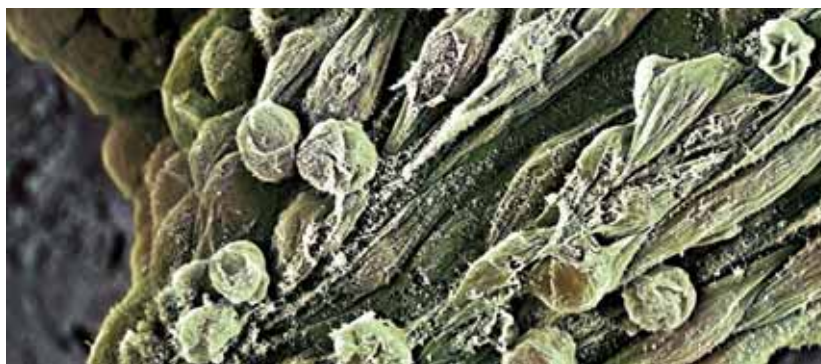


THE NATIONAL ACADEMIES **IN FOCUS**

infocusmagazine.org



Safeguarding Against Animal Diseases
Toward Cures for Spinal Cord Injury
Using Dispersants on Nearshore Oil Spills
Crucial Guidelines for Stem Cell Research

Summer 2005
vol. 5 number 2

THE NATIONAL ACADEMIES

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Page 15:	F/A-22 Raptor, photo courtesy U.S. Air Force
Page 16:	Bruce Alberts with a young student during visit to a lab school at Smith College in Northampton, Mass., photo by Carol Lollis
Page 17:	Farewell celebration for Bruce Alberts, photo by Mark Finkenstaedt
Pages 18&19:	Photos courtesy the National Academies' Christine Mirzayan Science and Technology Policy Graduate Fellowship Program
Page 21:	Photo courtesy Marian Koshland Science Museum of the National Academy of Sciences

FEATURES

HEALTH & SAFETY

4 Regenerating Hope

Speeding progress toward cures for spinal cord injuries



4

6 A Peace Corps for Global Health

Much-needed help for nations hard hit by AIDS

ENVIRONMENT & RESOURCES

10 Oil Spill Dispersants

Chemicals used in deep waters should be studied for use closer to coastline

12 Animals and Health

Strengthening safeguards against disease outbreaks



12

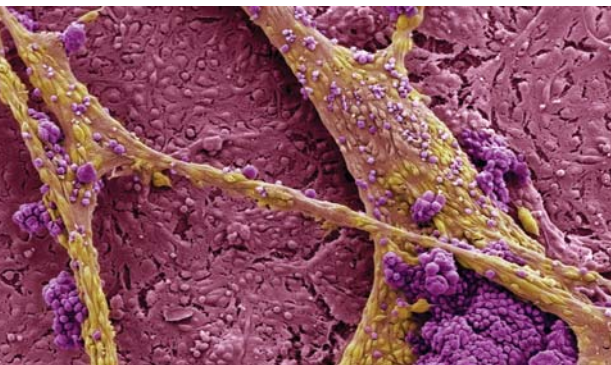
EDUCATION & RESEARCH

7 Stem Cell Research

Report offers scientists direction in controversial area

9 A State of Independence for New Investigators

Helping postdocs jump-start their careers as independent researchers



7

ENGINEERING & TECHNOLOGY

13 Dousing Danger at Nuclear Power Plants

Ways to reduce risks from terrorist attacks

15 Polymer Matrix Composites

High performance and full of promise



15

16 Profile

Bruce Alberts: The Education President

Excerpts from a recent profile by science writer Regina Nuzzo in the *Proceedings of the National Academy of Sciences*



16

18 20/20

Uncovering the Secrets of Washington Policy

By Mara Jeffress

Academies fellowship helps a young scholar explore a career in science policy

20 Brief Takes

- **New Fund Honors Alberts' Commitment to Science Education**
- **Partner Academies Chosen to Buoy African Science**
- **Science Museum Celebrates First Anniversary**

22 New Projects & Publications

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The Education President

Thomas Jefferson famously remarked that “If the condition of man is to be progressively ameliorated, as we fondly hope and believe, education is to be the chief instrument in effecting it.” By this statement he meant both that society would benefit from the advancement of knowledge and that an educated citizenry would be essential for safeguarding the vitality and liberty of the young republic.

At the National Academies, we strive to realize these dual aspects of Jefferson’s vision through the promotion of scientific knowledge that can improve human society and through efforts to better inform decision-making by leaders and citizens at large on matters relating to science, technology, and health. This work takes many forms, ranging from reports that advise the government to our one-year-old Marian Koshland Science Museum.

Outgoing NAS President Bruce Alberts has led a host of projects to promote scientific literacy in the general public. Under his leadership, the National Academies initiated the National Science Education Standards project, which has outlined curricular standards for kindergarten through 12th grade. The Center for Education at the National Academies continues to undertake a broad spectrum of studies devoted to assessing and improving pedagogical practices. Other recent Academies reports have aimed at improving undergraduate education in the life sciences and fostering the independence of young postdoctoral researchers, described in this issue of *In Focus*. The National Academy of Engineering, for its part, has helped promote standards for learning about technology in primary and secondary schools, and the Institute of Medicine has highlighted the consequences and solutions for poor health literacy among the public in its report on *Health Literacy: A Prescription to End Confusion*.

IOM and NAE are also working to strengthen professional education in their respective fields. The NAE, for example, has just released the second of a two-part report on *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*. The IOM has promoted better professional education in health through such reports as *Who Will Keep the Public Healthy?* on the training of public health professionals and *Health Professions Education: A Bridge to Quality* on the training of clinical professionals.

As decisions affecting everything from personal health to national policy come to depend increasingly on public awareness and understanding of scientific issues, the National Academies will continue to provide objective and authoritative information to support an informed citizenry. Through his work promoting science education at home — and through his efforts to build the advisory capacity of scientific academies abroad — Bruce Alberts has stamped an important Jeffersonian legacy onto his 12 years of service to the Academies. This is a legacy worth preserving and extending, every bit as important at the start of the 21st century as it was more than 200 years ago.



A handwritten signature in black ink that reads "Harvey V. Fineberg". The signature is fluid and cursive, with the first name "Harvey" and last name "Fineberg" clearly legible.

HARVEY V. FINEBERG
President, Institute of Medicine

The ancient Egyptians considered spinal cord injury a condition that could not be treated, and even after doctors began to try — the Greek physician Hippocrates was one of the first — their attempts met with little success. Until around World War II, the vast majority of people who sustained these injuries died within a year, often from infections that followed on the heels of the trauma.



REGENERATING HOPE

Speeding Progress Toward Cures for Spinal Cord Injuries

The arrival of antibiotics and other improvements in care made survival possible for many with spinal cord injuries. But doctors and researchers had written off the idea of curing the fundamental injury and the paralysis and loss of sensation it caused. Once spinal cord neurons were destroyed, it was believed, they were gone for good.

Fortunately, research in recent years has undercut that assumption. Studies have shown that nerve cells and their axons — the threadlike fibers that conduct electrical impulses to other cells — can indeed be

regenerated, a finding that creates new possibilities for treating spinal cord injuries. And the attention drawn to these opportunities by the late actor Christopher Reeve following his own injury has given new vigor to the research effort.

“We now need to think about a new stage in recovery — actual improvement of the injured cord,” said Richard T. Johnson, a professor of neurology, microbiology, and neuroscience at the Johns Hopkins University School of Medicine in Baltimore. Johnson chaired an Institute of Medicine committee that recently looked at the status of research

on spinal cord injuries and suggested ways to accelerate progress toward new treatments.

When most people think of a “cure,” they think of restoring the ability to walk again, but the committee’s report urges a broader approach. Research should be directed not only at restoring major motor functions such as walking, but also at healing the other body systems damaged by these injuries — sensory, bladder, and sexual functions, for example. Better treatments are also needed for complications such as pain, spasticity, pressure sores, and depression.

Few therapies are ready for clinical trials, the report says, but many show promise in cell cultures and animal studies. If transplanted, cells that usually protect axons in other parts of the body may be able to stimulate, guide, and protect axons in the spinal cord as well. And though research is still in its early stages, stem cells from adult and embryonic tissues show strong potential for replacing damaged spinal cord cells. One innovative approach may use engineered tissues to fill gaps in the injured cord, and to serve as “scaffolds” from which transplanted cells could grow.

