“Science is a collaborative effort. The combined results of several people working together [are] often much more effective than … that of an individual scientist working alone.”

These words of the late John Bardeen — the only two-time Nobel Prize winner in physics and a member of both the National Academy of Sciences and National Academy of Engineering — describe the core of our work at the Academies. On almost every working day of the year, we convene the nation’s premier scientists, engineers, health professionals, and policy experts to take on critical national and global issues. These collaborations take many different forms, but the goal is always the same: to share expertise, work across disciplines, and address tough challenges in innovative ways.

In this Report to Congress you’ll read about some of the more than 400 reports produced by the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council in 2013. They are the result of experts coming together without compensation over many months to gather information, review evidence, and ultimately provide peer-reviewed findings on important national and international issues. Our committees proposed an ambitious research agenda for combating gun violence, examined the consequences of abrupt climate change, and called for adequate and timely care for soldiers returning home from Iraq and Afghanistan, among the multitude of subjects tackled.

In addition to convening experts to serve on study committees, in 2013 the Academies held dozens of public workshops, forums, and colloquia to explore cutting-edge, sometimes controversial issues in science, technology, and health. We also established new roundtables to spur conversation and positive momentum on subjects as varied as obesity prevention and the care and use of laboratory animals in research. Moreover, ongoing initiatives such as the Frontiers of Science and Frontiers of Engineering encourage future leaders in these professions to work across disciplinary and international boundaries.

Sadly, 2013 also marked the loss of a great leader, our friend and colleague former NAE President Charles Vest. Throughout his career, Chuck’s vision inspired thousands across professions and disciplines to join forces and do their part to make the world a better place. We offer our work as a tribute to his enduring legacy.

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National Academy of Sciences  
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SCIENCE, ENGINEERING, AND TECHNOLOGY
THE POTENTIAL OF ALTERNATIVE VEHICLES AND FUELS

Cars and SUVs consume almost half of the nation’s petroleum, and about half of that fuel is imported. Congress asked the National Research Council to assess whether alternative fuels and light-duty vehicles could decrease petroleum use and greenhouse gas emissions in the U.S. by 80 percent by 2050.

Transitions to Alternative Vehicles and Fuels says that the U.S. could meet that goal through a combination of more efficient vehicles, alternative fuels, and strong government policies to overcome barriers such as high costs and consumer choices.

Improving the efficiency of conventional vehicles is, up to a point, the most economical and easiest-to-implement approach to saving fuel and lowering emissions, however this alone will not meet the 2050 goals, the report says. To reach them, the average fuel economy of vehicles on the road would have to exceed 180 mpg, which is extremely unlikely with current technologies.

The report identified several scenarios that could meet the more demanding 2050 greenhouse gas goal. Each combines highly efficient vehicles with at least one of three alternative energy sources — biofuels, electricity, or hydrogen.

All the vehicles considered are and will continue to be several thousand dollars more expensive than today’s conventional vehicles and will likely be limited to a few body styles and sizes in the early years. Wide consumer acceptance is essential, therefore, and large numbers of alternative vehicles must be purchased long before 2050 if the on-road fleet is to meet desired performance goals. Strong policies and technology advances are critical in overcoming this challenge.

The study was funded by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy.

A BOOST FOR U.S. MANUFACTURING

For more than two decades, the United States has sought to strengthen manufacturing through the Manufacturing Extension Partnership (MEP) — a national network of 60 affiliated extension centers and field offices that spans all 50 states. Run through the National Institute of Standards and Technology, MEP provides access to expertise, services, and assistance directed at improving growth, innovation, workforce training, and adoption of emerging technologies by the nation’s small and medium manufacturers.
21st Century Manufacturing: The Role of the Manufacturing Extension Partnership Program identifies new challenges facing MEP as the nation’s manufacturing firms adapt to a rapidly evolving, globally competitive environment. The report reviews programs to support manufacturing in Germany, Taiwan, France, Canada, and the United Kingdom in terms of practices, funding levels, and accomplishments, as a point of reference for the U.S. and also to illustrate the global focus on advanced manufacturing.

To ensure that the U.S. MEP program remains effective, the report identifies a number of steps that NIST should take, including enhancing manufacturing growth, innovation, and sustainability; significantly improving collection and analysis of performance data; and adapting lessons learned from U.S. and international best practices. With the adoption of these improvements, federal funding for the MEP program should be set at a level commensurate with its mission, and take into account relevant international benchmarks.

The National Research Council study was funded by the National Institute of Standards and Technology.

SAFETY OF OFFSHORE OIL AND GAS TECHNOLOGIES

After the disastrous Deepwater Horizon oil spill in the Gulf of Mexico, the U.S. Department of the Interior sought to improve its approach for implementing a decades-old congressional mandate to require the use of technologies deemed “best available and safest” — as well as economically feasible — for offshore oil and gas drilling and production. DOI’s Bureau of Safety and Environmental Enforcement (BSEE), which is responsible for safety and environmental oversight of oil and gas operations on the U.S. outer continental shelf, asked the National Academies to identify and evaluate a range of implementation approaches.

BSEE will need to draw on expertise outside the government to improve its efforts to identify and develop the best available and safest technologies for offshore oil and gas production, says Best Available and Safest Technologies for Offshore Oil and Gas Operations: Options for Implementation. The BSEE-funded Offshore Energy Safety Institute — planned as the report was in progress — could be a “suitable vehicle” for evaluating and developing new technologies to meet the mandate.

BSEE should enlist a multidisciplinary group of individuals with the necessary skills to
perform critical technical assessments, economic analysis, and independent reviews when needed. The institute would greatly aid in tapping the additional talent BSEE needs, as long as it is properly organized, staffed, and supported. However, the initial scale and structure of the institute should be significantly expanded to fully address the range of offshore challenges, the report adds.

The study by the National Research Council and National Academy of Engineering was funded by the U.S. Department of the Interior.

**STRENGTHENING STATES’ RESEARCH CAPACITY**

The long-term health of the U.S. research enterprise depends on providing opportunities for talented young people in every state to participate in high-quality science and engineering research.

The primary federal programs designed to ensure that universities across the U.S. are capable of engaging in the nation’s research enterprise fall under the Experimental Program to Stimulate Competitive Research (EPSCoR). The National Science Foundation, departments of Energy and Agriculture, and NASA have active EPSCoR programs. The National Institutes of Health have a related program called Institutional Development Awards (IDeA).

EPSCoR has provided significant benefits to participating states and thus to the nation, says *The Experimental Program to Stimulate Competitive Research*, a report from the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. It has boosted the nation’s human capital by strengthening research infrastructure and training many future scientists and engineers in states where, in some cases, training opportunities had been scarce.

To strengthen EPSCoR’s focus and impact, programs should concentrate on the core elements of enhancing research excellence and postsecondary training in science and engineering. Over the years, EPSCoR programs have added other goals, such as encouraging innovation to stimulate economic development and expanding the diversity of the science and engineering workforce. Although adding these broader social goals may be compelling, it dilutes the program’s ability to advance its primary mission.

All EPSCoR funding should require some level of state matching funds, the report adds. EPSCoR should also develop and enforce a realistic framework for state eligibility and graduation. The program was intended to support states while they
built their research capacity, with the expectation that they would eventually be able to compete successfully for federal research funding on their own. At this point, however, no state that has participated in the decades-old program has yet permanently graduated from it.

The study was funded by the National Science Foundation.

**FEDERAL NANOTECHNOLOGY R&D**

The global market for nanotechnology is expected to exceed $3 trillion by 2015 and includes products that range from cosmetics to medical therapies to electronics. Two reports by the National Research Council examine the federal government’s efforts in researching and developing nanotechnology and in investigating potential health and environmental risks.

*Triennial Review of the National Nanotechnology Initiative* is the Research Council’s most recent review of the NNI, a multiagency, multidisciplinary federal initiative that supports a collection of research programs and other activities. The report identifies several cross-cutting, high-priority areas for NNI, including improving information gathering and communication at the project level, developing and implementing interagency plans for focused areas, and identifying, sharing, and implementing best practices, especially to foster technology transfer and commercialization.

The report evaluates the suitability of current procedures and criteria for determining progress toward NNI goals, and recommends explicit definitions of success and metrics associated with meeting those goals.

Another report, *Research Progress on Environmental, Health, and Safety Aspects of Engineered Nanomaterials*, notes that despite increased research, the potential effects of nanomaterials on humans and ecosystems are still not fully understood. The committee that issued the report previously presented a strategic approach in 2012 for developing the research and scientific infrastructure needed to address the potential health and environmental risks of nanomaterials. In this report, the committee developed a set of indicators to evaluate the progress of recent research efforts in the United States and the European Union.

To improve the level of progress, the report offers specific actions and objectives for each research category. But reiterating one of its earlier conclusions, the committee stressed that accountability for implementation of a research strategy is hampered by the absence of an entity with sufficient management and
budgetary authority to direct research efforts governmentwide. In addition, NNI would benefit from a clearer separation of authority and accountability for its environmental, health, and safety research enterprise in relation to its mandate to promote overall nanotechnology development and commercialization.

The studies were funded by the National Nanotechnology Coordination Office and the U.S. Environmental Protection Agency.

**S&E AT NATIONAL SECURITY LABS**

The U.S.’s three national security laboratories — Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories — are charged with securing the aging nuclear weapons stockpile and advancing nuclear nonproliferation. Congress asked the National Research Council to review the quality of scientific research and engineering at the labs. An earlier report, released in February 2012, examined management of the laboratories.

*The Quality of Science and Engineering at the NNSA National Security Laboratories* says that there are currently no problems with quality that would prevent certification of the stockpile. But the report identifies several stresses that could contribute to the deterioration of the work environment for scientists and engineers and limit the quality of their work in the future — and thus the nation’s ability to benefit fully from the laboratories’ potential.

The report examines capabilities in the areas of weapons design; system engineering and the effects of aging on system performance; the weapons science base; and modeling and simulation. The laboratories are building enhanced computational models that account for changes in weapon properties as they age, and this requires state-of-the-art capabilities in a number of areas, the report says — not only in computation but also in facilities for the experiments that “ground” those models in reality. The National Nuclear Security Administration should conduct a detailed assessment of simulation and modeling needs, including the necessary experimental facilities and programs, and implement an adequately funded plan to meet those needs.

While the safety risks inherent in experimental work done at the labs must be controlled, the report says that the current system for managing these risks is contributing to escalating costs and schedule delays, and in some cases may limit experimentation. The system for assessing and mitigating these risks should be reviewed to improve efficiency while maintaining a safe working environment.
The study was funded by the U.S. Department of Energy’s National Nuclear Security Administration.

