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Top Research Priorities for the Antarctic

Immigrants & Integration Into U.S. Society

Moving the Nation's Freight

Options for National Flood Insurance Program

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The National Academies of
SCIENCES • ENGINEERING • MEDICINE

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Hanging on a Heartbeat

STRATEGIES TO SURVIVE CARDIAC ARREST

It can happen in the blink of an eye. Someone suddenly collapses. When you approach to see what happened, you notice the person is unconscious. When you check for a pulse, you find none. These are the signs of cardiac arrest — a disturbance in the electrical activity of the heart that causes it to stop beating — and it strikes almost 600,000 people each year in the U.S., killing the vast majority of them.

A recent Academies report presents a series of strategies and actions to improve the chances for survival and quality of life following cardiac arrest, which some estimates suggest is the third leading cause of death in the U.S. behind cancer and heart disease.

For those who experience cardiac arrest outside of a hospital, the survival rate is less than 6 percent. Survival rates depend greatly on where the cardiac arrest occurs, and each minute without treatment decreases the likelihood of surviving without disability, said the study committee that wrote the report. And the chance of survival drops by 10 percent with every passing minute between collapse and return of spontaneous circulation, although new research offers hope in extending this time.

Effective treatment demands an immediate response from someone who can recognize cardiac arrest, call 911, start CPR,

and use an automated external defibrillator (AED). Decreasing the time between the onset of cardiac arrest and the first chest compression is critical, the committee said. Although evidence indicates that bystander CPR and AED use can significantly improve a victim's chance of survival and the outcomes from cardiac arrest, each year less than 3 percent of the U.S. population receives CPR training, leaving many bystanders unprepared to respond. The committee recommended greater public awareness and that CPR and AED training take place in middle and high schools, workplaces, and other community settings.

Furthermore, EMS systems vary in capacity and resources to respond to complex medical events. Despite a lack of national oversight of EMS systems, which can contribute to fragmentation and an absence of system-wide coordination in response to cardiac arrest, some communities have demonstrated that focused leadership with accountability can improve cardiac arrest outcomes. Educating and training EMS professionals to administer "high-performance CPR" — which emphasizes team-related factors such as communication and collaboration — and providing dispatcher-assisted CPR can help increase the likelihood of positive outcomes.

"Cardiac arrest survival rates are unacceptably low," said Robert Graham, chair of the committee. "Cardiac arrest treatment is a community issue, requiring a wide range of people to be prepared to act, including bystanders, family members, first responders, emergency medical personnel, and health care providers."

Although the terms are often used interchangeably, cardiac arrest is different and medically distinct from a heart attack. A heart attack occurs when blood flow to an area of the heart is blocked by a narrowed or completely obstructed coronary artery, resulting in the damage of heart muscle. Heart attack symptoms may include pain, dizziness, and shortness of breath, among others. The treatment goal for a heart attack is to reopen blocked arteries and restore blood flow, whereas cardiac arrest treatment aims to restore circulation and electric rhythm.

The committee also recommended establishing a national registry of cardiac arrest; developing strategies to improve systems of care within hospital settings, such as setting national accreditation standards related to cardiac arrest for hospitals and health care systems; and creating a national cardiac arrest collaborative to unify the field and identify common goals, including research priorities and action strategies.

— *Jennifer Walsh*

Strategies to Improve Cardiac Arrest Survival: A Time to Act. Committee on the Treatment of Cardiac Arrest: Current Status and Future Directions, Board on Health Sciences Policy, Institute of Medicine (2015, 456 pp.; ISBN 978-0-309-37199-5; available from the National Academies Press, tel. 1-800-624-6242; $74.00 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21723>).

The committee was chaired by **Robert Graham,** director of the national program office for Aligning Forces for Quality at George Washington University, Washington, D.C. The study was sponsored by the American Heart Association, American Red Cross, American College of Cardiology, Centers for Disease Control and Prevention, National Institutes of Health, and U.S. Department of Veterans Affairs.

Gray Matters

NEW REPORT IDENTIFIES WAYS TO HELP STAY MENTALLY SHARP

People often forget things — a name, where they put their keys, or a phone number. These moments of forgetfulness can be dismissed as a minor inconvenience at 25 or 35, but they can evolve into a major source of worry at 55 or 65. A new report from the Academies finds that one of the most challenging health issues older adults encounter is the gradual and variable change in mental functions that occurs naturally as people age and is not part of a neurological disease such as Alzheimer's.