Regenerating nerves is only one part of restoring function, however. Another research priority is finding ways to steer the growth of axons so that they connect with and stimulate the right cells and tissues. If they connect in the wrong way, then pain and spasticity — rather than recovery of movement and other functions — can result.

Research should also be devoted to developing acute-care therapies that could be used soon after an injury, the report adds. A cascade of inflammation, cell death, and scarring occurs in the days and weeks after the trauma, and finding ways

to block these processes could help minimize damage.

No single treatment will likely cure these injuries, the committee cautioned. Researchers should focus on finding combinations of therapies that could work together. For example, therapies that promote the growth



of axons could be developed alongside agents that produce myelin, the substance that protects axons and speeds nerve impulses.

Coordinating all of the research activities — and translating promising findings into treatments quickly — will require a centralized network, the report says. The National Institutes of Health should establish a Spinal Cord Injury Network to lead and organize future research efforts. — *Sara Frueh*

■ **Spinal Cord Injury: Progress, Promise, and Priorities.**

Committee on Spinal Cord Injury, Board on Neuroscience and Behavioral Health, Institute of Medicine (2005, 352 pp.; ISBN 0-309-09585-9; available from the National Academies Press, tel. 1-800-624-6242; \$49.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11253.html>).

Richard T. Johnson, Distinguished Service Professor of Neurology, Microbiology, and Neuroscience, Johns Hopkins University School of Medicine and Bloomberg School of Public Health, Baltimore, chaired the committee. The study was funded by the State of New York Department of Health.



Every day, 14,000 people across the world contract HIV and another 8,500 die from AIDS. The global effort that's necessary to combat the rapid spread of HIV/AIDS has no precedent. The volume of trained health care workers and support personnel needed to provide lifelong care for people with an incurable disease far surpasses what was needed to tackle smallpox, polio, or any other previous public health crisis.

Nothing less than a Peace Corps-scale contingent of health care professionals and other experts should be mobilized to plan, carry out, and sustain a campaign against the disease, says a new report from the Institute of Medicine. The report envisions a new Global Health Service with a pivotal "service corps" among its many elements — a cadre of full-time, salaried clinicians, educators, and managers who travel overseas to work with other U.S. colleagues already in place and local counterparts in running treatment and prevention programs for HIV/AIDS as well as malaria and tuberculosis, diseases which often overlap with and are exacerbated by HIV/AIDS. Some 150 U.S. health professionals should be selected in the first year of the program for assignments lasting at least two years in hard-hit African, Caribbean, and Southeast Asian countries. Corps members would help train local professionals in addition to conducting hands-on treatment of patients or other activities.

Of course, the skilled professionals who are promising recruits for the service corps may have tens of thousands of dollars in debt remaining from their education and

A Peace Corps for Global Health

professional training, or mortgages, career commitments, and other ties that can make it difficult for them to travel abroad for an extended period. To encourage participation, incentives such as competitive salaries, a fellowship program

offering awards of \$35,000 annually, and a scholastic loan repayment program that would provide \$25,000 for each completed year of service in the corps should be used to expand the pool of candidates.

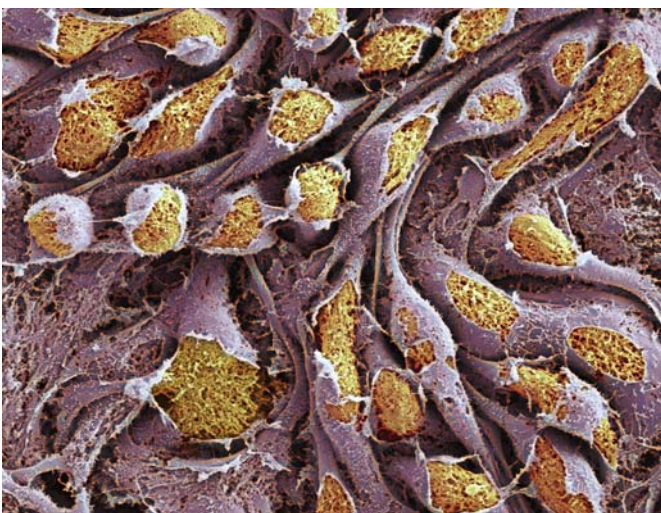
These initiatives could mobilize thousands of health personnel to work abroad, providing desperately needed expertise in countries beset by critical shortages of doctors, nurses, and other health care professionals. There is only one physician for every 30,000 people in Mozambique and one nurse for every 5,000 Ugandans. Rwanda has just 11 pharmacists. "The dearth of qualified and trained workers in many low-income nations presents the single greatest obstacle to stemming the spread of AIDS, malaria, and tuberculosis," said study chair Fitzhugh Mullan. "Members of the Global Health Service Corps would offer both concrete assistance and hope for these nations by multiplying essential skills and services."

— *Christine Stencel & Vanee Vines*

Healers Abroad: Americans Responding to the Human Resource Crisis in HIV/AIDS. Committee on Options for Overseas Placement of U.S. Health Professionals, Board on Global Health, Institute of Medicine (2005, 264 pp.; ISBN 0-309-09616-2; available from the National Academies Press, tel. 1-800-624-6242; \$38.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11270.html>).

The committee was chaired by **Fitzhugh Mullan**, clinical professor of pediatrics and public health, George Washington University, Washington, D.C. The study was funded by the Office of the U.S. Global AIDS Coordinator, located in the U.S. Department of State.

STEM CELL RESEARCH



Report Offers Scientists Direction in Controversial Area

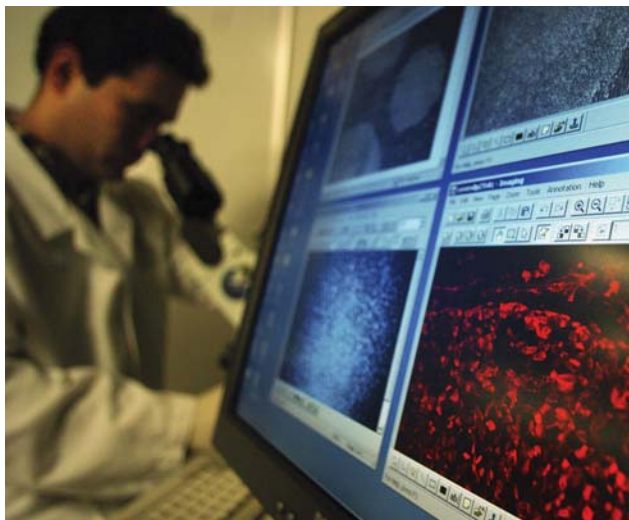
Stem cell research is an exciting new frontier in medical science. Under the right conditions, these all-purpose cells can be coaxed to develop into more specialized cells, which could be powerful tools for scientific inquiry and improved therapies for treating disease. But like any other frontier, this area of research has yet to be fully explored. And given its controversial nature, there should be clear boundaries for how it is carried out.

A new report from the National Academies provides guidelines for research involving human embryonic stem cells, and says that a standard set of requirements for obtaining, storing, distributing, and using embryonic stem cell lines — one embraced by the entire U.S. scientific community — is the most responsible means to achieve advances in this area.

In previous reports, the National Academies have recommended that both adult and embryonic stem cell research should go forward, including research using a lab technique called nuclear transfer to derive stem cells, but that human reproductive cloning should not be attempted. In view of current restrictions on federal involvement in human embryonic stem cell research, the scientific community needs guidelines to ensure that the work is conducted responsibly.

Human embryonic stem cells may be obtained from blastocysts — three- to five-day-old embryos — left over at fertility clinics; created specifically for research; or produced by nuclear transfer. The guidelines say that Embryonic Stem Cell Research Oversight, or ESCRO, committees should be set up to monitor scientific investigations involving these cells at all institutions conducting such work. But the oversight committees should not replace other research compliance bodies, such as institutional review boards.

ESCRO committees should review all research proposals that involve human embryonic stem cells. Any proposal to



generate new stem cell lines using human embryos should also be vetted by ESCRO committees, the guidelines say.