**EFFECTS OF DILUTED BITUMEN ON PIPELINES**

The heavy form of petroleum known as bitumen has been imported from Canada for more than 30 years and is transported in diluted form through numerous crude oil pipelines in the United States. With bitumen production from Canada’s oil sands on the rise, Congress passed legislation in January 2012 calling upon the secretary of transportation to determine whether an increased risk of release exists for pipelines transporting bitumen imports. The U.S. Department of Transportation asked the National Research Council to analyze one aspect of this risk: whether that likelihood is greater for pipelines transporting diluted bitumen than it is for pipelines transporting other crude oils. The Research Council was not asked to examine whether the environmental or public safety consequences of a diluted bitumen release differ from those of other crude oils.

Pipelines transporting diluted bitumen have no greater likelihood of release than pipelines transporting other crude oils, says *Effects of Diluted Bitumen on Crude Oil Transmission Pipelines*. Diluted bitumen has physical and chemical properties within the range of other crude oils, the report says, and no aspect of its transportation by pipeline would make it more likely to cause an accidental release.

Shipments of diluted bitumen do not contain higher concentrations of water, sediment, dissolved gases, or other agents that cause or exacerbate internal pipeline corrosion, and the organic acids in diluted bitumen are not corrosive to steel at pipeline operating temperatures. In addition, no properties in diluted bitumen make transmission pipelines more vulnerable to erosion, external corrosion and cracking, or damage from mechanical forces.

The study was funded by the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation.
BETTER INFORMATION ON GUN VIOLENCE
Tens of thousands of people every year are injured or killed in the U.S. because of a firearm-related incident. Many recent highly publicized, tragic mass shootings have led to public demands for better protection against firearm violence in schools and communities.

In response to an executive order issued by President Obama in January 2013, the Institute of Medicine and National Research Council were asked to recommend a research agenda to improve understanding of the public health aspects of gun violence, including its causes, health burden, and possible interventions. *Priorities for Research to Reduce the Threat of Firearm-Related Violence* states significant progress can be achieved in three to five years through a research program that addresses five high-priority areas: the characteristics of gun violence, risk and protective factors, prevention and other interventions, gun safety technology, and the influence of video games and other media.

This research agenda could work toward developing effective policies to reduce the occurrence of firearm violence and its impact in the United States. Similar approaches to public health problems have produced successes in lowering tobacco use, accidental poisoning, and motor vehicle fatalities. The committee that wrote the report urged that this agenda be integrated with research conducted from criminal justice and other perspectives to provide a much fuller knowledge base.

The study was funded by the Centers for Disease Control and Prevention and the CDC Foundation, with the foundation’s support originating from the Annie E. Casey Foundation, California Endowment, California Wellness Foundation, Joyce Foundation, Kaiser Permanente, Robert Wood Johnson Foundation, and one anonymous donor.

SEX TRAFFICKING OF MINORS
Every day, children and adolescents in the U.S. become victims of commercial exploitation and sex trafficking, crimes that cause long-term physical, mental, and emotional harm. Despite laws in every state that make it illegal to have sex with a child under a certain age, children and adolescents who are victims of sex trafficking are themselves often treated as criminals and subject to arrest, detention, or incarceration.

Minors who are prostituted or sexually exploited in other ways should be recognized as victims of abuse and violence and directed toward
systems, agencies, and services that are equipped to meet their needs, says *Confronting Commercial Sexual Exploitation and Sex Trafficking of Minors in the United States*, a report from the Institute of Medicine and National Research Council.

There is no reliable estimate of the scope or prevalence of these crimes in the U.S., the report says; estimates of the number of prostituted children and adolescents, for example, have ranged from 1,400 to 2.4 million. Like other crimes of a hidden nature, these crimes may go undetected because they occur at the margins of society and behind closed doors, and the young people involved may not recognize themselves as victims of a crime.

Although estimates are imperfect, commercial sexual exploitation and sex trafficking of minors in the United States clearly are serious problems, the report says. The U.S. departments of Justice, Health and Human Services, and Education, working with other partners, should support efforts to raise awareness of these crimes that include training for teachers, health care workers, and others who routinely interact with minors. In addition, laws intended to hold exploiters, traffickers, and solicitors accountable for their role should be reviewed and strengthened.

The study was funded by the U.S. Department of Justice.

**ACCURATE DATA ON RAPE AND SEXUAL ASSAULT**

Understanding when and why rape and sexual assault occur is vital for deciding how to direct law enforcement resources and for designing and sustaining programs that support victims. However, the National Crime Victimization Survey, the main federal survey now used for collecting information on how often Americans are criminally victimized, is not well-suited to capturing data on rape and sexual assault and is likely undercounting these crimes, says *Estimating the Incidence of Rape and Sexual Assault*.

A lack of privacy may be a major reason for underreporting rape and sexual assault in the survey, which relies upon oral interviews conducted in a household by an interviewer. Because most of these attacks are committed by individuals whom the victim knows, respondents may be reluctant to disclose their victimization to an interviewer within earshot of family members. In addition, the survey’s criminal context may also inhibit reporting; for example, a victim might think an incident should not be reported on a government crime survey if it was not reported to the police. Moreover, because the survey uses terms such as “rape” and “sexual assault” without defining the specific behaviors involved,
a respondent may not realize that what he or she experienced might fit the definition of those acts.

To obtain more accurate data, the U.S. Department of Justice’s Bureau of Justice Statistics should establish a separate survey to measure rape and sexual assaults, the report recommends. Questions should be worded to describe specific actions rather than using terms like “rape” and “sexual assault,” and they should be framed within a noncriminal, neutral context, as a survey of health and well-being would be, so as not to limit responses. And to protect privacy, the survey should be self-administered by the respondent using a computer and earphones.

The National Research Council study was funded by the Bureau of Justice Statistics.

THE NATION’S HEALTH DISADVANTAGE

Although Americans’ life expectancy and health have improved over the past century, these gains have lagged behind those of other high-income countries. This health disadvantage prevails even though the United States spends more per person on health care than any other nation.

_U.S. Health in International Perspective: Shorter Lives, Poorer Health_, a report from the National Research Council and Institute of Medicine, examines multiple diseases, injuries, and behaviors across the entire life span, comparing the United States with 16 peer nations — affluent democracies that include Australia, Canada, Japan, and many western European countries. In this group, the U.S. ranks at or near the bottom in nine key areas of health, including infant mortality and low birth weight; injuries and homicides; teenage pregnancies and sexually transmitted infections; prevalence of HIV and AIDS; drug-related deaths; obesity and diabetes; heart disease; chronic lung disease; and disability.

Although documented flaws in the U.S. health care system may contribute to poorer health, the report says that many factors are responsible for the nation’s health disadvantage. For example, Americans are more likely to engage in certain unhealthy activities, from heavy caloric intake to behaviors that increase the risk of fatal injuries, the report says.

In addition, Americans still fare worse than people in other countries even when the analysis is limited to non-Hispanic whites and people with relatively high incomes and health insurance, nonsmokers, or people who are not obese.

The report calls for a comprehensive public outreach campaign to stimulate a national discussion and call attention to Americans’ health status. In addition, research is needed to study the
factors responsible for the U.S. disadvantage and potential solutions.

The study was funded by the National Institutes of Health and the U.S. Department of Health and Human Services.

MEASURES OF WELL-BEING
During the past decade, interest in measuring subjective well-being — how people feel about their experiences and how satisfied they are with their lives — has grown among policymakers, researchers, and the general public. At the request of the U.S. National Institute on Aging and the U.K. Economic and Social Research Council, a National Research Council panel study considered the extent to which it would be useful to measure people’s self-reported or “subjective” well-being for informing policy.

The resulting report, *Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience*, says that gathering survey data on “experienced” well-being — the self-reported levels of contentment, joy, stress, frustration, and other feelings people experience throughout the day and while engaged in various activities — would be valuable for policymakers. In particular, data on specific actions intended to improve the living and working conditions of different population groups, including children or older adults, show promise in developing policies and practices in such areas as end-of-life care, commuting, child custody laws, and city planning, to name a few.

Several government and private surveys — including the Bureau of Labor Statistics’ American Time Use Survey and the Gallup World Poll — already include questions on experienced well-being. The report identifies additional more-specialized government surveys — such as the American Housing Survey’s Neighborhood Social Capital module and the Panel Study of Income Dynamics — as candidates for inclusion of experienced well-being questions. Questions could also be considered on a pilot basis for broader population surveys fielded by federal statistical agencies, as they have been in the U.K. and elsewhere internationally.

The study was funded by the U.S. National Institute on Aging and the U.K. Economic and Social Research Council.

COPYRIGHT POLICY AND THE INTERNET
The rollout of the World Wide Web and expanded use of digital technologies in the mid-1990s marked the beginning of a technological revolution that changed long-established modes of creating,
distributing, and using creative works, from literature and news to film and music to scientific publications and computer software. The Internet enables near instantaneous and free distribution to mass audiences, yet content creators and distributors have lost much of their ability to prevent infringement on intellectual property.

*Copyright in the Digital Era: Building Evidence for Policy*, a report from the National Research Council, says that the debate between those who believe the digital revolution has undermined copyright protection and those who believe enhancements to copyright policy inhibit innovation and free speech has been poorly informed by objective data and independent empirical research.

The report proposes a detailed set of research questions that could inform key aspects of copyright policy, including the scope and duration of copyright protection, safe harbors and fair-use exceptions, effective enforcement strategies, and whether different industries should abide by different rules.

In addition, the report calls for the collection, organization, and availability of data associated with the activities of various stakeholders and end-user populations. Because much of this data resides in the private sector, public and private organizations should cooperate in building a copyright data infrastructure accessible to academic and industry investigators.

The study was funded by the Alfred P. Sloan Foundation, Ford Foundation, Institute of Museum and Library Sciences, National Science Foundation, American Chemical Society, Business Software Alliance, Entertainment Software Association, Google Inc.-Tides Foundation, Intel, Microsoft, Motion Picture Association, and Pamela Samuelson and Robert J. Gulshko.
HEALTH AND SAFETY
YOUNG ATHLETES AND CONCUSSIONS

Sports-related concussions and their effects on the developing brains of young people have become a significant public health concern in recent years. Approximately 250,000 sports- and recreation-related concussions and other traumatic brain injuries (TBIs) among youths ages 19 and under were treated in U.S. emergency departments in 2009. However, estimates of the overall incidence of sports-related concussions are likely to be conservative, in part because many young athletes encounter a “culture of resistance” to reporting when they might have a concussion or to following treatment plans, says *Sports-Related Concussions in Youth: Improving the Science, Changing the Culture*.