Just like any other part of the body, the aging process affects the brain. Known as "cognitive aging," the type and rate of change can vary widely among individuals. Some will experience very few, if any, effects, while others may experience shifts in their memory, speed of processing information, and problem solving, learning, and decision-making abilities.

The committee that carried out the study and wrote the report proposed three top actions healthy individuals can take to help maintain an agile brain and optimal cognitive function as they age.

- Be physically active.
- Reduce and manage cardiovascular disease risk factors, including high blood pressure, diabetes, and smoking.
- Regularly discuss and review health conditions and medications that might influence cognitive health with a health care professional.

Communities, nonprofit organizations, and businesses can play a significant role in developing partnerships and programs to help aging individuals take charge of their cognitive health, the committee said. Health care professionals should prepare to provide guidance to older adults and their families as the patient population ages.

In addition, the report emphasizes that cognitive aging has significant impacts and widespread consequences on society, including financial losses. Older adults lose an estimated $2.9 billion a year, directly and indirectly, to financial fraud. The committee called for the improvement of programs and services used by older adults, including those in financial institutions, to help them avoid exploitation, optimize independence, and make sound decisions. For example, the financial services industries and relevant state and federal agencies should implement systems approaches, training, and laws and regulations to help verify that financial transactions are not fraudulent or the result of older adults' diminished decision-making capacity or undue influence. — *Jennifer Walsh*

Cognitive Aging: Progress in Understanding and Opportunities for Action. Committee on the Public Health Dimensions of Cognitive Aging, Board on Health Sciences Policy, Institute of Medicine (2015, 330 pp.; ISBN 978-0-309-36862-9; available from the National Academies Press, tel. 1-800-624-6242; $64.95 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21693>).

The committee was chaired by **Dan G. Blazer,** J.P. Gibbons Professor of Psychiatry Emeritus at Duke University Medical Center, Durham, N.C. The study was sponsored by the McKnight Brain Research Foundation, National Institutes of Health (National Institute of Neurological Disorders and Stroke and National Institute on Aging), Centers for Disease Control and Prevention, Retirement Research Foundation, and AARP.

IMMIGRANTS AND THEIR INTEGRATION INTO U.S. SOCIETY

The United States prides itself on being a nation of immigrants, and it has a long history of accepting people from across the globe into its populace. With 41 million immigrants and 37.1 million children of immigrants born stateside, these first and second generations account for one-quarter of the U.S. population. In recent months, immigration reform has resurfaced as a major topic of discussion in presidential campaigns, bringing questions about whether immigrants are integrating into life in the U.S. and becoming successful members of our society under a spotlight.

A recent Academies report examines the evidence on how immigrants are doing in a range of areas — from education and health to language and family patterns. The study committee that wrote the report found that across all measurable outcomes, immigrants and their descendants are integrating into U.S. society. As they assimilate, many aspects of their lives improve over subsequent generations, including educational attainment, occupational distribution, income, and language ability. Over generations, however, their well-being declines and comes to resemble that of native-born Americans in the areas of health, crime, and family patterns.

Immigrants are less likely to die from cardiovascular disease and all cancers, have lower infant mortality and obesity rates, and have a longer life expectancy in comparison with the native-born. However, these advantages decline as their health status converges with that of the general population over generations.

Other measures of individual and community well-being show the same pattern, according to the committee. Immigrant men age 18-39 are incarcerated at one-fourth

the rate of native-born American men of the same age, but crime rates increase in subsequent generations and by the third generation resemble those of the general U.S. population. Similarly, immigrant divorce rates and out-of-wedlock birth rates start off much lower than those of native-born Americans but rise over time. Because single-parent families are more likely to be impoverished, this is a disadvantage going forward

Despite large differences in education starting points among first-generation immigrant groups, there is strong progress across generations. Among most immigrant groups, the children of immigrants meet or exceed the schooling level of typical third-generation and native-born American children.

In terms of employment and earnings, immigrant men with the lowest level of education are more likely to be employed than comparable native-born men, suggesting that immigrants appear to be filling low-skilled jobs that native-born Americans are not available or willing to take. Foreign-born workers' earnings improve relative to native-born earnings the longer they live in the United States, though earnings assimilation is considerably slower for Hispanic (predominantly Mexican) immigrants than for others.

With regard to residential integration, most immigrants and their descendants gradually become less segregated over time from native-born whites and more dispersed across regions, cities, and neighborhoods. In addition, the committee found, race plays an independent role: Asians are the least segregated from native-born whites in metropolitan areas, followed by Hispanics, and then black immigrants, who are the most segregated.