Practices for obtaining donated eggs, sperm, or blastocysts should meet the highest ethical and scientific standards, the guidelines stress. Before conducting studies, researchers must obtain donors' consent to use their blastocysts to generate stem cells, and donors should not be paid. Donors also should be told that they have the right to withdraw their consent at any point before cell lines are derived, and whether information on personal identity would be encoded and their privacy protected. Furthermore, donors should be made aware that embryos would be destroyed in the process of generating stem cells, resulting cell lines could be kept for years, and that the cells might be genetically modified or transplanted into animals for further scientific investigation. Researchers should not ask fertility doctors to create more embryos than are needed for fertility treatment.

The guidelines recognize that scientists may need to combine human and animal cells for animal studies that would gauge

whether human stem cells could treat people with various ailments. But animal embryonic stem cells should not be transplanted into human blastocysts. Also, human embryonic stem cells should not be placed in the blastocysts of non-human primates.

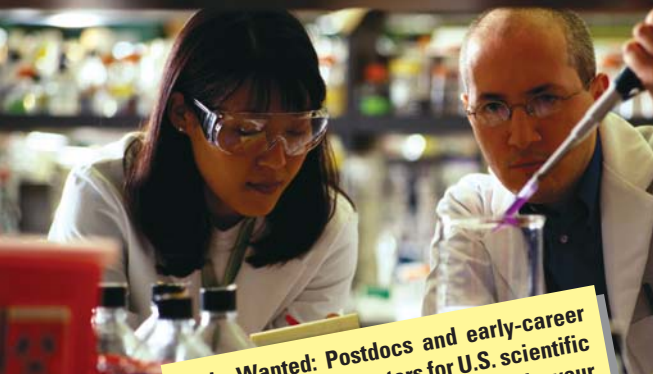
ESCRO committees must approve any placement of human embryonic stem cells into animals. Animals used in such experiments should not be allowed to produce offspring, however. And human embryonic stem cells should be introduced into nonhuman mammals only when no other experiment can provide the information needed.

The report also recommends the creation of an independent body to periodically review the guidelines, taking into account advances in stem cell science as well as evolving public attitudes. It is essential to assure the public that this research is being conducted ethically and responsibly.

— *Vanee Vines & Bill Kearney*

Guidelines for Human Embryonic Stem Cell Research. Committee on Guidelines for Human Embryonic Stem Cell Research; Board on Life Sciences, Division on Earth and Life Studies, and Board on Health Sciences Policy, Institute of Medicine (2005, approx. 272 pp.; ISBN 0-309-09653-7; available from National Academies Press, tel. 1-800-624-6242; \$44.95 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11278.html>).

The committee was co-chaired by **Richard O. Hynes**, Daniel K. Ludwig Professor of Cancer Research and a Howard Hughes Medical Institute investigator, Massachusetts Institute of Technology, Cambridge; and **Jonathan D. Moreno**, Emily Davie and Joseph S. Kornfeld Professor of Biomedical Ethics and director of the Center for Biomedical Ethics, University of Virginia, Charlottesville. The study was funded by the National Academies with additional support from the Ellison Medical Foundation and the Greenwall Foundation.



Help Wanted: Postdocs and early-career biomedical investigators for U.S. scientific enterprise. Few opportunities to do your own work. Limited access to research funds for original projects. Training to last more than 10 years. Mentoring from top scientists hit or miss.

Such an ad would entice few people, but it describes some key challenges facing postdocs and new scientists in biomedical research. Their autonomy and creativity frequently take a back seat in systems often marked by conventionality. The National Institutes of Health should promote their independence by giving them more resources and opportunities, says a new report from the National Research Council.

NIH alone cannot transform the status quo, however. Other stakeholders — including university administrators and professional societies — must share the responsibility, the report says.

Postdoctoral training should be temporary, the report emphasizes. NIH and other institutions should limit the time individuals work as postdoctoral researchers to five years total — regardless of the type of award or grant they work under.

Most biomedical postdocs are paid through “R01” research grants that are made to principal investigators (PIs). So, trainees are often required to focus on the work of others, a pattern that may stifle their creativity, the report says. NIH should move some of the postdoctoral support from R01 grants to training grants and individual awards that aid postdocs more directly. To complement its Ruth L. Kirschstein National Research Service Awards, NIH also should create a

A State of Independence for New Investigators

new independent-research award that allows postdocs to control their own projects under the mentorship of senior investigators. Additionally, the agency should improve data collection on the progress of all postdocs, and consider the training history of PIs.

To help postdocs move into jobs as independent researchers, NIH should replace its collection of “K22” career-transition award programs with a more effective, agencywide grant program. The recommended program would help new investigators jump-start their careers and encourage them to pursue fresh ideas, the report says.

Landing grants for novel projects can be difficult. Currently, R01 grant applications require candidates to submit preliminary data predicting the success of their proposals. Early-career researchers often have not had the resources to obtain such data. NIH should create a “New Investigator R01” award that would ask for a discussion of previous experience instead of preliminary data, the report says. And the agency should provide funding opportunities for researchers who are not on the tenure track and whose job security typically depends on external grants. — *Vanee Vines*

■ **Bridges to Independence: Fostering the Independence of New Investigators in Biomedical Research.** Committee on Bridges to Independence: Identifying Opportunities for and Challenges to Fostering the Independence of Young Investigators in the Life Sciences, Board on Life Sciences, Division on Earth and Life Studies (2005, approx. 138 pp.; ISBN 0-309-09626-X; available from National Academies Press, tel. 1-800-624-6242; \$33.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11249.html>).

The committee was chaired by **Thomas R. Cech**, president, Howard Hughes Medical Institute, Chevy Chase, Md., and distinguished professor of chemistry and biochemistry, University of Colorado, Boulder. The study was sponsored by the National Institutes of Health.



OIL SPILL Dispersants

Chemicals Used in Deep Waters Should Be Studied for Use Closer to Coastline

The National Research Council issued a report in 1989 that recommended chemical dispersants be considered as a first response option to oil spills. When the worst oil spill in U.S. history occurred later that year, cleanup crews tried to use oil dispersants at the scene of the Exxon Valdez disaster. Although sufficient supplies of a chemical dispersant were stored nearby, only one helicopter bucket spray system was available to apply the chemical to the slick, and the few applications that did take place were deemed ineffective.

Since then, dispersants have been used extensively in other parts of the world, and they have been successfully employed in

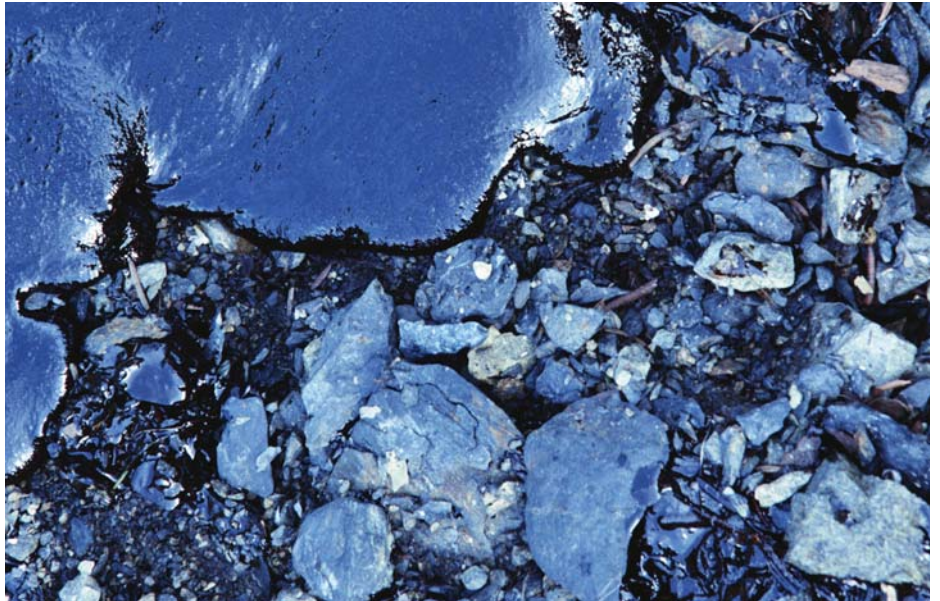
response to several oil spills in the Gulf of Mexico. Nevertheless, continued difficulty in quickly mobilizing oil dispersal prompted the U.S. Coast Guard recently to require that more equipment and personnel be on hand to apply dispersants to spills in a timely manner. The use of dispersants is generally approved for spills at least five kilometers from shore and in water at least 10 meters deep, where dispersed oil's impact on marine life is likely to be low. But now that dispersal equipment will be more readily available, officials are wondering whether these agents should be used in nearshore, shallow waters, where most oil spills in the United States occur but also where much less is known about how even small droplets of oil affect the sea life and plants living there. Again, the Research Council was called upon to examine the current state of science surrounding the use of dispersants as a response to oil spills, particularly nearshore ones.