The committee that wrote the report found that research about youth concussions is limited and identified several areas for further research, including establishing a national surveillance system to accurately determine the number of sports-related concussions, identifying changes in the brain following concussions in youth, conducting studies to assess the consequences and effects of concussions over a life span, and evaluating the effectiveness of sports rules and playing practices in reducing concussions.

Once a concussion is recognized and diagnosed, its management is of vital importance, but a standard level and duration of rest needed does not exist. Researchers should establish specific metrics and markers of concussion diagnosis, prognosis, and recovery for youths and create age-specific, evidence-based guidelines for managing short- and long-term consequences of concussions.

There is little evidence that current sports helmet designs reduce concussion risk, the committee found. Nevertheless, it recommended properly fitted helmets, face masks, and mouth guards still be worn because they reduce the risk of other injuries, such as skull fractures and facial and dental injuries.

Since the report was released, the Concussion Awareness and Education Act of 2014 was introduced in the U.S. House of Representatives, and the National Athletic Trainers’ Association is convening a task force of representatives from many groups involved in youth sports — such as the National Collegiate Athletic Association, National Federation of State High School Associations, and U.S. Department of Education — to examine options for changing the culture around concussions.

This study by the Institute of Medicine and National Research Council was funded by Centers for Disease Control and Prevention, U.S. Department of Defense, U.S. Department
of Education, Health Resources and Services Administration, National Athletic Trainers’ Association Research and Education Foundation, National Institutes of Health, and the CDC Foundation with support from the National Football League.

**THE CHILDHOOD VACCINE SCHEDULE**

Roughly 90 percent of American children receive most of the childhood vaccines advised by the federal immunization schedule by the time they enter kindergarten. However, some parents have concerns about the number of doses that children receive or object to having their children immunized at all. The U.S. Department of Health and Human Services asked the Institute of Medicine to review the available evidence on the safety of the schedule.

*The Childhood Immunization Schedule and Safety: Stakeholder Concerns, Scientific Evidence, and Future Studies* finds no evidence that the schedule is unsafe. If signals arise that indicate the need to investigate the schedule, the report offers a framework for conducting safety research using existing or new data collection systems.

The current schedule entails 24 immunizations by age 2 given in amounts ranging from one to five injections during a pediatric visit. The schedule is designed to protect children from 14 pathogens by inoculating them at the time in their lives when they are most vulnerable to disease. Studies have repeatedly shown the health benefits associated with the recommended schedule, including fewer illnesses, deaths, and hospital stays, the report notes. Every new vaccine is tested for safety and evaluated in the context of the entire schedule before it is added. And the systems designed to detect possible harmful effects of immunization have worked well at discovering any problems with individual vaccines.

However, the elements of the schedule — the number, frequency, timing, order, and age at which vaccines are administered — are not well-defined in existing research and should be improved, the report says. Newer data collection and surveillance systems offer great potential to monitor for rare adverse events that may be associated with the childhood immunization schedule.

The study was funded by the U.S. Department of Health and Human Services.

**PHYSICAL ACTIVITY FOR CHILDREN**

Only about half of school-age children meet the current guideline of at least 60 minutes of daily vigorous or moderate-intensity physical activity, as recommended by the U.S. Department of Health
and Human Services. However, evidence suggests that increasing physical activity and fitness may improve academic performance — especially in mathematics and reading — and that the benefits of engaging in physical activity during the school day outweigh the benefits of exclusive use of classroom time for academic learning.

Given the implications for the overall health, development, and academic success of children, most daily physical activity should occur during regular school hours in physical education classes, recess or breaks, and classroom time dedicated to physical activity, with additional opportunities available through active commutes to and from school, before- and after-school programs, and participation in intramural or varsity sports, says *Educating the Student Body: Taking Physical Activity and Physical Education to School*.

Moreover, schools should devote 30 minutes per day in elementary school and 45 minutes per day in middle and high schools to physical education, and at least half of that class time should be spent engaged in vigorous or moderate-intensity physical activity.

The Institute of Medicine study was funded by the Robert Wood Johnson Foundation.

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**A CRISIS IN CANCER CARE**

In the United States, more than 1.6 million new cases of cancer are diagnosed each year. By 2030, cancer incidence is expected to rise by 45 percent as the segment of the population that accounts for most cancer diagnoses — older adults — rapidly increases.

*Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis* notes that a combination of factors, including higher demand, a shrinking oncology workforce, rising costs of cancer care, and the complexity of the disease and its treatment, is straining an already overburdened system.

The report recommends strategies for improving cancer care, beginning with a system that supports patients in making informed medical decisions that are consistent with their needs, values, and preferences. New models of team-based care can also promote coordinated care for patients with cancer and respond to existing workforce shortages and demographic changes. And to achieve higher-quality care, the workforce must include enough clinicians with essential core competencies for providing care to patients with cancer.
The report also called for a system that can “learn” by enabling real-time analysis of data from cancer patients in a variety of care settings; tools and initiatives that can help clinicians incorporate new medical knowledge into routine care; and accessible and affordable cancer care, especially for vulnerable and underserved populations, such as those who lack access to health care, are of lower socio-economic status, are older, or are racial or ethnic minorities.

Since the report’s release, the National Association of Managed Care Physicians is using guidance from the report to create a new program to empower cancer patients, physicians, insurance providers, and employers, and improve transparency regarding cancer care choices.

The study was funded by the National Cancer Institute; Centers for Disease Control and Prevention; AARP; American Cancer Society; American College of Surgeons, Commission on Cancer; American Society of Clinical Oncology; American Society of Hematology; American Society for Radiation Oncology; California HealthCare Foundation; LIVESTRONG; National Coalition for Cancer Survivorship; Oncology Nursing Society; and Susan G. Komen for the Cure.

**VARIATION IN MEDICARE SPENDING**

Although Medicare is a national program, variations in spending among different regions of the country — unrelated to actual health outcomes — have been documented for years. The Centers for Medicare and Medicaid Services asked the Institute of Medicine to investigate these variations in spending and quality and to analyze payment policies that could encourage high-value care.

The resulting report, *Variation in Health Care Spending: Target Decision Making, Not Geography*, says a “geographic value index” that would tie Medicare payment rates to the health benefits and costs of health services in particular regions of the country should not be adopted by Congress. Decisions about health care generally are made at the level of the physician or organization, such as a hospital, not at the regional level. Because individual physician performance varies, sometimes even within a single practice group, an index based on regions is unlikely to encourage more efficient behavior among individual providers or improve the overall value of health care.

To improve care, payment reforms need to create incentives for behavioral change by decision makers, whether they are at the level of individual providers, hospitals, health care systems, or stakeholder collaboratives, the report says.
CMS should continue to test Medicare payment reforms that encourage the clinical and financial integration of health care delivery systems and the coordination of care among individual providers. CMS should also evaluate the effects of test payment reforms on health care quality, and if they prove effective Congress should give CMS the flexibility to accelerate the adoption of the new Medicare payment models.

The study was funded by the Centers for Medicare and Medicaid Services.

ADJUSTING TO LIFE AFTER DEPLOYMENT
More than 2.2 million troops have served in the wars in Iraq and Afghanistan. Although the majority has readjusted well to post-deployment life, a large minority — 44 percent — has reported difficulties since returning home.

Returning Home From Iraq and Afghanistan: Assessment of Readjustment Needs of Veterans, Service Members, and Their Families, a report from the Institute of Medicine, says that the U.S. departments of Defense and Veterans Affairs should ensure that their systems have sufficient capacity to provide timely and adequate care to service members, veterans, and their families. The agencies need to boost efforts to reduce the stigma associated with getting care for mental health and substance abuse problems. More efforts are also needed to support the readjustment needs of military family members.

Significant percentages of personnel deployed to Iraq and Afghanistan have suffered traumatic brain injuries (TBI), and many have shown symptoms of post-traumatic stress disorder, depression, and substance misuse or abuse. In many ways, DOD and VA health care providers are at the forefront of providing evidence-based care for TBI and psychological health problems. But the tool that DOD uses to assess cognitive function after a head injury has no clear scientific evidence basis to assure its effectiveness. In addition, VA includes a depression therapy among its front-line treatments that lacks sufficient evidence. And DOD policy prohibits restricting that individual’s access to privately owned weapons even if a service member is at risk for suicide.

The report calls for comprehensive, longitudinal studies that increase the understanding the physical, psychological, and social impact of combat. The departments should also complete work as soon as possible on an interoperable electronic health record that will help service members and veterans more easily navigate the services offered by each department and ease the transition from one to the other.

The study was funded by the U.S. Department of Defense.
A GLOBAL RESPONSE TO HIV/AIDS
Through the President’s Emergency Plan for AIDS Relief (PEPFAR), one of the most ambitious global health efforts in history, Congress has authorized over $60 billion to address HIV, malaria, and tuberculosis in more than 100 countries during the past decade.

Evaluation of PEPFAR, a congressionally mandated report from the Institute of Medicine, finds that the initiative’s bilateral HIV programs have saved and improved millions of lives, offering proof that HIV/AIDS services can be effectively delivered on a large scale in countries with high rates of disease and resource constraints. Overall, PEPFAR reset the world’s expectations for what can be accomplished with ambitious goals, ample funding, and humanitarian commitment to a public health crisis.

Working with a wide range of international and local partners, PEPFAR has expanded HIV testing, increased the number of people receiving clinical care and being treated with antiretroviral drugs, and increased services to prevent mother-to-child HIV transmission during pregnancy and birth. Described as a lifeline across partner countries, the initiative has trained hundreds of thousands of service providers, provided additional nonclinical support services for people living with HIV/AIDS, and made an unprecedented investment in programs for orphans and vulnerable children. PEPFAR has also strengthened health systems and engaged with partner countries to facilitate HIV policy and planning.

Going forward, the report says, greater attention to a range of prevention strategies is needed, in particular preventing sexual transmission of HIV, which is responsible for the majority of new infections. The report also recommends the need to support partner countries in taking on greater responsibility for sustainably managing their own HIV/AIDS programs. PEPFAR’s guidance should be reoriented from prescribing specific activities to outlining key outcomes and enabling partner countries to determine how to prioritize their efforts to achieve these outcomes.

The study was funded by the U.S. Department of State.

HEALTH EFFECTS OF INORGANIC ARSENIC
People can be exposed to inorganic arsenic through various foods or drinking water, raising questions about the extent to which such exposure contributes to the development of cancer or other health problems. The U.S. Environmental Protection Agency is planning to address such questions using its Integrated Risk Information
System (IRIS), and asked the National Research Council to review its draft plan for the assessment.