It is a political and not a scientific question whether the U.S. should try to prevent the integration of undocumented immigrants or provide a path to legalization, and thus was not within the committee's study purview. However, it identified three barriers to immigrant integration that are of particular concern. First is the role of legal status in slowing or blocking the integration of not just the estimated 11.3 million undocumented but also their citizen children. Second, patterns of immigrant integration are shaped by race, and there is ongoing racial stratification in socioeconomic outcomes for immigrants and their children. Last, the low percentage of immigrants who naturalize — only 50 percent — compared with other immigrant-receiving countries has negative implications for political and civic integration.
— *Dana Korsen*

The Integration of Immigrants Into American Society. Panel on the Integration of Immigrants Into American Society, Committee on Population, Division of Behavioral and Social Sciences and Education (2015, approx. 520 pp.; ISBN 978-0-309-37398-2; available from the National Academies Press, tel. 1-800-624-6242; $75.00 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21746>).

The committee was chaired by **Mary Waters,** M.E. Zukerman Professor of Sociology at Harvard University, Cambridge, Mass. The study was sponsored by the Carnegie Corporation of New York, National Science Foundation, Russell Sage Foundation, and the U.S. Citizenship and Immigration Services of the U.S. Department of Homeland Security, with additional funding from the National Academy of Sciences' Kellogg Fund.

Strengthening Science & Technology AT THE STATE DEPARTMENT

Combating cybercrime, preventing the spread of contagious diseases across borders, addressing the causes and effects of global climate change — these are just a few of the many international challenges in which science and technology play a critical role. Given their importance in a range of diplomatic arenas, science and technology (S&T) need a higher profile and stronger presence within the U.S. Department of State, says a new report from the Academies.

The report urges the State Department's leadership to take prompt steps to increase staffers' comprehension of the importance of S&T developments around the world and to incorporate this understanding into the nation's foreign policy. A culture shift is needed within the department so that expertise in S&T is valued as highly as fluency in foreign languages or expertise in area studies.

As one step toward this culture shift, the position of the Science and Technology Adviser to the Secretary should be elevated to a status equivalent to that of an Assistant Secretary. And the Secretary of State should create an advisory board to provide guidance on non-defense S&T issues that are related to the department's diplomatic agenda.

The department should also keep a steady eye on the horizon for S&T developments that pose new challenges for foreign policy — for example, drought conditions that result in large migrations or the increasing use of drones that cross international boundaries for civilian purposes. The department should conduct foresight assessments that identify these types of challenges, synthesize knowledge about them, and offer action-oriented recommendations for department officials to consider.

U.S. embassies are in particular need of greater S&T expertise and support. The department should more fully support its front-line diplomats with strong contingents of civil servants who are up-to-date on the technical dimensions of issues on the department's agenda. It should increase the cadre of Foreign Service Officers (FSOs) with technical backgrounds and provide training and education for all FSOs to prepare them for handling S&T-related issues. In addition, the department should maintain S&T counselors at embassies where S&T issues are particularly important components of the bilateral relationship.

In strengthening its own capabilities, the department should also look beyond itself. Many entities outside government — universities, research institutes, nongovernment organizations, and private companies — are increasing their international reach, and all can be rich sources of knowledge that the department should harness in bolstering its S&T capacity. — *Sara Frueh*

Diplomacy for the 21st Century: Embedding a Culture of Science and Technology Throughout the Department of State. Committee on Science and Technology Capabilities at the Department of State; Development, Security, and Cooperation; Division on Policy and Global Affairs (2015, 190 pp., ISBN 978-0-309-37313-5; available from the National Academies Press, tel. 1-800-624-6242; $48.00 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21730>).

The committee was co-chaired by **Thomas Pickering,** vice chairman, Hills and Company, Washington, D.C.; and **Adel Mahmoud,** professor in molecular biology and public policy, Princeton University, Princeton, N.J. The study was sponsored by the Carnegie Corporation of New York, Golden Family Foundation, John D. and Catherine T. MacArthur Foundation, and the William and Flora Hewlett Foundation, supplemented by funds from the Academies.

Improving the National Flood Insurance Program

TWO REPORTS EVALUATE OPTIONS FOR THE FUTURE

Of all natural disasters, floods are the most costly and affect the most people. And in spite of natural phenomena such as sea-level rise and more frequent heavy precipitation, new construction continues to flourish in flood-prone areas, increasing the number of homes and people in harm's way.