Oil spill dispersants are controversial because unlike traditional cleanup techniques, where booms and skimmers are used in attempts to remove oil altogether from the water's surface, dispersants do not

reduce the total amount of oil entering the sea. They can, however, dissolve a slick before it reaches the shoreline, where the oil smears birds and marine mammals and turns beaches and coastal wetlands black. The chemical agents used as dispersants work by reducing the tension between oil and water, thereby enhancing the natural process of dispersion that takes place when waves mix large numbers of small oil droplets into the water beneath a spill. To be effective, however, they must be used in a hurry — within 12 to 48 hours after a spill according to the committee that wrote the new report — before fluctuations in water temperature change the oil's viscosity, possibly turning it into a semi-solid that cannot be dispersed.

As the report notes, the decision to use dispersants is a trade-off between decreasing the risk to organisms that thrive on the water's surface and coastline, and possibly increasing the risk to fish populations, sea grasses and coral reefs, and creatures that live on the seafloor. Better information is needed to decide whether to make that trade-off.

With limited funding — less than \$10 million annually — for research on oil spill dispersants, the report recommends that federal and state agencies, along with industry and international partners, establish an integrated research plan focused on experiments to support decisions about when and where to use dispersants. For example, models need to be designed that can predict the concentration and underwater move-



ment of dispersed oil more accurately and deliver rough estimates to emergency responders within hours of a spill. Monitors also should be rapidly deployed to the scene of any spill where dispersants are used in order to collect data on the fate of the dispersed oil. And more studies are needed on the toxicity of dispersed oil to sea life.

For now, experiments should be conducted in wave tanks, although field testing in actual water environments may be deemed necessary in the future, the report says.

— *Bill Kearney*

■ **Understanding Oil Spill Dispersants: Efficacy and Effects.** Committee on Understanding Oil Spill Dispersants: Efficacy and Effects, Ocean Studies Board, Division on Earth and Life Studies (2005, approx. 248 pp.; ISBN 0-309-09562-X; available from the National Academies Press, tel. 1-800-624-6242; \$40.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11283.html>).

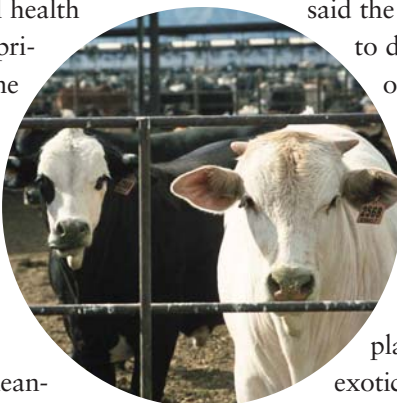
The committee was chaired by **Jacqueline Michel**, president, Research Planning Inc., New Orleans. The study was funded by the U.S. Department of the Interior's Mineral Management Service, National Oceanic and Atmospheric Administration, U.S. Coast Guard, and the American Petroleum Institute.

ANIMALS and HEALTH

Strengthening Safeguards Against Disease Outbreaks

The need to make animal health one of the nation's top priorities may surprise some people, but it shouldn't, says a new National Research Council report, given the threat posed by new and emerging animal diseases that spread easily in today's global marketplace. Many of these diseases are zoonotic, meaning they can be transmitted to humans. Mad cow, avian flu, lyme disease, and West Nile virus are just a few of the zoonotic diseases making headlines. Even when people are not infected, an animal disease can have a staggering economic impact on the \$2 trillion U.S. food and fiber industry. There is also the danger that terrorists will use an animal pathogen to strike at the food supply.

These challenges led the committee that wrote the report to conclude that a new high-level mechanism, or "strategic focal point," is needed to coordinate the work of dozens of federal and state agencies, university laboratories, and private companies currently responsible for safeguarding animal health in this country. New technologies also need to be implemented more quickly, to better detect, diagnose, and thwart animal-borne diseases. Recent technological advances, such as health-monitoring chips that can be embedded underneath an animal's skin and improved early-warning systems, have not been fully exploited by the current animal health framework, according to the committee. And while it applauded the establishment of a National Animal Health Laboratory Network, which links labs conducting disease testing for the U.S. Department of Agriculture, the committee



said the network lacks the capacity to deal with massive, multiple outbreaks, and at present is only prepared to detect a narrow list of diseases. A more robust linkage of all those involved in animal disease diagnosis is needed.

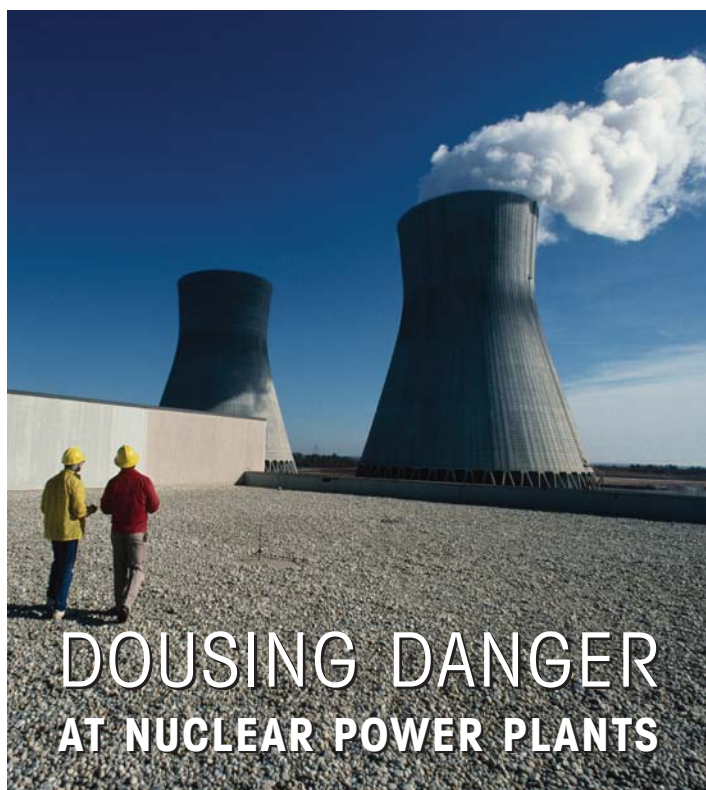
Although new limits were placed on the importation of exotic animals following an outbreak of monkeypox in 2003 that was linked to an African rodent, the tracking of such animals in the United States is inconsistent and ineffective, the committee found. It said new regulations were needed to govern the possession of exotic, nondomesticated, and wild animals.

The rising challenges in animal health come at time unfortunately when fewer veterinarians are pursuing public health and biomedical research careers; USDA predicts a shortfall of several hundred veterinarians on its staff by 2007. New strategies are needed to recruit veterinarians into fields such as pathology and laboratory animal medicine, the committee said.

The report is the first of a three-part study, with follow-up reports expected on animal disease surveillance and response and recovery plans for an epidemic. — *Bill Kearney*

■ **Animal Health at the Crossroads: Preventing, Detecting, and Diagnosing Animal Diseases.** Committee on Assessing the Nation's Framework for Addressing Animal Diseases, Board on Agriculture and Natural Resources, Division on Earth and Life Studies (2005, approx. 237 pp.; ISBN 0-309-09259-0; available from the National Academies Press, tel. 1-800-624-6242; \$46.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11365.html>).

The committee was chaired by **Lonnie J. King**, dean, College of Veterinary Medicine, Michigan State University, East Lansing. The study was funded by the National Academies.



Ways to Reduce Risks From Terrorist Attacks

Almost from the day the first U.S. commercial nuclear power reactor went online in 1957, rods containing used — yet still highly radioactive — uranium have been accumulating in cooling pools and dry casks at over 100 operating and decommissioned plants. Since Sept. 11, 2001, some independent analysts have worried that these fuel rods could be stolen by terrorists to make “dirty bombs” or that cooling pools at the plants could become new targets for terrorist attacks.