*Critical Aspects of EPA’s IRIS Assessment of Inorganic Arsenic — Interim Report* says that to reach the best evidence-based conclusions, EPA’s draft plan should take greater advantage of the extensive data on the naturally occurring element. It also recommends alternative statistical approaches over EPA’s current default methods for estimating risk.

The interim report largely agrees with EPA’s plan to include a framework for categorizing various health problems according to how strongly the evidence supports or suggests causal relationships with exposure to inorganic arsenic and offers a starting point for prioritizing those health outcomes. Lung, skin, and bladder cancer, ischemic heart disease, and skin lesions should be priority outcomes for EPA to evaluate, followed by prostate and renal cancer, diabetes, non-malignant respiratory disease, pregnancy outcomes, neurodevelopmental toxicity, and immune effects.

In addition, newer studies of exposures in the low to moderate range deserve considerable attention, and a key objective of EPA’s assessment should be to better characterize risks at lower exposure levels. The agency should also consider whether separate analyses are merited to determine whether factors such health status, sex, age at exposure, or genetic factors might affect people’s susceptibility to health effects from inorganic arsenic.

The study was funded by the U.S. Environmental Protection Agency; a final report is expected in the spring of 2014.
NATURAL RESOURCES AND THE ENVIRONMENT
ABRUPT CLIMATE CHANGE
Climate change has increased apprehension over possible large and rapid changes in Earth’s physical climate system, which includes the atmosphere, land surfaces, and oceans. Some of these changes could occur within a few decades or even years, leaving little time for society and ecosystems to adapt.

Abrupt Impacts of Climate Change: Anticipating Surprises points out, however, that even steady, gradual changes in the physical climate system can have abrupt impacts elsewhere if critical thresholds are crossed. For example, relatively slow global sea-level rise could reach a “tipping point” and directly affect local infrastructure such as roads, airports, pipelines, or subway systems if a sea wall or levee is breached. The report says abrupt changes already underway are of immediate concern, including the disappearance of late-summer Arctic sea ice and increases in extinction rates of marine and terrestrial species.

Some changes such as a shutdown in the Atlantic Ocean circulation patterns or a rapid release of methane from high-latitude permafrost or undersea ice are now known to be unlikely in this century. But more research is needed to determine timelines for abrupt changes whose likelihood is unknown such as the collapse of the West Antarctic ice sheet.

The report calls for the development of an early warning system that could help society better anticipate sudden changes and emerging impacts. An effective system would need to be flexible and adaptive, including careful and vigilant monitoring, data collection and analysis, model testing and improvement, and model predictions that suggest future data needs.

The National Research Council study was funded by the National Oceanic and Atmospheric Administration, National Science Foundation, the U.S. intelligence community, and the National Academies.

PESTICIDES AND ENDANGERED SPECIES
Before a pesticide can be sold or used in the United States, the U.S. Environmental Protection Agency must ensure that it will not cause unreasonable adverse effects on the environment, which includes species listed as threatened or endangered and their critical habitats. If EPA determines that a listed species or its habitat is likely to be adversely affected, it must consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service, which then conducts its own assessment and issues a biological opinion on the matter.

Each agency has developed its own methods for assessing those risks, and they have been
unable to reach a consensus about which approaches to use. Together with the U.S. Department of Agriculture, the agencies asked the National Research Council to examine the scientific and technical issues.

*Assessing Risks to Endangered and Threatened Species From Pesticides* says that a common approach among the agencies is needed, and recommends following a risk-assessment paradigm grounded in two previous National Research Council reports: *Risk Assessment in the Federal Government: Managing the Process* (1983) and *Science and Decisions: Advancing Risk Assessment* (2009). After 30 years of use and refinement, the risk-assessment paradigm has become scientifically credible, transparent, and consistent, and it is already used elsewhere in the federal government.

If FWS and NMFS could build on EPA’s initial analysis of whether a pesticide is likely to adversely affect a listed species rather than conduct a completely new analysis, the assessment would likely be more effective and scientifically credible, the report adds. Action is also needed to improve communication and coordination among the three agencies throughout the process. Coordination is necessary to ensure a complete and representative assessment of risk and that each agency’s technical needs are met.

The study was funded by the National Oceanic and Atmospheric Administration, U.S. Department of Agriculture, U.S. Environmental Protection Agency, and U.S. Fish and Wildlife Service.

**U.S. TAX POLICY AND GREENHOUSE GAS EMISSIONS**

Transportation fuel taxes, oil and gas depletion allowances, subsidies for ethanol, and tax credits for renewable energy are designed in part to achieve certain effects on energy production and consumption, which in turn could impact the level of greenhouse gas emissions. At the request of Congress, the National Research Council evaluated the most important tax provisions that affect carbon dioxide and other greenhouse gas emissions and estimated the magnitude of the effects.

*Effects of U.S. Tax Policy on Greenhouse Gas Emissions* says that although it is difficult to estimate the precise impact of energy-related tax provisions on emissions, they achieve very little greenhouse gas reductions at a substantial cost. The U.S. Department of the Treasury estimates that the combined federal revenue losses from energy-sector tax subsidies in 2011 and 2012 totaled $48 billion. While few of these provisions were created solely to reduce greenhouse gas emissions, they are a poor tool for doing so, the report says.
Several existing tax subsidies have unexpected effects, and others yield little reduction in greenhouse gas emissions per dollar of revenue loss, the report says. For example, provisions subsidizing renewable electricity reduce greenhouse gas emissions only slightly, while those for biofuels may have increased emissions by lowering the price of blended gasolines.

In addition to energy-related taxes, the report also examines broad-based provisions that may have indirect effects on emissions such as those for employer-provided health insurance or incentives for investment in machinery. The models indicate that these provisions affect emissions primarily through their effect on national economic output.

Tax policies that target emissions directly, such as carbon taxes or tradable emissions allowances, would be the most effective and efficient ways of reducing greenhouse gases.

The study was funded by the U.S. Department of the Treasury.

**REBUILDING U.S. FISHERIES**

About 20 percent of the U.S. fisheries that have been assessed are overfished, according to a 2012 report by the National Oceanic and Atmospheric Administration. When fish stocks drop to an overfished level, the law requires that fishery managers implement plans to rebuild the stocks, in most cases within 10 years. These rebuilding plans usually require significant restrictions on fishing for the depleted species, limits that may also affect fishing for other species in the same waters.

Because of concerns about the economic and social impacts of these restrictions, Congress requested a National Research Council assessment of the rebuilding plans and their associated ecological and economic effects. *Evaluating the Effectiveness of Fish Stock Rebuilding Plans in the United States* says that these efforts have been successful at reducing fishing pressure on many overfished stocks, and numbers have generally increased. However, outcomes have been mixed across fisheries; fishing pressure is still too high for some fish stocks, others have not rebounded as quickly as projected, and many stocks have not been assessed.

Much of the variation reflects a mismatch between the current prescriptions for rebuilding within a limited time frame and the uncertainties inherent in assessing and managing fisheries given data limitations and complex ecosystem dynamics where fishing is only one of many influences on fish populations. Because climate change and other ecological factors can also drive changes in fish stocks, rebuilding fish populations within a certain time frame cannot be assured.
The report identifies strategies for accommodating these uncertainties that could lessen short-term economic and social impacts for the fishing industry and communities while still promoting rebuilding.

The study was funded by the National Oceanic and Atmospheric Administration.

**A DIFFERENT APPROACH TO DAMAGE ASSESSMENT**

Since the 2011 Deepwater Horizon oil spill, federal, state, and local policymakers have been grappling with the difficult task of restoring the ocean and coastal ecosystems in the region to the condition they would have been before the spill. None of the agencies has ever been faced with a spill affecting such a wide area and broad range of ecosystems.

The extent and severity of these impacts and the value of the resulting losses cannot fully be measured without considering the goods and services provided by the Gulf, says *An Ecosystem Services Approach to Assessing the Impacts of the Deepwater Horizon Oil Spill in the Gulf of Mexico*. The National Research Council report offers an approach that could establish a more comprehensive understanding of the impacts and help inform options for restoration activities.

The impacts of environmental damage extend beyond individual resources such as number of fish killed or acres of wetland destroyed — the kind of measures traditionally called for under current law, the report says. Rather, an ecosystemwide approach to damage assessment is needed, which requires an understanding of the environmental impacts from a disruption, the resulting decrease in ecosystem goods and services, and the value of those losses to individual communities and society at large.

The report illustrates how this approach might be applied to coastal wetlands, fisheries, marine mammals, and the deep sea — each of which provide key services in the Gulf. Many may have enormous value despite being difficult to measure, and such services should be given adequate consideration in evaluating restoration options.

The study was funded by the National Oceanic and Atmospheric Administration.

**IMPROVED FLOOD INSURANCE PROGRAM**

Properties located in floodplains but protected by an accredited levee system — one built to withstand the kind of flood that has only a 1 percent chance of happening each year — are exempt from the requirement to buy flood insurance. However, with the modernization of
flood mapping, it has become apparent that some accredited levees no longer meet the standard of protecting against a “1 percent annual chance” flood.

In establishing flood insurance premium rates, the Federal Emergency Management Agency considers a non-accredited levee to be the same as no levee at all; this means that communities protected by levees that do not meet the standard would be considered “without levee” and required to buy flood insurance at the same rates as those with no levees. At the urging of Congress, FEMA was asked to replace its current “without levee” approach with one that would better reflect the flood risk in areas impacted by non-accredited levees. In response, FEMA is developing a new approach, the Levee Analysis and Mapping Procedure (LAMP).

Levees and the National Flood Insurance Program: Improving Policies and Practices, a report from the National Research Council, recommends a more modern approach to analyzing and managing flood risk behind levees — one that would better inform public officials and give individual property owners a clearer idea of the risks they face. Although the LAMP approach is technically sound, it is a short-term response and is not based on modern risk-based analysis.

The report recommends flood risk analysis that would use 21st century computational and mapping techniques to produce state-of-the-art risk estimates for all areas that are vulnerable to flooding. It would assess how well levee systems are likely to perform, taking into account the probabilities that the many components of a system will function as designed. The report also proposes interim steps to deal with non-accredited levees.

The study was funded by the U.S. Federal Emergency Management Agency.

MANAGEMENT OF WILD HORSES AND BURROS

In 1971 Congress tasked the Bureau of Land Management with protecting and managing the wild horse and burro populations living on western public lands. BLM is also responsible for managing the lands for other uses — such as recreation, forestry, mining, and wildlife habitat — and maintaining a “thriving natural ecological balance.”
To try to address these many responsibilities, BLM established Herd Management Areas and limits wild horses and burros to those areas. When crowding or habitat destruction becomes a concern, some horses and burros are removed and offered for adoption. Most are not adopted, however, and the expense of maintaining the relocated animals in long-term holding facilities consumes about half the Wild Horse and Burro program’s budget.