The National Flood Insurance Program (NFIP), created in 1968, aims to reduce flood losses for individuals as well as their reliance on federal post-disaster aid. While insurance rates for new structures reflect the risk of flooding, taking into account property elevation and other factors, structures built before floodplain maps became available received subsidized rates. Today, nearly 20 percent of the 5.5 million NFIP policies are subsidized and do not reflect actual risk.

The Biggert-Waters Flood Insurance Reform Act of 2012 and subsequent legislation require these subsidies to be phased out, which will result in substantial premium increases for those 1 million subsidized policies. Two recent Academies studies evaluated flood insurance options for the NFIP to consider as it pursues dual goals of offering fair and affordable rates and increasing participation in the program.

Risk-Based Rates

Most of the 1 million subsidized policies are tied to "negatively elevated" properties, or those whose lowest level, including the basement, lies below the current NFIP benchmark elevation for construction and floodplain management. These properties are more likely to incur losses as they are potentially subject to longer and deeper flooding and are inundated more often by smaller flood events.

One of the reports finds that current NFIP methods for calculating risk-based insurance rates don't fully capture the flood risk for these low-lying structures. It offers a number of alternative approaches for determining appropriate premiums, ranging from incremental changes to current methods to a complete overhaul of the system.

NFIP could determine more accurate rates by using local hazard data and water

surface elevations from smaller, frequent floods, researching which drivers of flood damage are most important as well as the ability of levees to prevent inundation during frequent events, and adjusting damage estimates annually. It could also increase deductible amounts to reduce premiums or impose penalties for underinsured structures.

Alternatively, NFIP could undertake a comprehensive risk assessment, which would determine flood hazard for individual structures by understanding flood characteristics at very fine scales, describing the varying levels of protection offered by different mitigation strategies, and account for uncertainties related to current and future flood protection measures.

A Community Approach

In contrast to evaluating and determining rates for individual structures, NFIP could consider offering single policies that cover an entire community. Although community-based flood insurance would not resolve all of the nation's flood insurance challenges, it could provide the opportunity to increase purchase rates for coverage, promote mitigation and floodplain management strategies to reduce risk, and reduce administrative costs associated with administering a high number of individual policies, according to the other Academies report.

However, the report also discusses the challenges of a community-based flood insurance option and offers design considerations should such a program be created.

Communities must have a willingness to participate, the ability to enter into a contractual agreement, and the authority to regulate land use and collect revenue, the report notes. And while a city or town might qualify, it is unclear whether the definition of community could extend to a neighborhood or business district.

Any future option must also consider who bears the risk, who determines and writes policy terms, how premium costs are priced and underwritten, and how compliance with purchase requirements are ensured. — *Lauren Rugani*

Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain. Committee on Risk-Based Methods for Insurance Premiums of Negatively Elevated Structures in the National Flood Insurance Program; Water Science and Technology Board, Division on Earth and Life Studies; and Board on Mathematical Sciences and Their Applications, Division on Engineering and Physical Sciences (2015, 86 pp.; ISBN 978-0-309-37166-7). The committee was chaired by **David T. Ford,** president, David Ford Consulting Engineers, Sacramento, Calif.

A Community-Based Flood Insurance Option. Committee on Community-Based Flood Insurance Options; Water Science and Technology Board, Division on Earth and Life Studies; and Board on Mathematical Sciences and Their Applications, Division on Engineering and Physical Sciences (2015, 102 pp.; ISBN 978-0-309-37468-2). The study was chaired by **Henry J. Vaux Jr.,** professor emeritus of resource economics and chair, Rosenberg International Forum on Water Policy at the University of California, Berkeley and Riverside.

Both studies were funded by the Federal Emergency Management Agency and are available from the National Academies Press, tel. 1-800-624-6242 and on the Internet at <www.nap.edu>.

ANTARCTICA AND THE SOUTHERN OCEAN

Top Research Goals for NSF's Antarctic Program

The Antarctic and Southern Ocean regions provide an immense natural laboratory for studying scientific questions in many areas, ranging from oceanography to tectonics, glaciology to atmospheric chemistry, and microbiology to astrophysics. Given the almost limitless research opportunities the Antarctic region offers, an Academies report presents a strategic vision to guide research investments in the U.S. Antarctic Program at the National Science Foundation over the next 10 years.

The top research priority, the report says, is to better understand the scope and pace of melting Antarctic ice sheets, which could have huge impacts on sea-level rise across the globe. The report proposes a Changing Antarctic Ice Sheets Initiative, which includes a multidisciplinary campaign to study the complex climatic, oceanic, and atmospheric interactions and fluctuations in key zones of the West Antarctic Ice Sheet, and a new generation of ice and sediment core studies to improve understanding of past episodes of rapid ice-sheet collapse.