At the request of Congress, a committee of experts was convened by the National Academies to examine the safety and security of spent nuclear fuel stored at commercial nuclear power plants. The committee’s consensus report was delivered in classified form in July of last year to Congress, the U.S. Nuclear Regulatory Commission (USNRC),

and the U.S. Department of Homeland Security. A public version of the committee’s report was released in April 2005.

The committee found that cooling pools at some plants are potentially at risk from a terrorist attack, but given existing plant security measures, the likelihood that terrorists could steal enough spent fuel to use in a nuclear dispersal device is small.

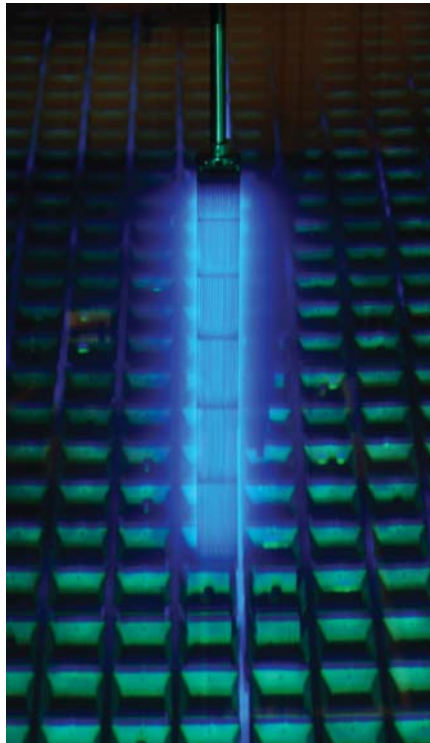
The most significant threat from a terrorist attack is the potential for breaching the cooling pools themselves. The committee said an attack that partially or completely drains a cooling pool could have severe consequences, including the initiation of a high-temperature fire in the fuel’s zirconium cladding, which could result in the release of large quantities of radioactive material. The report recommends that two immediate steps be taken to reduce the chances and

consequences of such fires: repositioning fuel rods in the pools to more evenly distribute heat loads from radioactive decay and installing water-spray systems to cool the fuel in the event of a coolant loss.

The committee noted that the potential risks depend on plant design. Some cooling pools, for example, are located below ground level or are otherwise protected from external line-of-sight

attacks. For this reason, the Nuclear Regulatory Commission should promptly undertake plant-by-plant vulnerability analyses to determine which plants are at highest risk. The committee also found that dry cask storage, which is used to store fuel older than about five years, has security advantages over storage in cooling pools; for example, it divides the inventory of spent fuel among a number of individual containers. Consequently, less fuel is at risk in an attack. Once the recommended plant-by-plant vulnerability analyses are completed, the USNRC may conclude that earlier-than-planned movements of spent fuel from pools to dry casks would be prudent at some plants.

The report also recommends that the USNRC improve the sharing of pertinent information from its analyses with nuclear power plant operators and commercial vendors. During its work, the committee observed that current classification and security practices have impeded the sharing



of valuable information that could improve plant security, with a negative effect on feedback, cooperation, and overall confidence in the agency.

The public version of the National Academies' report was prepared with the cooperation of the Nuclear Regulatory Commission. It contains all of the findings and recommendations of the original classified study, although classified security and safeguards infor-

mation has been removed. "This publicly available version of our report," said Bruce Alberts, president of the National Academy of Sciences, "fulfills our responsibility to inform the public and elected officials about a critical national security issue while also ensuring that we publish nothing that might inadvertently aid a terrorist."

— William Skane

■ **Safety and Security of Commercial Spent Nuclear Fuel Storage: Public Report.** Committee on Safety and Security of Commercial Spent Nuclear Fuel Storage, Board on Radioactive Waste Management, Division on Earth and Life Studies (2005, approx. 125 pp.; ISBN 0-309-09645-6; available from the National Academies Press, tel. 1-800-624-6242; \$32.00 plus \$4.50 shipping for single copies; also on the Internet at <books.nap.edu/catalog/11263.html>).

Louis J. Lanzerotti, distinguished research professor, New Jersey Institute of Technology, and consultant, Bell Labs, Lucent Technologies, Murray Hill, N.J., chaired the committee. The study was funded by the U.S. Nuclear Regulatory Commission and the U.S. Department of Homeland Security.



POLYMER MATRIX COMPOSITES

Lighter and stronger materials are being designed that can be used at high temperatures and resist corrosion better than conventional metals or plastics in various commercial and military applications. Called polymer matrix composites, these materials consist of strong fibers embedded in a resilient plastic that holds them in place.

Polymer composites are used to make very light bicycles that are faster and easier to handle than standard ones, fishing boats that are resistant to corrosive seawater, and lightweight turbine blades that generate wind power efficiently. New commercial aircraft also contain more composites than their predecessors. A 555-passenger plane recently built by Airbus, for example, consists of 25 percent composite material, while Boeing is designing a new jumbo aircraft that is planned to be more than half polymer composites.

But composites can be costly to make and their long-term properties are not easy to predict. So, although many companies and government agencies realize the potential of these materials, they only use them in a limited number of well-proven applications.

Two new reports from the National Research Council explore how to better understand the properties of polymer composites and how industry and the U.S. military could use more composites with higher confidence as their reliability improves.

Scientists have devised various theoretical models to explain some aspects of composites' distinctive properties. Teams of scientists and engineers with expertise in chemistry, polymer physics, materials processing, and other relevant fields could combine information from these models to make more reliable predictions about how polymer composites behave, particularly under extreme conditions, says one of the reports.

High Performance and Full of Promise

Scientists and engineers also should be able to use data about composites' chemical makeup, properties, and processing conditions from large composite

development projects at government agencies, such as NASA, and at private companies, such as Airbus and Boeing. The data could be assembled in a database similar to the popular gene and protein databases used by life scientists, the report adds.

In the future, polymer composites could be even tougher and lighter than today's composites, owing to M5 fibers, which promise to be the strongest and most versatile fibers ever created. These composites could improve protection against fire, blasts, and bullets for military equipment and personnel. In the next five to 10 years, the Defense Department should invest in M5 fiber research and development and should evaluate new ways of developing and purchasing high-performance fibers, the second report recommends, to improve the performance and availability of composites in the future. — *Patrice Pages*

■ **High-Performance Structural Fibers for Advanced Polymer Matrix Composites.** Committee on High-Performance Structural Fibers for Advanced Polymer Matrix Composites, Division on Engineering and Physical Sciences (ISBN 0-309-09614-6). The committee was chaired by **John W. Gillespie Jr.**, director of the University of Delaware's Center for Composite Materials, Newark.

■ **Going to Extremes: Meeting the Emerging Demand for Durable Polymer Matrix Composites.** Committee on Durability and Lifetime Prediction of Polymer Matrix Composites in Extreme Environments, Division on Engineering and Physical Sciences (ISBN 0-309-09715-0). **Catherine Brinson**, professor of mechanical engineering and materials science and engineering at Northwestern University, Evanston, Ill., chaired the committee.

Both studies were funded by the U.S. Department of Defense. The reports are available from the National Academies Press, tel. 1-800-624-6242; also on the Internet at <books.nap.edu>.



Bruce Alberts

THE EDUCATION PRESIDENT

As Bruce Alberts stepped down on July 1 one of the most accomplished and distinguished presidents of the National Academy of Sciences, he was singularly focused on education — specifically, teaching students about real science. He has been brewing an idea for a new science course that he would like to teach to his graduate students at the University of California, San Francisco, the approach for which is partly inspired by the three years he spent in graduate school charging straight into an experimental dead-end. First, Alberts says, he would toss out the traditional classroom lectures and instead hand students a small stack of carefully selected scientific articles. Then he would have them argue among themselves which papers are outstanding and, most importantly, which are not. “We always talk about good papers, but we never talk about the substantial amount of mediocre work that’s done,” Alberts says.

Alberts wants to get students and scientists talking about what he considers the critical issue in a scientific career: how a scientist learns where to spend limited time, money, and energy in the most effective way. “I think the right type of course could do a lot to help future scientists develop the kind

of taste and judgment they need to really be successful,” he says. Good scientists usually acquire this research acumen by osmosis or “trial and error,” Alberts says. “In my case, it was a lot of error.”