The National Research Council report *Using Science to Improve the BLM Wild Horse and Burro Program: A Way Forward* concludes that continuing “business as usual” will be expensive and unproductive. Compelling evidence exists that there are more horses and burros on public rangelands than BLM has estimated, and that population growth rates are high — 15 percent to 20 percent annually for most herds.

BLM could improve its estimates of population size by continuing its collaboration with the U.S. Geological Survey to conduct regular surveys of horse and burro populations using scientific methods. More accurate population estimates could be used with modeling to predict the results of management actions. BLM could also make greater use of fertility-control methods to lower population growth rates. Using these and other scientific management approaches consistently and communicating them transparently with the public could help increase public confidence in the program.

The study was funded by the Bureau of Land Management.
Studies and Projects Completed in 2013

**DEFENSE, NATIONAL SECURITY, AND SPACE**

2011-2012 Assessment of the Army Research Laboratory

Assessment of Supercritical Water Oxidation System Testing for the Blue Grass Chemical Agent Destruction Pilot Plant

Assessment to Enhance Air Force and Department of Defense Prototyping for the New Defense Strategy — A Workshop Summary

Capability Surprise for U.S. Naval Forces: Initial Observations and Insights — Interim Report

Emerging and Readily Available Technologies and National Security: A Framework for Addressing Ethical, Legal, and Societal Issues


Energy-Efficiency Standards and Green Building Certification Systems Used by the Department of Defense for Military Construction and Major Renovations

Engineering Aviation Security Environments: Reduction of False Alarms in Computed Tomography-Based Screening of Checked Baggage

Future of Battlespace Situational Awareness — A Workshop Summary

Improving the Assessment of the Proliferation Risk of Nuclear Fuel Cycles

Lessons Learned in Decadal Planning in Space Science — Summary of a Workshop

Making the Soldier Decisive on Future Battlefields

Performance Metrics for the Global Nuclear Detection Architecture: Abbreviated Version

Professionalizing the Nation’s Cybersecurity Workforce? Criteria for Decision-Making

The Quality of Science and Engineering at the NNSA National Security Laboratories [page 9]

The Resilience of the Electric Power Delivery System in Response to Terrorism and Natural Disasters — Summary of a Workshop

Responding to Capability Surprise: A Strategy for U.S. Naval Forces

Review of Biotreatment, Water Recovery, and Brine Reduction Systems for the Pueblo Chemical Agent Destruction Pilot Plant


U.S. Naval Forces’ Capabilities for Responding to Small Vessel Threats: Abbreviated Version of a Classified Report

Zero-Sustainment Aircraft for the U.S. Air Force — A Workshop Summary

**EDUCATION AND SOCIAL ISSUES**

Adapting to a Changing World: Challenges and Opportunities in Undergraduate Physics Education

Benefits, Burdens, and Prospects of the American Community Survey — Summary of a Workshop

Confronting Commercial Sexual Exploitation and Sex Trafficking of Minors in the United States [page 12]
Developing Assessments for the Next Generation Science Standards

Developing New National Data on Social Mobility — A Workshop Summary

Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning — Summary of a Forum

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Estimating the Incidence of Rape and Sexual Assault [page 13]

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Improving Self-Escape From Underground Coal Mines

Messaging for Engineering: From Research to Action

National Patterns of R&D Resources: Future Directions for Content and Methods — Summary of a Workshop

New Directions in Assessing Performance Potential of Individuals and Groups — Workshop Summary

New Directions in Child Abuse and Neglect Research

New Directions in the Sociology of Aging

Nonresponse in Social Science Surveys: A Research Agenda

Practical Guidance on Science and Engineering Ethics Education for Instructors and Administrators — Papers and Summary From a Workshop, Dec. 12, 2012

Preparing the Next Generation of Earth Scientists: An Examination of Federal Education and Training Programs


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Acute Exposure Guideline Levels for Selected Airborne Chemicals, Vol. 13

Acute Exposure Guideline Levels for Selected Airborne Chemicals, Vol. 14

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Challenges and Opportunities for Change in Food Marketing to Children and Youth — Workshop Summary

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Cognitive Rehabilitation Therapy for Traumatic Brain Injury: Model Study Protocols and Frameworks to Advance the State of the Science — Workshop Summary

Core Measurement Needs for Better Care, Better Health, and Lower Costs: Counting What Counts — Workshop Summary

Countering the Problem of Falsified and Substandard Drugs

Creating Equal Opportunities for a Healthy Weight — Workshop Summary

Crisis Standards of Care: A Toolkit for Indicators and Triggers

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Establishing Transdisciplinary Professionalism for Improving Health Outcomes — Workshop Summary

Evaluating Obesity Prevention Efforts: A Plan for Measuring Progress

Financing Long-Term Services and Supports for Individuals With Disabilities and Older Adults — Workshop Summary

Fostering Independence, Participation, and Healthy Aging Through Technology — Workshop Summary

Genome-Based Diagnostics: Demonstrating Clinical Utility in Oncology — Workshop Summary

Gulf War and Health: Treatment for Chronic Multisymptom Illness

Health and Incarceration — A Workshop Summary

Health Impact Assessment of Shale Gas Extraction — Workshop Summary

Health Literacy: Improving Health, Health Systems, and Health Policy Around the World — Workshop Summary

Identifying and Addressing the Needs of Adolescents and Young Adults With Cancer — Workshop Summary

Implementing a National Cancer Clinical Trials System for the 21st Century — Second Workshop Summary

Improving and Accelerating Therapeutic Development for Nervous System Disorders — Workshop Summary

Improving the Health, Safety, and Well-Being of Young Adults — Workshop Summary

Improving the Utility and Translation of Animal Models for Nervous System Disorders — Workshop Summary

Interim Report of the Committee on Geographic Variation in Health Care Spending and Promotion of High-Value Health Care: Preliminary Committee Observations

Interprofessional Education for Collaboration: Learning How to Improve Health From Interprofessional Models Across the Continuum of Education to Practice — Workshop Summary

Large Simple Trials and Knowledge Generation in a Learning Health System — Workshop Summary

Launching a National Conversation on Disaster Resilience in America — Workshop Summary

Leveraging Action to Support Dissemination of Pregnancy Weight Gain Guidelines — Workshop Summary

Leveraging Culture to Address Health Inequalities: Examples From Native Communities — Workshop Summary

Nationwide Response Issues After an Improvised Nuclear Device Attack: Medical and Public Health Considerations for Neighboring Jurisdictions — Workshop Summary

Neurodegeneration: Exploring Commonalities Across Diseases — Workshop Summary

The Nexus of Biofuels, Climate Change, and Human Health — Workshop Summary

Nutrition Education in the K-12 Curriculum: The Role of National Standards — Workshop Summary

Observational Studies in a Learning Health System — Workshop Summary

Oral Health Literacy

Organizational Change to Improve Health Literacy — Workshop Summary

Oversight and Review of Clinical Gene Transfer Protocols: Assessing the Role of the Recombinant DNA Advisory Committee

Partnering With Patients to Drive Shared Decisions, Better Value, and Care Improvement — Workshop Proceedings

Perspectives on Research With H5N1 Avian Influenza: Scientific Inquiry, Communication, Controversy — Summary of a Workshop

Population Health Implications of the Affordable Care Act — Workshop Summary
Preparedness, Response, and Recovery Considerations for Children and Families — Workshop Summary

Public Health Linkages With Sustainability — Workshop Summary

Ranking Vaccines: A Prioritization Software Tool — Phase II: Prototype of a Decision-Support System

A Ready and Resilient Workforce for the Department of Homeland Security: Protecting America’s Front Line

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Supplemental Nutrition Assistance Program: Examining the Evidence to Define Benefit Adequacy

Technologies to Enable Autonomous Detection for BioWatch: Ensuring Timely and Accurate Information for Public Health Officials — Workshop Summary

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Twenty-second Interim Report of the Committee on Acute Exposure Guideline Levels

An Update on Research Issues in the Assessment of Birth Settings — Workshop Summary

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Best Available and Safest Technologies for Offshore Oil and Gas Operations: Options for Implementation [page 6]

Best Practices in State and Regional Innovation Initiatives: Competing in the 21st Century

Building the Illinois Innovation Economy — Summary of a Symposium

Building the Ohio Innovation Economy — Summary of a Symposium

Colloquy on Minority Males in Science, Technology, Engineering, and Mathematics

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Flexible Electronics for Security, Manufacturing, and Growth in the United States — Summary of a Symposium

Future U.S. Workforce for Geospatial Intelligence

New York’s Nanotechnology Model: Building the Innovation Economy — Summary of a Symposium

Patent Challenges for Standard-Setting in the Global Economy: Lessons From Information and Communication Technology

Pathways to Urban Sustainability: A Focus on the Houston Metropolitan Region — Summary of a Workshop

Seeking Solutions: Maximizing American Talent by Advancing Women of Color in Academia — Summary of a Conference
Strengthening American Manufacturing: The Role of the Manufacturing Extension Partnership — Summary of a Symposium

Sustainability for the Nation: Resource Connections and Governance Linkages


Underground Engineering for Sustainable Urban Development

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Developing Capacities for Teaching Responsible Science in the MENA Region: Refashioning Scientific Dialogue

Evaluation of PEPFAR [page 23]

The Global Crisis of Drug-Resistant Tuberculosis and Leadership of China and the BRICS: Challenges and Opportunities — Summary of a Joint Workshop by the IOM and the Institute of Microbiology, Chinese Academy of Sciences

Global Development Goals and Linkages to Health and Sustainability — Workshop Summary


International Regulatory Harmonization Amid Globalization of Drug Development — Workshop Summary


Reducing Maternal and Neonatal Mortality in Indonesia: Saving Lives, Saving the Future

Sensing and Shaping Emerging Conflicts — Report of a Workshop by the National Academy of Engineering and the United States Institute of Peace Roundtable on Technology, Science, and Peacebuilding

Strengthening Human Resources Through Development of Candidate Core Competencies for Mental, Neurological, and Substance Use Disorders in Sub-Saharan Africa — Workshop Summary

The Unique U.S.-Russian Relationship in Biological Science and Biotechnology: Recent Experience and Future Directions

India-United States Cooperation on Global Security — Summary of a Workshop on Technical Aspects of Civilian Nuclear Materials Security

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An Evaluation of the U.S. Department of Energy’s Marine and Hydrokinetic Resource Assessments


Opportunities and Obstacles in Large Scale Biomass Utilization: The Role of the Chemical Sciences and Engineering Communities — A Workshop Summary
Protecting National Park Soundscapes