For millions of years, Antarctic ecosystems have evolved to adapt to extreme conditions and changes in this region. A second research priority is decoding the genomes of organisms in these ecosystems to better understand both their adaptability and vulnerability to environmental changes, including contemporary issues like ocean acidification, invasive species, and climate change.

Despite the variability of the region's ice sheets and ecosystems, the dry, stable atmosphere above Antarctica is an ideal backdrop for astrophysical observations, including studies of cosmic microwave background radiation. A next-generation CMB telescope installation, recommended as the third research priority, would provide potential new insights about the origins and nature of the universe.

To help advance these research priorities, NSF should expand access to remote field sites and expedite the acquisition of a new heavy icebreaker ship and an ice-capable polar research vessel. Further, it must strategically augment existing observational networks, improve field-based communications and information technology for data transmission, and facilitate more open and organized data management. NSF should also continue to support a broad spectrum of research in response to proposals from the scientific community.

These recommendations result from extensive engagement with the scientific community by the study committee that wrote the report. The selected research priorities were based on criteria that included compelling science, potential for social impact, time-sensitivity, feasibility, and key areas for U.S. and NSF leadership. It also took into consideration possibilities for interagency and international partnerships, impacts on the program's balance, and the potential to bridge disciplinary divides.

— *Emily Raschke & Lauren Rugani*

A Strategic Vision for NSF Investments in Antarctic and Southern Ocean Research. Committee on the Development of a Strategic Vision for the U.S. Antarctic Program, Polar Research Board, Division on Earth and Life Studies (2015, 154 pp.; ISBN 978-0-309-37367-8; available from the National Academies Press, tel. 1-800-624-6242; $60.00 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21741>).

The committee was co-chaired by **Robin E. Bell,** Palisades Geophysical Institute/Lamont Research Professor at Columbia University, and **Robert A. Weller,** senior scientist at Woods Hole Oceanographic Institution. The study was funded by the National Science Foundation.

Industries on the Move

A LOOK AT TWO CRITICAL MODES OF FREIGHT TRANSPORTATION

Companies in the U.S. rely on various transportation systems to make sure needed commodities reach American manufacturers and consumers, so ensuring the physical condition and economic efficiency of these systems is important. Approximately one-third of all freight tonnage is moved by rail, and nearly 7 percent is transported on the country's inland waterways. Shippers of bulk commodities such as corn, wheat, and other farm products, coal and petroleum, and chemicals are especially dependent on these two modes of transport.

For much of the 20th century, freight railroads had grown inefficient, in part because of overregulation. The Staggers Rail Act of 1980 eliminated or eased many federal regulations governing railroad pricing and operations and allowed railroads to redress decades-long declines in traffic, stagnant productivity, and oversized networks that had become chronically undermaintained and misaligned with demand. A recent Academies report says that while the Staggers Act enabled the development of a financially stronger and innovative freight railroad industry better able to compete with trucks, invest in capacity, and respond to shippers' needs, key components of the revamped regulatory system are no longer suited to today's freight railroad industry. The report recommends that these outdated regulatory processes be replaced.

In particular, current procedures designed to protect rail users from excessive rates are not working for many shippers who transport small volumes. The Staggers Act allows rail shippers who lack competitive transportation options to challenge some rates that seem unreasonably high, but the formula used to identify those rates is arbitrary and unreliable. More appropriate and usable procedures are needed to resolve rate disputes without threatening the ability of railroads to earn the total revenues they need to pay for their capital-intensive networks.

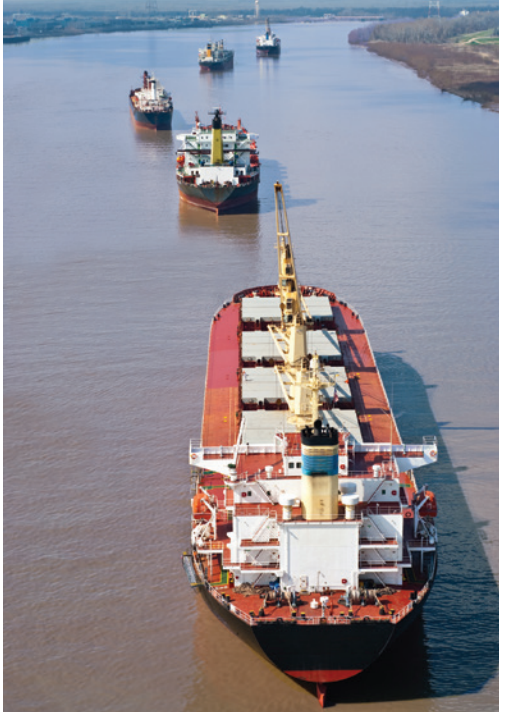
The report recommends that regulators develop a better tool that compares disputed

rates with those charged for similar rail shipments made in competitive transportation markets. Rates that greatly exceed their competitive benchmarks would then be eligible for arbitration to decide if the shipper is entitled to relief. The use of arbitration would compel faster, more economical resolutions of rate cases for shippers whose claims are too small to justify the expense of litigating a case using traditional regulatory hearings.