Nearly 30 years after his graduate school stumbling blocks, Alberts came to Washington, D.C., to be an “education president” of the Academy. His impressive list of achievements and accolades — including eight foreign academy memberships, 14 honorary degrees, and recognition ranging from the San Francisco Exploratorium to the National Academy of Education — reflects his abiding interest in science research and policy as well as basic science education. During his 12-year tenure, he has made immense strides in bringing science education reform to the classroom.

Elected NAS president in 1993, Bruce Alberts immediately began attending to the National Science Education Standards — a project to develop the first-ever set of science educational standards for kindergarten through high school — helping to shape and move the project forward. In 1996, the Research Council released the long-awaited report, a 250-page guide containing recommendations on the content of science classes and on science teaching techniques. The

report emphasizes logic and hands-on problem solving, collaborative group work, and inquiry-based science. More than 250,000 copies have been distributed across the nation, and the voluntary standards have now been adopted to some extent in almost every state.

Under Alberts' leadership, the National Academies helped usher in other science education initiatives. In 1995, the Academies established a Center for Science, Mathematics, and Engineering Education, later merged with the Board on Testing and Assessment to form the Center for Education, which provided a locus for education activities. The National Academies tripled their education reports, producing more than 190 publications on some aspect of education from kindergarten through graduate school, and recently helped establish Strategic Education Research Partnership (SERP), a nonprofit agency that aims to create collaborative networks of teachers and education researchers to decipher what works best in our nation's schools.

Now that his second and final six-year term as NAS president has ended, Alberts will serve the next four years as co-chair of the InterAcademy Council, alongside Yongxiang Lu, president of the Chinese Academy of Sciences. The InterAcademy Council brings together the world's science academies to provide advice to international bodies, such as the United Nations and the World Bank. Alberts is also returning to teaching at UCSF, where he hopes to explore new methods of instruction, such as interactive minicourses between academic terms. He also plans to help UCSF's young faculty and postdoctoral fellows become more effective teachers and researchers themselves.

Looking back, Alberts can see the influences of his own education and teaching experiences on his philosophies of science

education. He saw the power that a good textbook can hold, and he experienced the consequences of learning too late the value of forming good scientific questions.

Alberts realizes that people are driven strongly by the pleasures of solving problems and feeling competent, not by external rewards, and these motivations hold for bril-



liant future scientists as well as struggling students. "I think that our education process should stress enabling every kid to realize in middle school that she or he is good at something, and that their job in life is to find out what they're really good at," he says. The importance of early science classes goes beyond the actual science, Alberts says. "You're trying to teach a much more basic skill — a strategy for dealing with life, basically. You're not trying to teach all students to be research scientists. You're trying to teach them how to deal with any problem they're going to encounter in a scientific way."

Adapted from a profile written by Regina Nuzzo and published in the Proceedings of the National Academy of Sciences on June 28, 2005.

BY MARA JEFFRESS



Mara Jeffress is a recent graduate from the University of Washington, Seattle, with a Ph.D. in molecular and cellular biology.

Uncovering the Secrets of **Washington Policy**

Three times a year a group of students arrives in Washington, D.C., to participate in the National Academies' 10-week Christine Mirzayan Science and Technology Policy Graduate Fellowship Program. These fellows are typically graduate students and postdocs in medicine, law, science, or engineering who are interested in the creation of science and technology policy and the interactions of science, technology, and government. I was part of the winter 2005 group and arrived in D.C. in early January, a newly minted Ph.D. from the University of Washington, green and as eager to discover the secrets of the Washington policy world as I was to discover the secrets of how molecules interact inside the microscopic world of our cells.

After a weeklong orientation, each policy fellow spends his or her remaining nine weeks working with a member of the senior staff on various aspects of the studies under way at a particular Academies' division. I worked with Steve Merrill at the Board on Science, Technology, and Economic Policy on policy issues surrounding patenting genes and genomic and proteomic intellectual property. We also attended luncheons with the presidents of the National Academy of Sciences, the Academy of Engineering, and the Institute of Medicine, as well as congressional hearings and seminars and career development workshops. Additionally, the fellows create and direct a science and technology policy seminar series at the Academies.

During orientation, the fellows divide into three groups and choose topics for the upcoming seminars. By working in small groups, much as Academies committees do, we experience the consensus process firsthand and learn to work together as a diverse and educated group of peers to address the challenge. Each seminar, which brings together two or three experts on a controversial policy topic, must be planned, advertised to both the public and the press, and executed with a professionalism befitting the Academies.

The seminars, and the program as a whole, help students develop essential skills different from those attained in academia.

Putting on a public event was new to the majority of us and there were several challenges. All three groups had to approach many experts before finding those who could participate. Within my group we divided up the tasks — acquiring speakers, writing press releases, making brochures and flyers, advertising, facilities coordination, and introducing and timing the speakers during the seminar — making each job more manageable. This was a crucial step, since all of us were working full time for an Academies unit and did not have much time to spare. My job was to make the seminar brochure and do some writing — two tasks I enjoyed. In fact, it seemed my group was fortunate in that each of us naturally fell into the job for which we were best-suited and which we most enjoyed.

The program's resulting seminars took place during the final weeks of the fellowship session at the Academies' Keck Center. Some of the few educational seminars on

S&T policy held at the Academies, they are open to the public and allow ample time for debate. Approximately 80 people attended each seminar.

My group's topic was the economics of health savings accounts. While some of the groups had to deal with late or confrontational speakers, fortunately the speakers for my group were on time and extremely courteous to each other despite a lively debate. The other seminar topics during the winter session were organic foods and the privacy issues surrounding security scanning technologies.

The seminars, and the program as a whole, help students develop essential skills different from those attained in academia. It opened up possibilities I never dreamed of while at my lab bench. As a result, I am now pursuing a science policy career. Some of my academic friends initially questioned my career decision. However, once I passionately explained to them the need for rigorously trained scientists to provide a voice in the policy milieu — something many scientists are simply unaware of — they understand. I only wish they could have experienced what I did in 10 short weeks in Washington.



Find out more about the Christine Mirzayan Science and Technology Policy Graduate Fellowship Program and many other career opportunities available from the National Academies at national-academies.org/grantprograms.html.

New Fund Honors Alberts' Commitment to Science Education

Bruce Alberts arrived at the National Academy of Sciences in 1993 intending to become a president devoted to education reform. His many efforts on behalf of science education emphasize “science as inquiry,” an approach that aims to help students acquire a deep and useful understanding of the scientific method — not just the rote knowledge currently stressed in many U.S. schools. Making this shift, Alberts believes, will require the strong leadership of the scientific community.

To continue his work and to honor his passion for improving science education, the Academies have established the Bruce Alberts Fund for Science Education. The fund will support a variety of programs, including an effort to expand the concept of the Teacher Advisory Council, a group started by Alberts in 2002 to give expert science and math teachers a voice in national education policy. The Academies are now supporting the formation of similar advisory groups at the state level. Also planned is an initiative to build partnerships between the science and business communities to encourage the education system to produce a scientifically literate and capable work force. And the fund will support wider dissemination of the Academies' evidence-based studies on how students learn; the goal is to get these reports into the hands of more people who can put the recommendations into practice — such as federal and state policy-makers and education agencies, business leaders, principals, and classroom teachers themselves.

For more information about the fund, contact Merrill Meadow, NAS development director, at 202-334-2431, or visit national-academies.org/albertsfund.

— *Sara Frueh*

Partner Academies Chosen to Buoy African Science

The U.S. National Academies selected in February the science academies of Nigeria, Uganda, and South Africa as initial focal points for a program to strengthen African scientists' ability to inform government policy-making and public discourse with independent, evidence-based advice. Supported by a \$20 million grant from the Bill & Melinda Gates Foundation, the initiative will be carried out in Africa over the next decade, focusing on efforts to improve public health.

The project will help the three academies — which have limited experience in providing policy guidance — engage broader communities of African scientists, medical and health care professionals, and engineers in policy issues. The U.S. National Academies will steer efforts early on, in part by conducting a series of joint activities. But the aim is to create the capacity in each nation for efforts to thrive under the leadership and support of the African academies themselves. Some of the early activities will center on helping the three academies develop the skills to plan and execute scientific studies, organize major conferences, raise and manage funds, create and implement administrative procedures, and build lasting relationships with government officials and other stakeholders in their countries.