A Review of the Draft 2013 National Climate Assessment

Review of NOAA Working Group Report on Maintaining the Continuation of Long-Term Satellite Total Irradiance Observations

Review of the Federal Ocean Acidification Research and Monitoring Plan

Urban Forestry: Toward an Ecosystem Services Research Agenda — A Workshop Summary

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Adaptive Materials and Structures — A Workshop Report

Assessment of Advanced Solid State Lighting

Assessment of Inertial Confinement Fusion Targets

An Assessment of the National Institute of Standards and Technology Center for Neutron Research, Fiscal Year 2013

An Assessment of the Prospects for Inertial Fusion Energy

Capturing Change in Science, Technology, and Innovation: Improving Indicators to Inform Policy

The CTSA Program at NIH: Opportunities for Advancing Clinical and Translational Research

Directed Evolution for Development and Production of Bioactive Agents — A Meeting Summary

Frontiers in Massive Data Analysis

Frontiers of Engineering: Reports on Leading-Edge Engineering From the 2012 Symposium

Geotargeted Alerts and Warnings: Report of a Workshop on Current Knowledge and Research Gaps

High Magnetic Field Science and Its Application in the United States: Current Status and Future Directions

Landsat and Beyond: Sustaining and Enhancing the Nation’s Land Imaging Program

The Mathematical Sciences in 2025

National Academies Keck Futures Initiative: The Informed Brain in a Digital World — Interdisciplinary Team Summaries

Novel Processes for Advanced Manufacturing — Summary of a Workshop

Opportunities for High-Power, High-Frequency Transmitters to Advance Ionospheric-Thermospheric Research — Report of a Workshop

Report of the Committee on Proposal Evaluation for Allocation of Supercomputing Time for the Study of Molecular Dynamics, Fourth Round

Research Progress on Environmental, Health, and Safety Aspects of Engineered Nanomaterials [page 8]

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Views of the U.S. National Academy of Sciences and National Academy of Engineering on Agenda Items at Issue at the World Radiocommunication Conference 2012

TRANSPORTATION

Active Traffic Management for Arterials

Adapting Freight Models and Traditional Freight Data Programs for Performance Management — Summary of a Workshop, April 30-May 1, 2013, Washington, D.C.
Air Quality 2013, Vols. 1 and 2

Airport Leadership Development Program (with supplemental material on CD-ROM)

Airport Responsibility for Wildlife Management

Airport Wildlife Population Management

Analytical Procedures for Determining the Impacts of Reliability Mitigation Strategies

Apron Planning and Design Guidebook

Asphalt Materials and Mixtures 2012, Vols. 1 Through 4

Asphalt Materials and Mixtures 2013, Vols. 1 Through 3

Assessing Opportunities for Alternative Fuel Distribution Programs (with supplemental material on CD-ROM)

Assessment of Continuous Pavement Deflection Measuring Technologies


Aviation 2013

Bicycles 2012

Building a Sustainable Workforce in the Public Transportation Industry: A Systems Approach

Buy America Requirements for Federally Funded Airports

California Pilot Test of the Ecological Approaches to Environmental Protection Developed in Capacity Research Projects C06A and C06B

Carbon Footprint of Supply Chains: A Scoping Study

Carsharing, Demand Management, and Parking 2013

City Logistics Research: A Trans-Atlantic Perspective — Summary of the First EU-U.S. Transportation Research Symposium

Command-Level Decision Making for Transit Emergency Managers

Compilation of DOT [Department of Transportation] and FAA [Federal Aviation Administration] Airport Legal Determinations and Opinion Letters Through December 2012


Comprehensive Costs of Highway-Rail Grade Crossing Crashes

Concrete Materials 2013

Conducting Aeronautical Special Events at Airports

Conducting Airport Peer Reviews

Construction 2013

Contractual Means of Achieving High-Level Performance in Transit Contracts

Countermeasures to Address Impaired Driving Offenders

Data Supporting the Impact of Regulatory Compliance Costs on Small Airports, Vol. 1: Appendices to ACRP [Airport Cooperative Research Program] Report 90

Data Supporting the Impact of Regulatory Compliance Costs on Small Airports, Vol. 2: Technical Appendixes to ACRP Report 90

Demand Management and Carsharing 2012

Deployment, Use, and Effect of Real-Time Traveler Information Systems

Developing and Maintaining Support for Your Airport Capacity Project

Developing Countries 2012

Developing Partnerships Between Transportation Agencies and the Disability and Underrepresented Communities
Development of Left-Turn Lane Warrants for Unsignalized Intersections
Driving Forces Influencing Future Freight Flows
Durability of Concrete, Second Edition
Effective Removal of Pavement Markings
Emergency Evacuation and System Vulnerabilities 2013
Emergency Medical Services Response to Motor Vehicle Crashes in Rural Areas
Energy and Global Climate Change 2013
Energy Savings Strategies for Transit Agencies
Enforceability of Local Hire Preference Programs
Environment 2013
Environmental Assessment of Air and High-Speed Rail Corridors
Environmental Justice, Social Factors, and Gender-Related Issues in Transportation 2012
Environmental Management System Development Process
Environmental Optimization of Aircraft Departures: Fuel Burn, Emissions, and Noise (with supplemental material on CD-ROM)
Estimating Joint Probabilities of Design Coincident Flows at Stream Confluences
Evaluating Alternative Operations Strategies to Improve Travel Time Reliability
Evaluating Applications of Field Spectroscopy Devices to Fingerprint Commonly Used Construction Materials
Evaluating Pavement Strategies and Barriers for Noise Mitigation
Evaluation of Methodologies for Visual Impact Assessments
Exploring New Directions for the National Household Travel Survey
Feasibility Study for Highway Hazardous Materials Bulk Package Accident Performance Data Collection (with supplemental material on CD-ROM)
Finance, Pricing, Economics, and Equity Issues 2012
Forecasting Highway Construction Staffing Requirements
Freight Data Cost Elements
Freight Data Sharing Guidebook
Freight Demand Modeling and Data Improvement
Freight Demand Modeling and Data Improvement Strategic Plan
Freight Trip Generation and Land Use
Fuel Usage Factors in Highway and Bridge Construction
Geology and Properties of Earth Materials 2013
Geomaterials 2013
Glossary of Transportation Construction Quality Assurance Terms, Sixth Edition
Guide for Conducting Forensic Investigations of Highway Pavements (with supplemental material on CD-ROM)
Guidebook for Construction Management Practices for Rural Projects
Guidebook for Developing Subnational Commodity Flow Data
Guidebook for Preparing Airport Emissions Inventories for State Implementation Plans (with supplemental material on CD-ROM)
Guidebook on Integrating GIS [Geographic Information Systems] in Emergency Management at Airports (with supplemental material on CD-ROM)
Guidebook to Creating a Collaborative Environment Between Airport Operations and Maintenance

Guidelines for Airport Sound Insulation Programs

Guidelines for Geofoam Applications in Slope Stability Projects

Guidelines for Preparing Peak Period and Operational Profiles

Guidelines for the Load and Resistance Factor Design and Rating of Riveted and Bolted Gusset-Plate Connections for Steel Bridges

Guidelines for the Use of Mobile LIDAR [Light Detection and Ranging] in Transportation Applications

Hazardous Materials Transportation Risk Assessment: State of the Practice

Helping New Maintenance Hires Adapt to the Airport Operating Environment

High-Performance Concrete Specifications and Practices for Bridges

High-Performance/High-Strength Lightweight Concrete for Bridge Girders and Decks

Highway Design 2012

Highway Design 2013

Highway Safety Data, Analysis, and Evaluation 2012

Highway Safety Research Agenda: Infrastructure and Operations (with supplemental material on CD-ROM)

How Airports Measure Customer Service Performance

Human Performance, User Information, and Simulation 2012

Human Performance, User Information, and Simulation 2013

Impact of Regulatory Compliance Costs on Small Airports


Improving Management of Transportation Information

Improving Our Understanding of How Highway Congestion and Price Affect Travel Demand

Incorporating Greenhouse Gas Emissions Into the Collaborative Decision-Making Process

Infectious Disease Mitigation in Airports and on Aircraft

Initial Analyses from the SHRP 2 Naturalistic Driving Study: Addressing Driver Performance and Behavior in Traffic Safety

Innovative Bridge Designs for Rapid Renewal: ABC Toolkit

Integrating Environmental Sustainability Into Airport Contracts

Integrating Freight Considerations Into the Highway Capacity Planning Process: Practitioner’s Guide

Integrating Passenger Ferry Service With Mass Transit

Integrating Spatial and Business Data for Improved Decisions

Integrating Web-Based Emergency Management Collaboration Tools into Airport Operations — A Primer

Intelligent Transportation Systems 2013, Vol. 1

Intelligent Transportation Systems and Vehicle-Highway Automation 2012

Issues With Airport Organization and Reorganization

Laboratory Validation of an Endurance Limit for Asphalt Pavements

Left-Turn Accommodations at Unsignalized Intersections

Legal Aspects of Conservation Easements — A Primer for Transportation Agencies

Legal Aspects of Performance-Based Specifications for Highway Construction and Maintenance Contracts

The Legal Definitions of “First Responder”

Legal Issues Related to Developing Safety Management Systems and Safety Risk Management at U.S. Airports

Long-Distance and Rural Travel Transferable Parameters for Statewide Travel Forecasting Models

Long-Range Transportation Planning Process: Puget Sound TCAPP Pilot Test

Long-Term Performance of Epoxy Adhesive Anchor Systems

Maintenance and Preservation 2013, Vol. 1, Including 2013 Thomas B. Deen Distinguished Lecture

Maintenance and Preservation 2013, Vol. 2

Maintenance Services 2013

Marine Environment, Safety, and Human Factors 2013

Marine Transportation and Terminal Operations 2013

Measuring Cement Particle Size and Surface Area by Laser Diffraction

Measuring PM [Particulate Matter] Emissions From Aircraft Auxiliary Power Units, Tires, and Brakes


Methods for Evaluating Fly Ash for Use in Highway Concrete

Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation and Final Workbook

Millennials and Mobility: Understanding the Millennial Mindset and New Opportunities for Transit Providers

Model Education Curricula and Toolkit for the Transportation of Hazardous Materials

Model Mutual Aid Agreements for Airports

Motor Vehicle Crashes and Injuries Involving Teenage Drivers

A Multivariate Analysis of Crash and Naturalistic Driving Data in Relation to Highway Factors

Network Modeling 2013, Vols. 1 and 2

A New Route to Complete Streets? Using the TCAPP Model in Grand Rapids, Minnesota

New Urban Areas: A Transit Guidance Brief

Nondestructive Testing to Identify Delaminations Between HMA Layers, Vols. 1 Through 5

