U.S. Department of Energy, National Nuclear Security Administration,

U.S. Department of Homeland Security, Domestic Nuclear Detection Office, and U.S. Department of Defense, Defense Threat Reduction Agency.

### The U.S. Commitment to Global Health.

Board on Global Health, Institute of Medicine. Project director: Sarah Scheening. Co-chairs: Ambassador Thomas R. Pickering, vice chairman, Hills & Co., Washington, D.C.; and Harold Varmus, president and chief executive officer, Memorial Sloan-Kettering Cancer Center, New York City. Sponsors: Bill & Melinda Gates Foundation, Burroughs Wellcome Fund, National Institutes of Health, Rockefeller Foundation, Merck Company Foundation, Google.org, U.S. Department of Homeland Security, Centers for Disease Control and Prevention, and U.S. Department of State.

## 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](http://www.nap.edu)>. Documents from a specific unit of the National Academies are available from the source as noted.*

### 2008 Amendments to the National Academies’ Guidelines for Human Embryonic Stem Cell Research

Board on Life Sciences, Division on Earth and Life Studies; and Board on Health Sciences Policy, Institute of Medicine (2008, approx. 64 pp.; ISBN 0-309-12220-1; available from NAP).

**Antivirals for Pandemic Influenza: Guidance on Developing a Distribution and Dispensing Program**  
Board on Population Health and Public Health Practice, Institute of Medicine (2008, 132 pp.; ISBN 0-309-11866-2; available from NAP).

**Assessment of the Bureau of Reclamation's Security Program**  
Board on Infrastructure and the Constructed Environment, Division on Engineering and Physical Sciences (2008, approx. 152 pp.; ISBN 0-309-12527-8; available from NAP).

**Assessment of the Small Business Innovation Research Program at the Department of Energy**  
Division on Policy and Global Affairs (2008, approx. 330 pp.; ISBN 0-309-11412-8; available from NAP).

**Behavioral Modeling and Simulation: From Individuals to Societies**  
Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education (2008, 400 pp.; ISBN 0-309-11862-X; available from NAP).

**Changes in the Sheep Industry in the United States: Making the Transition From Tradition**  
Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2008, approx. 386 pp.; ISBN 0-309-12161-2; available from NAP).

**Common Standards for K-12 Education? Considering the Evidence — Summary of a Workshop Series**  
Center for Education, Division of Behavioral and Social Sciences and Education (2008, 104 pp.; ISBN 0-309-12524-3; available from NAP).

**Creating a Business Case for Quality Improvement Research: Expert Views — Workshop Summary**  
Board on Health Care Services, Institute of Medicine (2008, 70 pp.; ISBN 0-309-11652-X; available from NAP).

**Dispensing Medical Countermeasures for Public Health Emergencies — Workshop Summary**  
Board on Health Sciences Policy, Institute of Medicine (2008, approx. 130 pp.; ISBN 0-309-12096-9; available from NAP).

**Early Childhood Assessment: Why, What, and How?**  
Board on Children, Youth, and Families and Board on Testing and Assessment, Division of Behavioral and Social Sciences and Education (2008, approx. 384 pp.; ISBN 0-309-12465-4; available from NAP).

**Emerging Cognitive Neuroscience and Related Technologies**  
Standing Committee for Technology Insight - Gauge, Evaluate, and Review, Division on Engineering and Physical Sciences; and Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education (2008, approx. 202 pp.; ISBN 0-309-11894-8; available from NAP).

**Emerging Safety Science — Workshop Summary**  
Board on Health Sciences Policy, Institute of Medicine (2008, 150 pp.; ISBN 0-309-11012-2; available from NAP).

**Emerging Technologies to Benefit Farmers in Sub-Saharan Africa and South Asia**  
Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2008, approx. 328 pp.; ISBN 0-309-12494-8; available from NAP).

**Epidemiologic Studies of Veterans Exposed to Depleted Uranium: Feasibility and Design Issues**  
Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2008, approx. 58 pp.; ISBN 0-309-12006-3; available from NAP).