The U.S. National Academies also awarded strategic planning grants to the science academies of Cameroon, Senegal, Ghana, and Kenya. Additionally, the initiative will support various meetings to promote collaboration and joint learning among sub-Saharan Africa's science academies. Canada's International Development Research Centre will support the initiative and provide financial assistance for the participation of a fourth initial partner in Africa. — *Vanee Vines*

Science Museum Celebrates First Anniversary

Under a striped circus tent decorated with metallic red, black, and silver balloons, hundreds of people gathered to learn about science and participate in festivities marking the first anniversary of the Marian Koshland Science Museum. The festive atmosphere continued inside the museum with raffle tickets, popcorn, and prizes. Nearly 600 people stopped by for the special event.

At one popular station, visitors were able to extract DNA from their own cheek cells and take home the sample in a necklace vial for safekeeping. And a microscopic power tool station allowed visitors the opportunity to use a small hand-held digital microscope to explore tiny objects including computer chips.

"Today's celebration is a thank you to the community for its support of our museum," said Patrice Legro, director of the museum.

The museum is part of the public outreach of the National Academies. Its exhibits are designed to make National Academies

reports more accessible to the public — through interactive displays and cutting-edge technology — and to increase public understanding of the nature and value of science.

The current exhibits at the museum focus on global warming and DNA, allowing visitors to glimpse the frontiers of today's scientific research; witness the effects of global warming; and explore how DNA analysis



can catch criminals and stop epidemics. In 2007, one of the exhibits will travel to partner museums across the country. A new exhibit on infectious disease is now under development. — *Maureen O'Leary*

Projects

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

Assessment of the U.S. Drug Safety System.

Board on Population Health and Public Health Practice, Institute of Medicine. Project director: Kathleen Stratton. Chair: Sheila P. Burke, deputy secretary and chief operating officer, Smithsonian Institution, Washington, D.C. Sponsor: U.S. Food and Drug Administration.

Human-System Design Support for Changing Technology.

Center for Studies of Behavior and Development, Division of Behavioral and Social Sciences and Education. Project director: Anne Mavor. Chair: Richard W. Pew, principal scientist, BBN Technologies, Cambridge, Mass. Sponsor: U.S. Army Research Laboratory and Air Force Research Laboratory.

National Tire Efficiency Study.

Studies and Information Services, Transportation Research Board, and Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences. Project director: Tom Menzies. Chair: Dale F. Stein, president emeritus, Michigan Technological University, Tucson, Ariz. Sponsor: National Highway Traffic Safety Administration.

Route Selection for Transportation of Research Reactor Spent Nuclear Fuel.

Nuclear and Radiation Studies Board, Division on Earth and Life Studies; and Studies and Information Services, Transportation Research Board. Project director: Kevin Crowley. Chair: Neal Lane, Edward A. and Hermena Hancock Kelly University Professor, and senior fellow, James A. Baker III Institute for Public Policy, Rice University, Houston. Sponsor: U.S. Department of Transportation.

Strategic Advice on the U.S. Climate Change Science Program.

Division on Earth and Life Studies, Division of Behavioral and Social Sciences and Education, and Division on Engineering and Physical Sciences. Project director: Anne Linn. Chair: To be selected. Sponsor: U.S. Climate Change Science Program.

Teacher Education Programs in the United States.

Center for Education, Division of Behavioral and Social Sciences and Education. Project director: Michael Allen. Chair: To be selected. Sponsor: U.S. Department of Education’s Institute of Education Sciences.

Understanding Premature Birth and Assuring Healthy Outcomes.

Board on Health Sciences Policy, Institute of Medicine. Project director: Adrienne Stith Butler. Chair: Richard E. Behrman, executive and chair of the Pediatric Education Steering Committee, Federation of Pediatric Organizations Inc., Menlo Park, Calif. Sponsors: National Institutes of Health’s National Institute of Child Health & Human Development and Office of Research on Women’s Health, U.S. Centers for Disease Control and Prevention, Health Resources and Services Administration, U.S. Environmental Protection Agency, March of Dimes, Burroughs Wellcome Fund, American College

of Obstetricians and Gynecologists, American Society for Reproductive Medicine, and the Society for Maternal-Fetal Medicine.

Publications

For documents shown as available from the National Academies Press (NAP), write to 500 Fifth St., N.W., Lockbox 285, Washington, D.C. 20055; tel. 202-334-3313 or 1-800-624-6242; or order on the Internet at <www.nap.edu>. Documents from a specific unit of the National Academies are available from the source as noted. Prices and availability of all documents are subject to change. Charges listed are for single copies; discounts are available for bulk orders.

Advancing the Nation’s Health Needs: NIH Research Training Programs

Board on Higher Education and Workforce, Division on Policy and Global Affairs (2005, 190 pp.; ISBN 0-309-09427-5; available from NAP, \$45.00 plus \$4.50 shipping).

Are Chemical Journals Too Expensive and Inaccessible? A Workshop Summary to the Chemical Sciences Roundtable

Chemical Sciences Roundtable, Board on Chemical Sciences and Technology, Division on Earth and Life Studies (2005, 50 pp.; ISBN 0-309-09590-5; available from NAP, \$18.00 plus \$4.50 shipping).

Assessing the Quality of Cancer Care: An Approach to Measurement in Georgia

National Cancer Policy Board, Institute of Medicine and National Research Council (2005, 292 pp.; ISBN 0-309-09569-7; available from NAP, \$49.00 plus \$4.50 shipping).

The Astrophysical Context of Life
Committee on the Origins and Evolution of Life, Space Studies Board, Division on Engineering and Physical Sciences, and Board on Life Sciences, Division on Earth and Life Studies (2005, 94 pp.; ISBN 0-309-09627-8; available from NAP, \$18.00 plus \$4.50 shipping; also available free from the Space Studies Board, tel. 202-334-3477 or e-mail <ssb@nas.edu>).

The Atacama Large Millimeter Array (ALMA): Implications of a Potential Descope
Committee on Astronomy and Astrophysics, Board on Physics and Astronomy and Space Studies Board, Division on Engineering and Physical Sciences (2005, approx. 31 pp.; ISBN 0-309-09694-4; available from NAP, \$12.00 plus \$4.50 shipping; also available free from the Space Studies Board, tel. 202-334-3477 or e-mail <ssb@nas.edu>).

Avoiding Surprise in an Era of Global Technology Advances
Division on Engineering and Physical Sciences (2005, 138 pp.; ISBN 0-309-09605-7; available from NAP, \$32.00 plus \$4.50 shipping).

Cord Blood: Establishing a National Hematopoietic Stem Cell Bank Program
Board on Health Sciences Policy, Institute of Medicine (2005, approx. 320 pp.; ISBN 0-309-09586-7; available from NAP, \$46.95 plus \$4.50 shipping).

Creating a Disaster Resilient America: Grand Challenges in Science and Technology — Summary of a Workshop of the Disasters Roundtable
Disasters Roundtable, Division on Earth and Life Studies (2005, 19 pp.; available only online at <www.nap.edu>).

Decreasing Energy Intensity in Manufacturing: Assessing the Strategies and Future Directions of the Industrial Technologies Program
Board on Manufacturing and Engineering Design, Division on Engineering and Physical Sciences (2005, 86 pp.; ISBN 0-309-09574-3; available from NAP, \$18.00 plus \$4.50 shipping).

Designing Nanostructures at the Interface Between Biomedical and Physical Systems — Conference Focus Group Summaries
National Academies Keck Futures Initiative (2005, 120 pp.; ISBN 0-309-09668-5; available from NAP, \$28.00 plus \$4.50 shipping).

Earth Science and Applications From Space: Urgent Needs and Opportunities to Serve the Nation
Space Studies Board, Division on Engineering and Physical Sciences (2005, approx. 50 pp.; ISBN 0-309-09672-3; available from NAP, \$12.00 plus \$4.50 shipping; also available free from the board, tel. 202-334-3477 or e-mail <ssb@nas.edu>).

Economic Models of Colorectal Cancer Screening in Average-Risk Adults — Workshop Summary
National Cancer Policy Board, Institute of Medicine and National Research Council, and Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2005, 310 pp.; ISBN 0-309-09539-5; available from NAP, \$60.00 plus \$4.50 shipping).