Another recent Academies report looks at prioritizing investments in the federal inland waterways infrastructure, managed by the U.S. Army Corps of Engineers (USACE) and consisting of more than 36,000 miles of commercially navigable channels and about 240 working lock sites. The chief and most expensive component of this system is the installation and maintenance of locks and dams to enable the upstream and downstream movement of cargo.

The study committee that wrote the report found that while the inland waterways system covers a vast geographic area, its freight traffic is highly concentrated, and the system needs a well-executed and sustainable plan for maintaining system reliability and performance to ensure that limited resources are directed where they are most essential.

About 50 percent of barge cargo moves on six major corridors — including the Mississippi, Illinois, and the Ohio rivers — which account for 16 percent of the total waterway miles, while other inland waterway segments have minimal freight traffic. Navigation could be improved by directing operations and maintenance resources toward major facilities with higher volumes of traffic, and where the time lost to shipping delays is significantly greater than the



river average, the report says. A system of asset management prioritized by the economic importance of facilities is already influencing USACE's maintenance and budgeting processes, but it is not fully developed or deployed across all USACE districts. Further, greater reliance on a "user pays" funding strategy for the commercial navigation system is feasible, would generate new revenues for maintenance, and would promote economic efficiency. — *Dana Korsen*

Modernizing Freight Rail Regulation — TRB Special Report 318. Committee for a Study of Freight Rail Transportation and Regulation, Transportation Research Board (2015, 264 pp.; ISBN 978-0-309-36906-0). The committee was chaired by **Richard L. Schmalensee,** Howard W. Johnson Professor of Management Emeritus, Sloan School of Management, Massachusetts Institute of Technology, Cambridge. The study was sponsored by the Federal Railroad Administration and U.S. Department of Transportation.

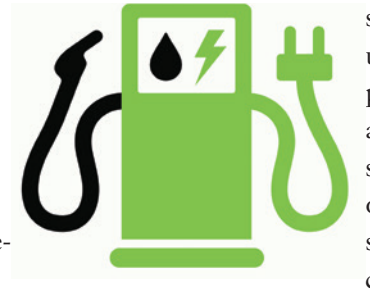
Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know — TRB Special Report 315. Committee on Reinvesting in Inland Waterways: What Policy Makers Need to Know, Transportation Research Board (2015, 230 pp.; ISBN 978-0-309-29568-0). The committee was chaired by **Chris T. Hendrickson,** Hamerschlag University Professor, departments of civil and environmental engineering and of engineering and public policy, Carnegie Mellon University, Pittsburgh. The study was sponsored by the Transportation Research Board and the U.S. Army Corps of Engineers.

Both reports are available from the Transportation Research Board Bookstore, tel. 202-334-3213, or on the Internet at <www.nap.edu>.

Moving From the **Pump** to the **Plug**

WHAT WOULD PUT MORE PLUG-INS ON THE ROAD?

Compared with gas-powered cars, plug-in electric vehicles (PEVs) offer lower operating costs, at-home refueling options, and zero tailpipe emissions when operating solely on battery power. Despite these advantages, PEVs have not been widely adopted since they entered the market.



According to a recent Academies report, consumer attitudes and lack of information about PEVs have slowed the acceptance of the new technology. Furthermore, current battery technology — which determines how far a vehicle can travel on a single charge — and the high vehicle cost are major barriers to wider adoption of PEVs. The report recommends continued federal investment in battery technology research, as less expensive, better performing batteries will help bring down the overall vehicle cost.

It should be noted, however, the study committee that wrote the report found that except for limited-range battery electric vehicles (BEVs), the travel range for most PEVs on a single charge is comparable to that of a conventional vehicle using one tank of gas. And although limited-range BEVs are not practical for long-distance trips, their ranges are more than sufficient for the average daily travel needs of the majority of U.S. drivers.