**Estimating Mortality Risk Reduction and Economic Benefits from Controlling Ozone Air Pollution**  
Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2008, 226 pp.; ISBN 0-309-11994-4; available from NAP).

**First Report from the National Research Council Committee on the Review of the Louisiana Coastal Protection and Restoration (LACPR) Program**  
Water Science and Technology Board and Ocean Studies Board, Division on Earth and Life Studies; and Board on Infrastructure and the Constructed Environment, Division on Engineering and Physical Sciences (2008, 32 pp.; available only online from NAP).



**Foodborne Disease and Public Health — Summary of an Iranian-American Workshop**  
Food and Nutrition Board, Institute of Medicine; and Office for Central Europe and Eurasia, Division on Policy and Global Affairs (2008, 108 pp.; ISBN 0-309-11613-9; available from NAP).

**Fourth Report of the National Academy of Engineering/National Research Council Committee on New Orleans Regional Hurricane Protection Projects: Review of the IPET Volume VIII**  
National Academy of Engineering, Division on Earth and Life Studies, and Division on Engineering and Physical Sciences (2008, 23 pp.; available only online from NAP).

**Frontiers of Engineering: Reports on Leading-Edge Engineering From the 2007 Symposium**  
National Academy of Engineering (2008, 208 pp.; ISBN 0-309-11253-2; available from NAP).

**Genetically Engineered Organisms, Wildlife, and Habitat — A Workshop Summary**  
Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2008, approx. 102 pp.; ISBN 0-309-12085-3; available from NAP).

**Gulf War and Health: Updated Literature Review of Depleted Uranium**  
Board on Population Health and Public Health Practice, Institute of Medicine (2008, approx. 308 pp.; ISBN 0-309-11919-7; available from NAP).

**Improving the Quality of Cancer Clinical Trials — Workshop Summary**  
National Cancer Policy Forum, Institute of Medicine (2008, 136 pp.; ISBN 0-309-11668-6; available from NAP).

**Initial Guidance for an Update of the National Vaccine Plan: A Letter Report to the National Vaccine Program Office**  
Board on Population Health and Public Health Practice, Institute of Medicine (2008, 38 pp.; ISBN 0-309-12198-1; available from NAP).

**Innovation in Global Industries: U.S. Firms Competing in a New World (Collected Studies)**  
Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2008, 386 pp.; ISBN 0-309-11631-7; available from NAP).

**Inspired by Biology: From Molecules to Materials to Machines**  
Board on Physics and Astronomy, Division on Engineering and Physical Sciences; and Board on Life Sciences, Division on Earth and Life Studies (2008, 172 pp.; ISBN 0-309-11704-6; available from NAP).

**Integrated Computational Materials Engineering: A Transformational Discipline for Improved Competitiveness and National Security**  
National Materials Advisory Board, Division on Engineering and Physical Sciences (2008, approx. 140 pp.; ISBN 0-309-11999-5; available from NAP).

**Methodological Challenges in Biomedical HIV Prevention Trials**  
Board on Global Health, Institute of Medicine (2008, 270 pp.; ISBN 0-309-11430-6; available from NAP).

**Nanophotonics: Accessibility and Applicability**  
Air Force Studies Board, Division on Engineering and Physical Sciences (2008, 236 pp.; ISBN 0-309-10722-9; available from NAP).

**NASA Aeronautics Research: An Assessment**  
Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2008, 122 pp.; ISBN 0-309-11913-8; available from NAP).

**The National Children's Study Research Plan: A Review**  
Board on Children, Youth, and Families, National Research Council and Institute of Medicine; Committee on National Statistics, Division of Behavioral and Social Sciences and Education; and Board on Population Health and Public Health Practice, Institute of Medicine (2008, 166 pp.; ISBN 0-309-12056-X; available from NAP).

**Opening New Frontiers in Space: Choices for the Next New Frontiers Announcement of Opportunity**  
Space Studies Board, Division on Engineering and Physical Sciences (2008, 82 pp.; ISBN 0-309-11889-1; available from NAP).