Operational and Business Continuity Planning for Prolonged Airport Disruptions (with supplemental material on CD-ROM)

Operational Effects of Geometrics and Access Management 2013

Overcoming Barriers to Electric-Vehicle Deployment — Interim Report

Paratransit Emergency Preparedness and Operations Handbook

Pavement Management 2012, Vols. 1 and 2

Pavement Management 2013, Vols. 1 and 2

Pedestrians 2012

Performance Indicators, Sustainability, and Socioeconomic Factors 2013

Performance Measurement of Transportation Systems — Summary of the Fourth International Conference

Performance-Based Seismic Bridge Design

Pilot Test of the Ecological Approaches to Environmental Protection Developed in Capacity Research Projects C06A and C06B

Pilot Test of the TCAPP Collaborative Decision-Making Framework Including a Self-Assessment Methodology: Washington State’s SR 509 Project

Planning 2012

Policy 2013: Finance, Economics, and Equity Considerations, Vols. 1 and 2

Pollutant Load Reductions for Total Maximum Daily Loads for Highways

Potential Impacts of Federal Health Care Reform on Public Transit

Practical Highway Design Solutions
Practices and Performance Measures for Local Public Agency Federally Funded Highway Projects

Practices for Unbound Aggregate Pavement Layers


Precast Concrete Pavement Technology

Predicting the Initial Retroreflectivity of Pavement Markings From Glass Bead Quality

A Pre-event Recovery Planning Guide for Transportation

Preparing Peak Period and Operational Profiles: Guidebook (with supplemental material on CD-ROM)


Procuring and Managing Professional Services for Airports

Project Management Strategies for Complex Projects

Public-Sector Aviation: Graduate Research Award Papers, 2011-2012

Quality-Related Pay Adjustment Factors for Pavements

Railroads 2013

Real-Time Smoothness Measurements on Portland Cement Concrete Pavements During Construction

Recycled Materials and Byproducts in Highway Applications — Summary Report, Vol. 1

Recycling Best Practices: A Guidebook for Advancing Recycling From Aircraft Cabins

Reference Guide for Applying Risk and Reliability-Based Approaches for Bridge Scour Prediction

Renewable Energy Guide for Highway Maintenance Facilities

Repairing and Maintaining Airport Parking Structures While in Use

Research and Education

Resource Allocation Logic Framework to Meet Highway Asset Preservation

Risk-Based Adaptation Frameworks for Climate Change Planning in the Transportation Sector

Roadside Safety Design and Devices — International Workshop

Rockfall: Characterization and Control (with video clips and image files on DVD)

The Rogue Valley Ecological Framework: Mapping Open Space, Ecologically Important Areas, and Ecological Corridors for Transportation Planners, Agencies, Municipalities, Developers, Conservation NGOs [Nongovernmental Organizations], and Citizens


Safety Management 2013


Sag Vertical Curve Design Criteria for Headlight Sight Distance

School Transportation, Operator Education and Regulation, and Traffic Law Enforcement 2013


Smart Growth and Urban Goods Movement

Soil Mechanics 2012

Soil Mechanics 2013

State Department of Transportation Small Business Programs

Strategic Directions on Roadway Departure Crashes

Strategic Issues Facing Transportation, Vol. 1: Scenario Planning for Freight Transportation Infrastructure Investment (with supplemental material on CD-ROM)
Strategic Issues Facing Transportation, Vol. 3: Expecting Future Technologies for Enhancing Transportation System Performance

Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment

Structures 2012

Structures 2013, Vols. 1 and 2

Sustaining the Metropolis: Light Rail Transit and Streetcars for Super Cities

Synthesis of Freight Research in Urban Transportation Planning

Taking Inventory of ACRP Research and the Next Challenges Facing the Airport Industry

TCAPP and Integrated Ecological Framework Pilot Projects: Synthesis of Lessons Learned

Technical Assessment of Dry Ice Limits on Aircraft

Theory, Explanation, and Prediction in Road Safety

Traffic Enforcement Strategies for Work Zones


Traffic Law Enforcement in Work Zones: Phase II Research

Traffic Signal Systems 2012

Traffic Signal Systems 2013, Vols. 1 and 2

Transit 2012, Vol. 3

Transit 2013, Vol. 4

Transit Bus Operator Distraction Policies

Transit Capacity and Quality of Service Manual, Third Edition (with supplemental material on CD-ROM)

Transit Station and Stop Adoption Programs

Transitions to Alternative Vehicles and Fuels

A Transportation Guide for All-Hazards Emergency Evacuation (with supplemental material on CD-ROM)

Travel Behavior 2012, Vol. 2

Travel Demand Forecasting 2012, Vols. 1 and 2

Travel Demand Forecasting 2013, Vols. 1 and 2

Travel Surveys, Asset Management, and Freight Data 2013

Traveler Response to Transportation System Changes, Chapter 1: Introduction

Trip Generation Rates for Transportation Impact Analyses of Infill Developments

Understanding Airline and Passenger Choice in Multi-Airport Regions

Urban and Traffic Data Systems 2012

Urban and Traffic Data Systems 2013, Vol. 1

Use of Advanced Geospatial Data, Tools, Technologies, and Information in Department of Transportation Projects

Use of Electronic Passenger Information Signage in Transit

Use of Market Research Panels in Transit

Use of Transportation Asset Management Principles in State Highway Agencies


Using Infrared and High-Speed Ground-Penetrating Radar for Uniformity Measurements on New HMA Layers

Using Pictograms to Make Transit Easier to Navigate for Customers With Communication Barriers

The Vector-Borne Disease Airport Importation Risk Tool

Winter Maintenance and Preservation 2013

Worker Health and Safety on Offshore Wind Farms
Current Congressionally Authorized Activities*

Public Law

113-76  Consolidated Appropriations Act, 2014

Evaluate, possibly on a periodic basis, the Strategic National Stockpile (SNS) distribution system and make recommendations to improve it, including consideration of private-public collaborations to increase efficiencies.

Upon completion of a Government Accountability Office analysis, review the National Oceanic and Atmospheric Administration’s ocean and coastal data collection systems to determine which systems should be maintained, which need sustained investment, and which should be retired.

Evaluate the Landscape Conservation Cooperatives program and whether it has brought measurable improvements in the health of fish, wildlife, and their habitats.

Conduct a study on the impact of federal regulations and reporting requirements on institutions of higher education (see Public Law 110-315).

Assess China’s strategies, policies, and programs to become an innovative society and to enhance its indigenous innovation.

Undertake a review of existing data collection methods pertaining to human trafficking and slavery and make recommendations to improve data collection in these areas.

Review the Bureau of Reclamation’s draft analysis of buried metallic water pipeline reliability to ensure that the uniform reliability standard, in addition to the analysis of economics, cost-effectiveness, and life-cycle costs, is accurate and consistent across all referenced materials.


Conduct a review of the options available to address near- and long-term threats to the national security space systems of the United States, including strategies and plans to counter such threats, and recommend courses of action.

113-6  Consolidated and Further Continuing Appropriations Act, 2013

Analyze the research and activities of the Institute for Telecommunications Services (ITS) of the National Telecommunications and Information Administration and make recommendations regarding the extent to which ITS research is addressing future telecommunications challenges and spectrum needs.

*While all projects listed have been designated in legislation, a few lack funding and final contracts.

Assess and provide an analysis and recommendations on the state of the Department of Veterans Affairs’ mental health services, including the department’s development and implementation of measures to assess its mental health care services and its staffing guidelines

Conduct a study of peer review and design competition related to nuclear weapons

Conduct a study of the state of molybdenum-99 production and utilization

112-141 Moving Ahead for Progress in the 21st Century Act (MAP-21)

Review a report which assesses the status of vehicle-to-vehicle and vehicle-to-infrastructure dedicated short-range communications technology and applications, analyzes the known and potential gaps, and defines a recommended implementation path

In consultation with the Comptroller General of the United States, conduct an economic analysis of the costs and benefits to the federal government of a flood insurance program with full risk-based premiums, combined with means-tested federal assistance to aid individuals who cannot afford coverage, through an insurance voucher program

Upon issuance of the rule establishing the Consumer Option for an Alternative System to Allocate Losses (COASTAL) Formula and each time it is modified, evaluate the expected financial impact on the national flood insurance program of the use of the formula, the validity of the scientific assumptions upon which it is based, and whether the formula can achieve a degree of accuracy of not less than 90 percent in allocating flood losses for indeterminate losses

112-95 FAA Reauthorization and Reform Act of 2011

Review the enterprise architecture for the NextGen

Review the research plan developed by the FAA administrator on the methods and procedures to improve both confidence in and the timeliness of certification of new technologies for their introduction into the national airspace system

Conduct a study, under the Airport Cooperative Research Program, on airport sustainability practices


Within four years of the enactment of the SBIR/STTR Reauthorization Act of 2011, and every four years thereafter, conduct a study of how the STTR program has stimulated technological innovation and technology transfer, estimate the number of jobs created by the SBIR and STTR programs, and make recommendations with respect to these issues
112-74  Consolidated Appropriations Act, 2012

Conduct a study to identify the market barriers slowing the purchase of electric vehicles and hindering the deployment of supporting infrastructure

Study the lessons learned from the Fukushima nuclear disaster

Form a work group to review, evaluate, and identify issues related to the Cures Acceleration Network (CAN) authority and provide a report for the CAN Board to help it identify ways to accelerate and expand the number of cures

Conduct a scientific peer review of the 12th Report on Carcinogens determinations related to formaldehyde and styrene

111-358  America COMPETES Reauthorization Act of 2010

Conduct a study on the scientific workforce in the areas of oceanic and atmospheric research and development

Initiate a study to evaluate, develop, or improve impact-on-society metrics

111-314  National and Commercial Space Programs

Periodically over the next decade, conduct independent assessments, also known as decadal surveys, taking stock of the status and opportunities for earth and space science discipline fields and aeronautics research and recommending priorities for research and programmatic areas (see Public Law 110-422)

At five-year intervals, review and assess the performance of each division in the science directorate of the National Aeronautics and Space Administration

111-267  National Aeronautics and Space Administration Authorization Act of 2010

Beginning in FY2012, conduct a review of the goals, core capabilities, and direction of human space flight, using the goals set forth in the National Aeronautics and Space Act of 1958, the National Aeronautics and Space Administration Authorization Act of 2005, the National Aeronautics and Space Administration Authorization Act of 2008, the goals set forth in this Act, and those set forth in any existing statement of space policy issued by the president

111-163  Caregivers and Veterans Omnibus Health Services Act of 2010

Conduct an expanded study on the health impact of Project Shipboard Hazard and Defense (Project SHAD)