The home is the most important place for charging infrastructure, followed by the workplace, in and around cities, and, lastly, on interstates. Local governments could encourage greater plug-in adoption by streamlining permitting processes and building codes and offering incentives that support future installation of infrastructure. The federal government and proactive states should use incentives and regulatory powers to ensure that plugs and charging stations are uniform and that universally accepted payment methods can be used at all charging stations, as is the case with conventional gas stations.

The federal government should refrain from directly investing in the installation of additional public charging infrastructure, however, until more research has been done to understand what role it would play in encouraging adoption and use of PEVs. Given that most PEV owners recharge at home or at work, research should also be undertaken to determine how much public infrastructure is needed and where it should be built.

One of the committee's most important recommendations is continuing the federal financial purchase incentives and re-evaluating them after a suitable period because PEVs are not currently cost-competitive with gas-powered cars without them. Other incentives to boost the purchase of PEVs include temporary exemptions from special roadway or registration fees and utility rate structures that allow owners to recharge when energy supply costs are low.

— *Lauren Rugani*

Overcoming Barriers to Deployment of Plug-in Electric Vehicles. Committee on Overcoming Barriers to Electric-Vehicle Deployment; Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences; and Transportation Research Board (2015, 152 pp.; ISBN 978-0-309-37217-6; available from the National Academies Press, tel. 1-800-624-6242; $59.00 plus $5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/21725>).

The committee was chaired by **John G. Kassakian,** professor of electrical engineering at Massachusetts Institute of Technology, Cambridge. The study was funded by the U.S. Department of Energy.

Initiative on Human Gene Editing

Hundreds Attend International Summit; Comprehensive Consensus Study Gets Underway

New gene-editing technologies such as CRISPR-Cas9 are being heralded as "revolutionary" because of the great promise they offer for advancing biomedical research and curing genetic diseases like cystic fibrosis and muscular dystrophy. The technologies could also deepen our understanding of Alzheimer's disease, cancer, and other illnesses with more complicated genetic connections.

However, the potential for gene editing to one day be used to make fundamental genetic changes that could be passed onto future generations — known as human germline editing — is of widespread concern, even to many of the scientists who are involved in such research. A group of prominent researchers who recognized how quickly this area of science is advancing approached the National Academy of Sciences and National Academy of Medicine for guidance. In response, the two academies launched a comprehensive initiative on human gene editing to provide researchers, clinicians, policymakers, and society with a thorough understanding of these technologies in order to inform decisions about human gene-editing research around the world.

The first major component of that initiative, the International Summit on Human Gene Editing, was convened in December in Washington, D.C. Co-hosted by NAS and NAM together with the Chinese Academy of Sciences and the Royal Society — the science academy of the United Kingdom — the summit attracted approximately 500 attendees and participants from more than 20 nations for three days of discussion about the scientific, ethical, and governance issues involved in human gene-editing research. In addition, more than 3,000 people in 70 countries participated via a live webcast of the summit, and there was widespread international news coverage of the event.

At its conclusion, the committee of experts that organized the summit issued a statement with its conclusions on basic and preclinical research, somatic cell research, and human germline research. "It would be irresponsible to proceed with any clinical use of germline editing unless and until (i) the relevant safety and efficacy issues have been resolved, based on appropriate understanding and balancing of risks, potential benefits, and alternatives, and (ii) there is broad societal consensus about the

appropriateness of the proposed application," the committee said. "Moreover, any clinical use should proceed only under appropriate regulatory oversight. At present, these criteria have not been met for any proposed clinical use: the safety issues have not yet been adequately explored; the cases of most compelling benefit are limited; and many nations have legislative or regulatory bans on germline modification. However, as scientific knowledge advances and societal views evolve, the clinical use of germline editing should be revisited on a regular basis."

The statement calls upon the four academies that convened the summit "to take the lead in creating an ongoing international forum to discuss potential clinical uses of gene editing; help inform decisions by national policymakers and others; formulate recommendations and guidelines; and promote coordination among nations." In response, the presidents of the four academies said they would work with academies around the world and in coordination with other international and scientific medical institutions "to establish a continuing forum for assessment of the many scientific, medical, and ethical questions surrounding the pursuit of human gene-editing applications."

Following the summit, NAS and NAM began moving forward with the second major component of the initiative: a study of the scientific underpinnings of human gene-editing technologies, their potential use in biomedical research and medicine — including human germline editing — and the clinical, ethical, legal, and social implications of their use.