**Origin and Evolution of Earth: Research Questions for a Changing Planet**

Board on Earth Sciences and Resources, Division on Earth and Life Studies (2008, 152 pp.; ISBN 0-309-11717-8; available from NAP).

**The Potential Impact of High-End Capability Computing on Four Illustrative Fields of Science and Engineering**

Division on Engineering and Physical Sciences and Division on Earth and Life Studies (2008, approx. 154 pp.; ISBN 0-309-12653-3; available from NAP).

**Preliminary Review of the Draft Science, Education, and Design Strategy for the Water and Environmental Research Systems (WATERS) Network**

Water Science and Technology Board, Division on Earth and Life Studies (2008, approx. 27 pp.; available only online from NAP).

**Public Participation in Environmental Assessment and Decision Making**

Committee on the Human Dimensions of Global Change, Division of Behavioral and Social Sciences and Education (2008, approx. 360 pp.; ISBN 0-309-12398-4; available from NAP).

**Radiation Source Use and Replacement — Abbreviated Version**

Nuclear and Radiation Studies Board, Division on Earth and Life Studies (2008, 232 pp.; ISBN 0-309-11014-9; available from NAP).

**Research on Future Skill Demands — A Workshop Summary**

Center for Education, Division of Behavioral and Social Sciences and Education (2008, 126 pp.; ISBN 0-309-11479-9; available from NAP).

**Respiratory Disease Research at NIOSH: Reviews of Research Programs of the National Institute for Occupational Safety and Health**

Board on Environmental Studies and Toxicology, Division on Earth and Life Studies (2008, 250 pp.; ISBN 0-309-11873-5; available from NAP).

**Review and Assessment of Developmental Issues Concerning the Metal Parts Treater Design for the Blue Grass Chemical Agent Destruction Pilot Plant**

Board on Army Science and Technology, Division on Engineering and Physical Sciences (2008, 62 pp.; ISBN 0-309-11515-9; available from NAP).

**Review of NASA's Exploration Technology Development Program — An Interim Report**

Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2008, approx. 60 pp.; ISBN 0-309-11943-X; available from NAP).

**A Review of the DOE Plan for U.S. Fusion Community Participation in the ITER Program**

Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2008, approx. 50 pp.; ISBN 0-309-12475-1; available from NAP).

**Review of the Naval Sea Systems Command (NAVSEA) Draft Memorandum: “NAVSEA’s 21st Century Engagement, Education, and Technology Initiative”**

Board on Higher Education and Workforce, Division on Policy and Global Affairs (2008, 62 pp.; available only online from NAP).

**Review of the Research Program of the FreedomCAR and Fuel Partnership — Second Report**

Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2008, 166 pp.; ISBN 0-309-11634-1; available from NAP).

**The Richard and Hinda Rosenthal Lecture 2007: Transforming Today’s Health Care Workforce to Meet Tomorrow’s Demands**

Institute of Medicine (2008, 50 pp.; ISBN 0-309-11539-6; available from NAP).

**Science Opportunities Enabled by NASA’s Constellation System — Interim Report**

Space Studies Board and Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2008, 70 pp.; ISBN 0-309-12010-1; available from NAP).

**Setting the Stage for International Spent Nuclear Fuel Storage Facilities — International Workshop Proceedings**

Office for Central Europe and Eurasia, Division on Policy and Global Affairs (2008, 128 pp.; ISBN 0-309-11961-8; available from NAP).

**Space Science and the International Traffic in Arms Regulations — Summary of a Workshop**

Space Studies Board, Division on Engineering and Physical Sciences (2008, 44 pp.; ISBN 0-309-11609-0; available from NAP).

**Standardizing Medication Labels: Confusing Patients Less — Workshop Summary**

Board on Population Health and Public Health Practice, Institute of Medicine (2008, 116 pp.; ISBN 0-309-11529-9; available from NAP).

**State Voter Registration Databases: Immediate Actions and Future Improvements — Workshop Summary**

Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2008, 74 pp.; ISBN 0-309-11878-6; available from NAP).