111-148  Patient Protection and Affordable Care Act

Review research on the selection of a set of key national indicators, determine how to implement and establish a key national indicator system, and report annually to the Commission on Key National Indicators any findings and recommendations
111-117 Consolidated Appropriations Act, 2010

Conduct a study of the feasibility of commercially provided earth science data

111-85 Energy and Water Development and Related Agencies Appropriations Act, 2010

Conduct a study to address the national security and extended deterrence value of the B61 bomb for both strategic and tactical purposes in light of nuclear terrorism risks and military threats

111-8 Omnibus Appropriations Act, 2009

Conduct an inventory of the energy development potential on all lands currently managed by the Department of Energy

Study the position of the United States in flexible electronics, its applications, and the steps that must be undertaken for a national initiative

110-422 National Aeronautics and Space Administration Authorization Act of 2008

Conduct a study to determine the most appropriate governance structure for U.S. Earth observations programs

Study the impacts of space weather on the current and future United States aviation industry, and in particular examine the risks for Over-The-Pole (OTP) and Ultra-Long-Range (ULR) operations

On a periodic basis, perform independent assessments — also known as decadal surveys — to take stock of the status and opportunities for the fields of earth and space science and aeronautics and to recommend priorities for research and programmatic areas over the next decade (see Public Law 111-314)

110-389 Veterans’ Benefits Improvement Act of 2008

Before March 31, 2012, report to Congress assessing the feasibility and advisability of conducting additional research after Sept. 30, 2012, on the assets transferred to the Institute of Medicine’s Medical Follow-Up Agency from the Air Force Health Study (see Public Law 109-364 for background on this request)

110-315 Higher Education Opportunity Act

Ascertain the amount and scope, by agency, of all federal regulations and reporting requirements with which institutions of higher education must comply and offer recommendations for consolidating, streamlining, and eliminating those that are redundant and burdensome (see Public Law 113-76)

110-161 Consolidated Appropriations Act, 2008

Establish an independent project review of NASA’s major programs

Support the International Institute for Applied Systems Analysis’ Global Energy Assessment
Recommend innovative approaches to educate and train scientists and users of Earth observations and applications and to assist in training students

110-140 Energy Independence and Security Act of 2007

Evaluate vehicle fuel economy standards, updating the initial report every five years through 2025

Assess the impact of the requirements described in Section 211(o) of the Clean Air Act on each industry relating to the production of feed grains, livestock, food, forest products, and energy

Five years after enactment of this Act, assess the Department of Energy’s performance in carrying out Section 641, titled the “United States Energy Storage Competitiveness Act of 2007”

Review and provide oversight for the Carbon Capture and Sequestration Research, Development, and Demonstration Programs under Section 963 of the Energy Policy Act of 2005 and as amended by Sections 702 and 703 of this Act

Conduct a study that defines an interdisciplinary program on the undergraduate and graduate levels in geology, engineering, hydrology, environmental science, and related disciplines that will support the nation’s capability to capture and sequester carbon dioxide from anthropogenic sources, and develop guidelines for proposals from colleges and universities with substantial capabilities in the required disciplines

110-114 Water Resources Development Act of 2007

Conduct a peer review for those project studies subject to a review as described in subsection (a), Section 2034, of this Act, which may include the economic and environmental assumptions and projections, project evaluation data, economic, environmental, and engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts of proposed projects, and any biological opinions of the project study

110-69 America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (America COMPETES) Act

Not later than five years and 10 years after enactment of this Act, assess the performance of the science, engineering, and mathematics education programs of the Department of Energy

Four years into its operation, conduct an evaluation of how well the Advanced Research Projects Agency — Energy (ARPA-E) is achieving its goals and mission


Receive custodianship of the Air Force Health Study assets, maintain the data and specimens, and make them available for additional studies
At five-year intervals, review and assess the performance of each division in the science directorate of NASA.

Recommend a research agenda for a national cooperative freight transportation research program and to support and carry out administrative and management activities related to its governance.

Carry out the nine research projects called for in the National Academies’ Transportation Research Board 2005 Special Report 283 titled “Cooperative Research for Hazardous Materials Transportation: Defining the Need, Converging on Solutions”.

Provide staff support to the Airport Cooperative Research Program Governing Board and carry out projects proposed by the board that the secretary of transportation considers appropriate.

Conduct a triennial evaluation of the National Nanotechnology Program.

Biennial review of the progress of the Comprehensive Everglades Restoration Plan.

Review and evaluate the available scientific evidence regarding associations between illness and service in the Persian Gulf War.

Develop a curriculum for the care and treatment of Persian Gulf War veterans who have ill-defined or undiagnosed illnesses and periodically review and provide recommendations regarding research plans and research strategies.

Study on the available scientific evidence regarding associations between illnesses and exposure to toxic agents, environmental or wartime hazards, or preventive medicines or vaccines associated with Gulf War service.
Revenue Applied to 2013

U.S. Government Agencies
(Grants and Contracts)

Department of Agriculture $ 2,021,600
Department of Commerce 7,915,329
Department of Defense
  Defense Threat Reduction Agency 2,284,022
  Department of Defense 4,850,283
  Department of the Air Force 7,714,051
  Department of the Army 10,216,279
  Department of the Navy 13,443,495
Department of Education 35,757
Department of Energy 7,293,414
Department of Health and Human Services 16,391,956
Department of Homeland Security 3,116,938
Department of the Interior 1,499,826
Department of Justice 1,618,480
Department of Labor 199,734
Department of State 3,371,780
Department of Transportation 107,484,190
Department of the Treasury 491,269
Department of Veterans Affairs 4,291,014
Environmental Protection Agency 4,126,383
Executive Office of the President 719,641
Government Accountability Office 407,259
General Services Administration 817
Institute of Museum and Library Services 148,291
Marine Mammal Commission 46,628
National Aeronautics and Space Administration 7,341,661
National Capital Planning Commission 21,862
National Geospatial Intelligence Agency 63,605
National Science Foundation 13,378,543
National Security Agency 41,524
National Transportation Safety Board 25,000
Nuclear Regulatory Commission 996,629
Office of the Director of National Intelligence 133,590
Social Security Administration 74,681
U.S. Agency for International Development 8,734,354
U.S. Arctic Research Commission 43,104

TOTAL U.S. GOVERNMENT AGENCIES $ 230,542,989

Private and Nonfederal Sources

Gulf Research Program $ 471,406,974
Grants and Contracts 50,475,733
Other Contributions 3,548,121

TOTAL PRIVATE AND NONFEDERAL SOURCES $ 525,430,828

[Note: Complete audited information was unavailable at press time.]
About the National Academies

The U.S. government’s need for an independent adviser on science and technology matters became evident by the height of the Civil War. On March 3, 1863, President Lincoln approved the congressional charter which created that adviser, the National Academy of Sciences.

The private, nonprofit Academy has counseled the federal government in wartime and peacetime ever since. As science and technology issues have grown in complexity and scope, so too has the Academy. Four separate but related entities continue this work.

THE NATIONAL ACADEMY OF SCIENCES (NAS) is a society of distinguished scholars engaged in scientific and engineering research, and dedicated to the use of science and technology for the public welfare. In addition to its role as adviser to the federal government, the Academy sponsors symposia, monitors human rights abuses against scientists worldwide, promotes the public understanding of science, and publishes a research journal, Proceedings of the National Academy of Sciences.

Ralph J. Cicerone, President
Bruce Darling, Executive Officer
James Hinchman, Deputy Executive Officer

THE NATIONAL ACADEMY OF ENGINEERING (NAE) is an association of outstanding engineers from industry and academia. Established in 1964 under NAS’ charter, NAE is autonomous in its administration and selection of its members. It shares with NAS responsibility for advising the federal government. It also conducts studies of policy issues in engineering and technology, encourages education and research, and grants awards to distinguished engineers.

C.D. Mote Jr., President
Lance Davis, Executive Officer

THE INSTITUTE OF MEDICINE (IOM) is an association of eminent health care professionals and experts in related fields. Established by NAS in 1970, IOM examines policy matters pertaining to the health of the public. It shares responsibilities with NAS and NAE for advising the federal government. It also undertakes studies on its own initiative, addressing issues of health care, health sciences, and education.

Harvey V. Fineberg, President
Clyde Behney, Acting Executive Officer

THE NATIONAL RESEARCH COUNCIL, founded in 1916, has become the principal administrative arm of NAS, NAE, and IOM. The Council’s staff convenes study committees for the NAS and NAE, and most of the studies appear under the Council’s name. The IOM convenes its own committees, following the same quality assurance procedures used by the Council.

In addition to conducting studies, the National Research Council brings together scientists, engineers, and educators to set priorities and encourage self-examination and improvement within their professions. It also works to improve science and math education at all levels, from kindergarten through doctoral programs.

Ralph J. Cicerone, Chair
C.D. Mote Jr., Vice Chair
Bruce Darling, Executive Officer
James Hinchman, Deputy Executive Officer
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Page 1: (left to right) Ralph J. Cicerone, president of the National Academy of Sciences and chair of the National Research Council; C.D. Mote Jr., president of the National Academy of Engineering and vice chair of the National Research Council; Harvey V. Fineberg, president of the Institute of Medicine

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Page 25: (clockwise from upper left) ©Nils Praise/iStock/Thinkstock; ©Jerry Hopman/iStock/Thinkstock; Louisiana Department of Fish and Wildlife personnel survey a barrier island near Grand Isle, La., Sept. 10, 2010, to determine oil spill’s impacts, U.S. Coast Guard photo by Petty Officer 2nd Class Etta Smith; Arctic Ocean, ©Jupiterimages/Photos.com/Thinkstock

Pages 26-27: Arctic sea ice, National Snow and Ice Data Center photo by Andy Mahoney; whooping cranes at Aransas National Wildlife Refuge in Texas, photo by Steve Hildebrand/U.S. Fish and Wildlife Service; ©Radius Images/Getty Images

Pages 28-29: Black sea bass in Georgia waters, photo by Greg McFall, Gray’s Reef National Marine Sanctuary, NOAA; shrimp boat captain sorts his catch after a delayed opening to the 2010 commercial shrimp season, U.S. Coast Guard photo by Petty Officer 3rd Class Nathan Bradshaw; North Dakota flooding in 2011, photo by Andrea Booser/FEMA

Pages 30-31: North Dakota flooding in 2011, photo by Andrea Booser/FEMA; wild horse roundup, photo courtesy Bureau of Land Management/Rocks Springs Field Office, Wyoming; burros for adoption, photo courtesy Bureau of Land Management

Back cover: The National Academy of Sciences building and the Academies’ Keck Center, both in Washington, D.C.