Over the next year, the committee conducting the study will perform its own independent and in-depth review of the science and policy of human gene editing by reviewing the literature and holding data-gathering meetings in the U.S. and abroad to solicit broad input from researchers, clinicians, policymakers, and the public. The committee will also monitor in real-time the latest scientific achievements of importance in this rapidly developing field. While informed by the statement issued at the international summit, the study committee will have broad discretion to arrive at its own findings and conclusions, which will be released in a peer-reviewed consensus report expected in 2016. The report will provide a framework based on fundamental, underlying principles that may be adapted by any nation considering the development of guidelines for human gene-editing research, with a focus on advice for the U.S. — *Molly Galvin*

Gulf Research Program Awards First Fellowships and Grants

As part of its initial suite of activities, the Gulf Research Program last summer announced the recipients of its first early-career research and science policy fellowships and exploratory research grants. Both sets of competitive awards support the program's 30-year mission to enhance oil system safety and the protection of human health and the environment in the Gulf of Mexico and U.S. outer continental shelf regions.

The early-career research fellowships recognized eight individuals at the critical pre-tenure phase of their careers who demonstrated exceptional leadership, past performance, and potential to make future contributions to improving oil system safety, human health, or the environment in the Gulf Region. Each fellow was awarded $76,000 in the form of a two-year grant, and will receive mentorship from a senior faculty member at their home institution as well as from a senior expert in their field.

Four science policy fellows were selected to spend one year on the staff of a state environmental agency or regional office of a federal agency in the Gulf region, with a focus on leadership development and capacity building at the science-policy interface. The fellows receive a stipend of $45,000 for current students or $55,000 for graduates, as well as mentorship by a professional at their host office.

The program also awarded 12 exploratory research grants, totaling more than $1.5 million, intended to catalyze innovative thinking in one of two areas: (1) how to effectively educate and train offshore oil and gas and health professionals and (2) how to improve understanding of links between human well-being and ecosystem services related to oil and gas production.

These one-year grants provide seed money for research in its early conceptual phase, for activities that can accelerate concept to testing, or for development of novel approaches. They also could support the application of new expertise or engagement of non-traditional disciplinary or interdisciplinary perspectives.

The program also announced the recipients of its final 2015 funding activity, data-synthesis grants, at the end of the year. These two-year awards — totaling more than $4.4 million — are designed to encourage activities that synthesize existing data in ways that inform efforts to restore and maintain the Gulf of Mexico's ecosystem services or that enhance understanding of the deep Gulf or its physical and biological connection to coastal communities.

— *Lauren Rugani & Molly Galvin*

National Academy of Medicine Established

Since its inception in 1970, the Institute of Medicine has operated under the congressional charter of the National Academy of Sciences as both an honorific membership society and a research organization that conducts studies on health and medicine and related policy issues. On July 1, 2015, the National Academy of Medicine was established, and it assumed the membership and honorific functions formerly administered by the IOM, inheriting more than 1,900 current elected and foreign members of the Institute. This change was part of a broader internal reorganization to more effectively integrate the work of the Academies.

In addition to its honorific functions, NAM administers fellowships, scholarships, and awards; hosts workshops, expert meetings, and symposia; and conducts programs to enrich the broader work of the entire institution. The NAM also publishes Perspectives, an expert commentary and discussion paper series.

At the NAM's annual meeting in October, Victor J. Dzau, president of the newly minted Academy, said the creation of the National Academy of Medicine is especially timely because of the immense challenges shaping today's landscape — increasing burden of noncommunicable diseases, aging, rising health care costs, and persistent health inequalities. "We are in the perfect position to steer this rapidly evolving health environment toward progress on many fronts. The NAM's independent status, with [its] unique interface with academia, government, industry and civil society, provide the platform and resources to impact health, both immediately and in the long run, in our own nation and beyond."

The studies and reports on health and medicine have continued uninterrupted as activities of the Institute of Medicine, which became one of six program units now operating under the umbrella of the three integrated Academies. Studies, reports, and activities that are produced by any of the Academies' six program units will be referenced as products of the National Academies of Sciences, Engineering, and Medicine.

"The establishment of the National Academy of Medicine is a significant milestone in our history," said NAS President Ralph J. Cicerone. "It is an acknowledgement of the importance of medicine and related health sciences to today's global research enterprise. It will also better align us to take a more integrated, multidisciplinary approach to our work, reflecting how science is best done today."
— *Jennifer Walsh*

Publications

For documents shown as available from the National Academies Press (NAP), write to 500 Fifth St., N.W., Room 360, Washington, D.C. 20001; call tel. 202-334-3313 or 1-800-624-6242; or order on the Internet at <www.nap.edu>. Documents from a specific unit of the Academies are available from the source as noted.

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