Effects of Nuclear Earth-Penetrator and Other Weapons
Division on Engineering and Physical Sciences (2005, approx. 150 pp.; ISBN 0-309-09673-1; available from NAP, \$33.00 plus \$4.50 shipping).

Estimating the Contributions of Lifestyle-Related Factors to Preventable Death — A Workshop Summary
Board on Population Health and Public Health Practice, Institute of Medicine (2005, 80 pp.; ISBN 0-309-09690-1; available from NAP, \$18.00 plus \$4.50 shipping).

Federal Agency Roles in Cancer Drug Development From Preclinical Research to New Drug Approval: The National Cancer Institute and the Food and Drug Administration — Background Paper Prepared for the National Cancer Policy Board
Institute of Medicine and National Research Council (2005, 68 pp.; available only online at <www.nap.edu>).

Final Comments on the Science Plan for the North Pacific Research Board
Ocean Studies Board and Polar Research Board, Division on Earth and Life Studies (2005, 44 pp.; ISBN 0-309-09602-2; available from NAP, \$12.00 plus \$4.50 shipping).

Frontiers of Engineering: Reports on Leading-Edge Engineering From the 2004 NAE Symposium on Frontiers of Engineering
National Academy of Engineering (2005, 164 pp.; ISBN 0-309-09547-6; available from NAP, \$35.50 plus \$4.50 shipping).

Impact of Revised Airborne Exposure Limits on Non-Stockpile Chemical Materiel Program Activities
Board on Army Science and Technology, Division on Engineering and Physical Sciences (2005, 108 pp.; ISBN 0-309-09545-X; available from NAP, \$25.75 plus \$4.50 shipping).

Implications of Genomics for Public Health — Workshop Summary
Board on Health Promotion and Disease Prevention, Institute of Medicine (2005, 98 pp.; ISBN 0-309-09607-3; available from NAP, \$18.00 plus \$4.50 shipping).

Implications of Nanotechnology for Environmental Health Research
Roundtable on Environmental Health Sciences, Research, and Medicine, Board on Health Sciences Policy, Institute of Medicine (2005, 70 pp.; ISBN 0-309-09577-8; available from NAP, \$18.00 plus \$4.50 shipping).

Improved Seismic Monitoring — Improved Decision-Making: Assessing the Value of Reduced Uncertainty
Committee on Seismology and Geodynamics, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2005, approx. 148 pp.; ISBN 0-309-09695-2; available from NAP, \$32.50 plus \$4.50 shipping).

Improving Breast Imaging Quality Standards
National Cancer Policy Board, Institute of Medicine and National Research Council (2005, approx. 248 pp.; ISBN 0-309-09648-0; available from NAP, \$42.00 plus \$4.50 shipping).

Improving the Characterization and Treatment of Radioactive Wastes for the Department of Energy's Accelerated Site Cleanup Program
Board on Radioactive Waste Management, Division on Earth and Life Studies (2005, 84 pp.; ISBN 0-309-09299-X; available from NAP, \$18.00 plus \$4.50 shipping).

Improving the Scientific Foundation for Atmosphere-Land-Ocean Simulations — Report of a Workshop
Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2005, 84 pp.; ISBN 0-309-09609-X; available from NAP, \$18.00 plus \$4.50 shipping).

Interfaces for Ground and Air Military Robots — Workshop Summary
Committee on Human Factors, Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education (2005, 60 pp.; ISBN 0-309-09606-5; available from NAP, \$18.00 plus \$4.50 shipping).

Interim Design Assessment for the Pueblo Chemical Agent Destruction Pilot Plant
Board on Army Science and Technology, Division on Engineering and Physical Sciences (2005, 92 pp.; ISBN 0-309-09445-3; available from NAP, \$18.00 plus \$4.50 shipping).

An International Perspective on Advancing Technologies and Strategies for Managing Dual-Use Risks — Report of a Workshop
Development, Security, and Cooperation, Division on Policy and Global Affairs; and Board on Global Health, Institute of Medicine (2005, approx. 154 pp.; ISBN 0-309-09682-0; available from NAP, \$33.50 plus \$4.50 shipping).

An International Spent Nuclear Fuel Storage Facility: Exploring a Russian Site as a Prototype — Proceedings of an International Workshop
Office for Central Europe and Eurasia, Development, Security, and Cooperation, Division on Policy and Global Affairs (2005, approx. 232 pp.; ISBN 0-309-09688-X; available from NAP, \$46.75 plus \$4.50 shipping).

Making Better Drugs for Children With Cancer
National Cancer Policy Board, Institute of Medicine and National Research Council (2005, 56 pp.; ISBN 0-309-09608-1; available from NAP, \$18.00 plus \$4.50 shipping).

Measuring Food Insecurity and Hunger — Phase 1 Report
Committee on National Statistics, Division of Behavioral and Social Sciences and Education (2005, 70 pp.; ISBN 0-309-09596-4; available from NAP, \$18.00 plus \$4.50 shipping).

Monitoring Nuclear Weapons and Nuclear-Explosive Materials: An Assessment of Methods and Capabilities
Committee on International Security and Arms Control, National Academy of Sciences (2005, 264 pp.; ISBN 0-309-09597-2; available from NAP, \$52.25 plus \$4.50 shipping).

Nutrient Composition of Rations for Short-Term, High-Intensity Combat Operations
Committee on Military Nutrition Research, Food and Nutrition Board, Institute of Medicine (2005, approx. 507 pp.; ISBN 0-309-09641-3; available from NAP, \$50.00 plus \$4.50 shipping).

Policy Implications of International Graduate Students and Postdoctoral Scholars in the United States
Committee on Science, Engineering, and Public Policy, the National Academies; and Board on Higher Education and Workforce, Division on Policy and Global Affairs (2005, approx. 214 pp.; ISBN 0-309-09613-8; available from NAP, \$43.00 plus \$4.50 shipping).

Prospective Evaluation of Applied Energy Research and Development at DOE (Phase One): A First Look Forward
Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2005, 138 pp.; ISBN 0-309-09604-9; available from NAP, \$38.00 plus \$4.50 shipping).

Public Water Supply Distribution Systems: Assessing and Reducing Risks — First Report

Water Science and Technology Board, Division on Earth and Life Studies (2005, 58 pp.; ISBN 0-309-09628-6; available from NAP, \$18.00 plus \$4.50 shipping).

Review of the HIVNET 012

Perinatal HIV Prevention Study
Board on Population Health and Public Health Practice, Institute of Medicine (2005, approx. 150 pp.; ISBN 0-309-09651-0; available from NAP, \$33.00 plus \$4.50 shipping).

Review of the U.S. Climate Change Science Program's Synthesis and Assessment Product on Temperature Trends in the Lower Atmosphere
Climate Research Committee, Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies (2005, 74 pp.; ISBN 0-309-09674-X; available from NAP, \$18.00 plus \$4.50 shipping).

Risks and Decisions About Disposition of Transuranic and High-Level Radioactive Waste
Board on Radioactive Waste Management, Division on Earth and Life Studies (2005, 236 pp.; ISBN 0-309-09549-2; available from NAP, \$37.00 plus \$4.50 shipping).

The Science of Instream Flows: A Review of the Texas Instream Flow Program

Water Science and Technology Board, Division on Earth and Life Studies (2005, 162 pp.; ISBN 0-309-09566-2; available from NAP, \$34.00 plus \$4.50 shipping).

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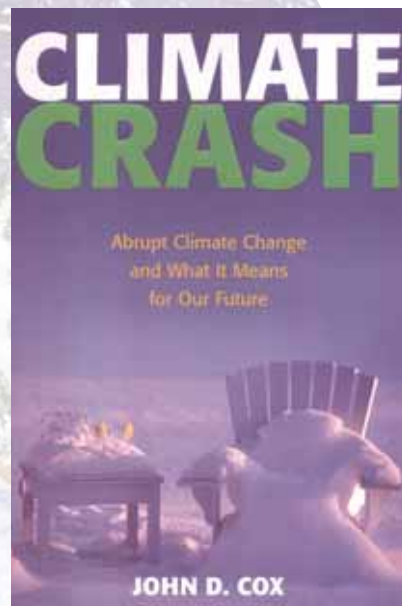
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