**Transitioning to Sustainability Through Research and Development on Ecosystem Services and Biofuels — Workshop Summary**

Science and Technology for Sustainability Program, Division on Policy and Global Affairs (2008, 130 pp.; ISBN 0-309-11982-0; available from NAP).

**Traumatic Injury Research at NIOSH: Reviews of Research Programs of the National Institute for Occupational Safety and Health**

Board on Population Health and Public Health Practice, Institute of Medicine (2008, approx. 238 pp.; ISBN 0-309-12507-3; available from NAP).

**United States Civil Space Policy — Summary of a Workshop**

Space Studies Board and Aeronautics and Space Engineering Board, Division on Engineering and Physical Sciences (2008, 42 pp.; ISBN 0-309-12014-4; available from NAP).

**U.S. Conventional Prompt Global Strike: Issues for 2008 and Beyond**

Naval Studies Board, Division on Engineering and Physical Sciences (2008, approx. 240 pp.; ISBN 0-309-11459-4; available from NAP).

**Use of Dietary Supplements by Military Personnel**

Food and Nutrition Board, Institute of Medicine (2008, approx. 440 pp.; ISBN 0-309-11617-1; available from NAP).

**Using the American Community Survey for the National Science Foundation's Science and Engineering Workforce Statistics Programs**

Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2008, 102 pp.; ISBN 0-309-12153-1; available from NAP).

**The Utility of Proximity-Based Herbicide Exposure Assessment in Epidemiologic Studies of Vietnam Veterans**

Board on Military and Veterans Health, Institute of Medicine (2008, 160 pp.; ISBN 0-309-11449-7; available from NAP).

**Vector-Borne Diseases: Understanding the Environmental, Human Health, and Ecological Connections**

— **Workshop Summary**  
Board on Global Health, Institute of Medicine (2008, 350 pp.; ISBN 0-309-10897-7; available from NAP).

**Workshop Series on Issues in Space Science and Technology: Summary of Space and Earth Science Issues from the Workshop on U.S. Civil Space Policy**

Space Studies Board, Division on Engineering and Physical Sciences (2008, 24 pp.; available only online from NAP).

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# Upcoming Exhibitions



Jo Whaley, *Papilio Ulysses*, 2000, chromogenic photograph, 30 x 24 inches

## The Theater of Insects: Paintings by Jo Whaley

Sept. 1 - Dec. 10

National Academies' Keck Center

500 Fifth St., N.W., First Floor Gallery

Viewable by appointment; call 202-334-2436

With a background in painting and scenic design, Jo Whaley infuses her photographs of insects with the illusionary world of theater. Presenting the insects as entomological specimens, Whaley introduces manufactured materials to construct elaborate tableaux, reflecting the interplay between urban culture and nature.

## An Iconography of Contagion

Sept. 2 - Dec. 19

National Academy of Sciences

2101 Constitution Ave., N.W., Upstairs Gallery

This exhibition features more than 20 health posters from the 1920s to the 1990s. Covering infectious diseases such as malaria, tuberculosis, AIDS, gonorrhea, and syphilis, the posters come from North America, Europe, Asia, and Africa and provide insight into the interplay between the public's understanding of disease and society's values. Considered an art form, many are beautiful and entertaining, but during their heyday, they sought to educate people on matters of life and death.



Vernon Grant, *When a Fly Wipes His Feet on Your Food*, U.S. Government Printing Office, 1944, photomechanical print, 36 x 51 cm.



John Brosio, *Breathing*, 2004-2005, oil on canvas, 48 x 60 inches

## Tornadoes: Paintings by John Brosio

Oct. 9 - Jan. 19

National Academy of Sciences

2101 Constitution Ave., N.W.,

Rotunda Gallery

For painter John Brosio, tornadoes represent a perfect blend of mythology and science. His juxtaposition of ominous skies against everyday settings serves as a metaphor for life's unpredictability and our inability to control the forces of nature.

Open weekdays from 9 a.m. to 5 p.m.; closed Nov. 27 and 28. Please visit our Web site for the most current information on all cultural programs at <[national-academies.org/arts](http://national-academies.org/arts)>.

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