Trust

The Pew Charitable Trusts

VOLUME 10 / NUMBER 3 / FALL 2007

Nanotech's Promise and Perils

Knowing USA's Muslims

Every Sea a Dead Sea?

Culture on a Spreadsheet

Literacy

Reading and writing—that was all the word *literacy* referred to, when it first came into use in the late 19th century. Now we commonly speak of scientific, geographic, computer, financial literacy, just to name a few variants. Each field has a distinct vocabulary, and when we learn it—when we gain literacy—we have the information to make informed decisions in the relevant field. Literacy is power, the power of knowledge.

Nanotechnology is a new area—less than 50 years old (the word itself was first used in 1986), it refers to the design, manufacture and use of materials at an incredibly small scale, about 1/100,000 the diameter of a human hair. The science is heralded as this century's industrial revolution. It is used in popular merchandise (e.g., stain-resistant clothing, tennis balls for longer-lasting bounce, dietary supplements) as well as in, for instance, biomedical devices, space exploration and computer-based goods. Its benefits will only expand, since the public and private sectors now invest more than $12 billion a year in nano research and development.

But what about the risks? Nano materials can pass barriers—in one notable experiment, the blood-brain barrier—that would stop larger particles, so medicines may penetrate the body more deeply than desired. The Project on Emerging Nanotechnologies, established as a partnership between the Woodrow Wilson International Center for Scholars and Pew, supports the responsible growth of the science, effective and transparent governmental oversight, and a public literate about the technology. Only an informed public can understand the risks, balance them against the rewards and hold policy makers accountable for policies protecting human health and the environment.

What happens in the world's oceans, like the work of nanoscience, takes place outside the range of the unaided human eye. Yet, unlike nanoscience, we think we know something about the oceans. We flock to the coasts (more than half of Americans live on or near an ocean) and are concerned about beached whales and dolphins. In terms of what we actually know about marine life, however, we have not scratched the surface of the seas, partly because science has not kept pace and partly because national and international policies are sometimes counter to public interest. Yet the more literate that we become about the implications of overfishing and other devastating practices on the oceans, the more informed that citizens in all countries can be in calling for policies to protect our environment.

The price of unabated and unregulated extractive activities, and the subsequent unwelcome changes to the oceans and other natural resources, are chronicled by Callum Roberts, a Pew marine conservation fellow, in his book *The Unnatural History of the Sea*, published this year. He also has a solution. An expert in conservation biology, he has shown that marine reserves can reverse the downward spiral. "If today's generations do not grasp this opportunity," Roberts notes, "tomorrow's may not get the chance."

No one should let misinformation or bad information stand for "literacy," but that is what many Americans do when it comes to understanding Muslim Americans. The Pew Research Center recently brought facts to bear in a poll exclusively about Muslim Americans and their daily experiences and aspirations. The data show that, as a group, Muslim Americans are "largely assimilated, happy with their lives, and moderate with respect to many of the issues that have divided Muslims and Westerners around the world," the report notes. Because lack of knowledge can breed disrespect and distrust, the survey's information is essential as we as a society become ever more diverse and complex.

Most people would agree that the arts contribute to the quality of life and the economy of a city or region. Still, knowing the facts can have a significant impact on support for cultural activities. The National Cultural Data Project is an ambitious, comprehensive and now-proven system of gathering and analyzing information about the contributions of this sector.

The project is like an enormous spreadsheet on which arts organizations enter their operations data, track them over time and compare their practices to those of their peers and the cultural sector at large. It streamlines an organization's process of applying for funds, and it gives arts advocates the statistical evidence to articulate the value and the needs of the arts.

This initiative, begun in Pennsylvania through a partnership of organizations that included Pew, now extends to Maryland and California, supported by local and regional funders.

Whether driven by our intellectual curiosity or in our role as engaged citizens, we can only make informed decisions if we have knowledge. The power that knowledge confers starts with being literate about the subject, and once we gain that basic mastery, there is no end to its potential to serve the public good. "An investment in knowledge," Benjamin Franklin perceptively wrote, "always pays the best interest."

Rebecca W. Rimel
President and CEO

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The Pew Charitable Trusts

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The Pew Charitable Trusts serves the public interest by providing information, advancing policy solutions and supporting civic life. Based in Philadelphia, with an office in Washington, D.C., the Trusts will invest $283 million in fiscal year 2008 to provide organizations and citizens with fact-based research and practical solutions for challenging issues.

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Design/Art Direction
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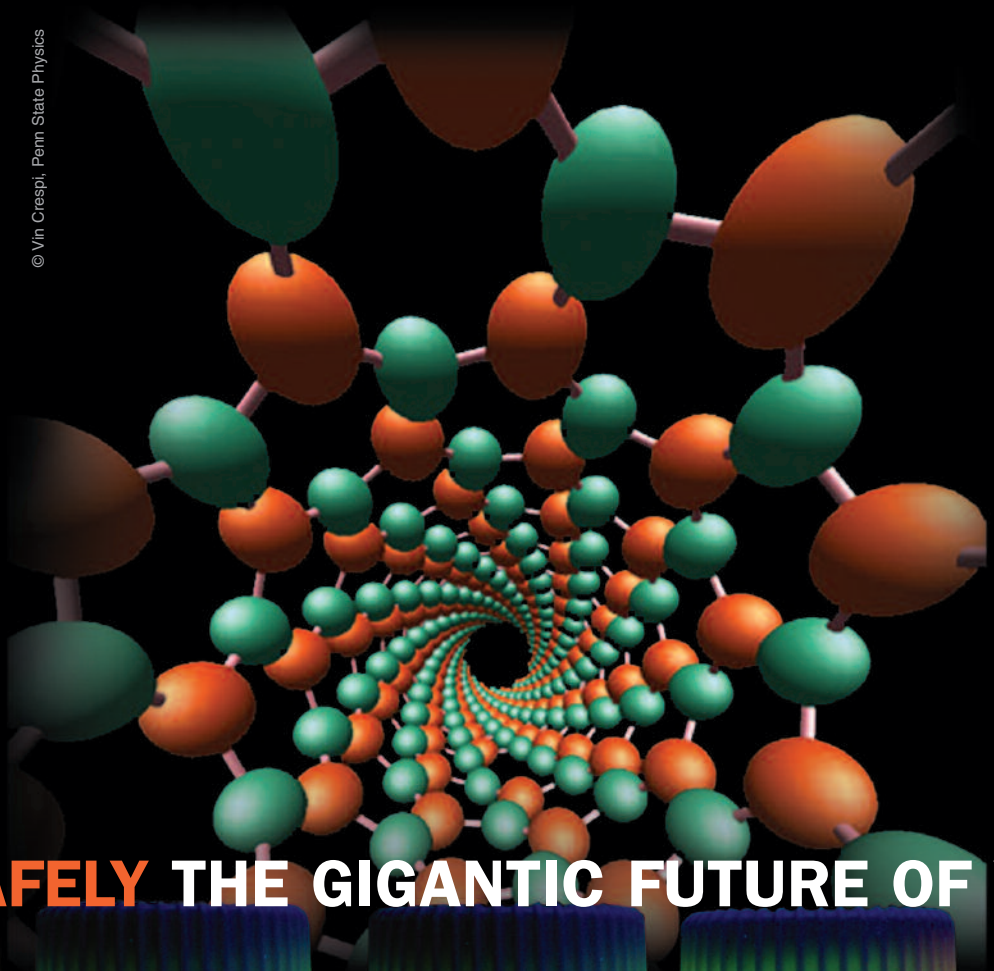
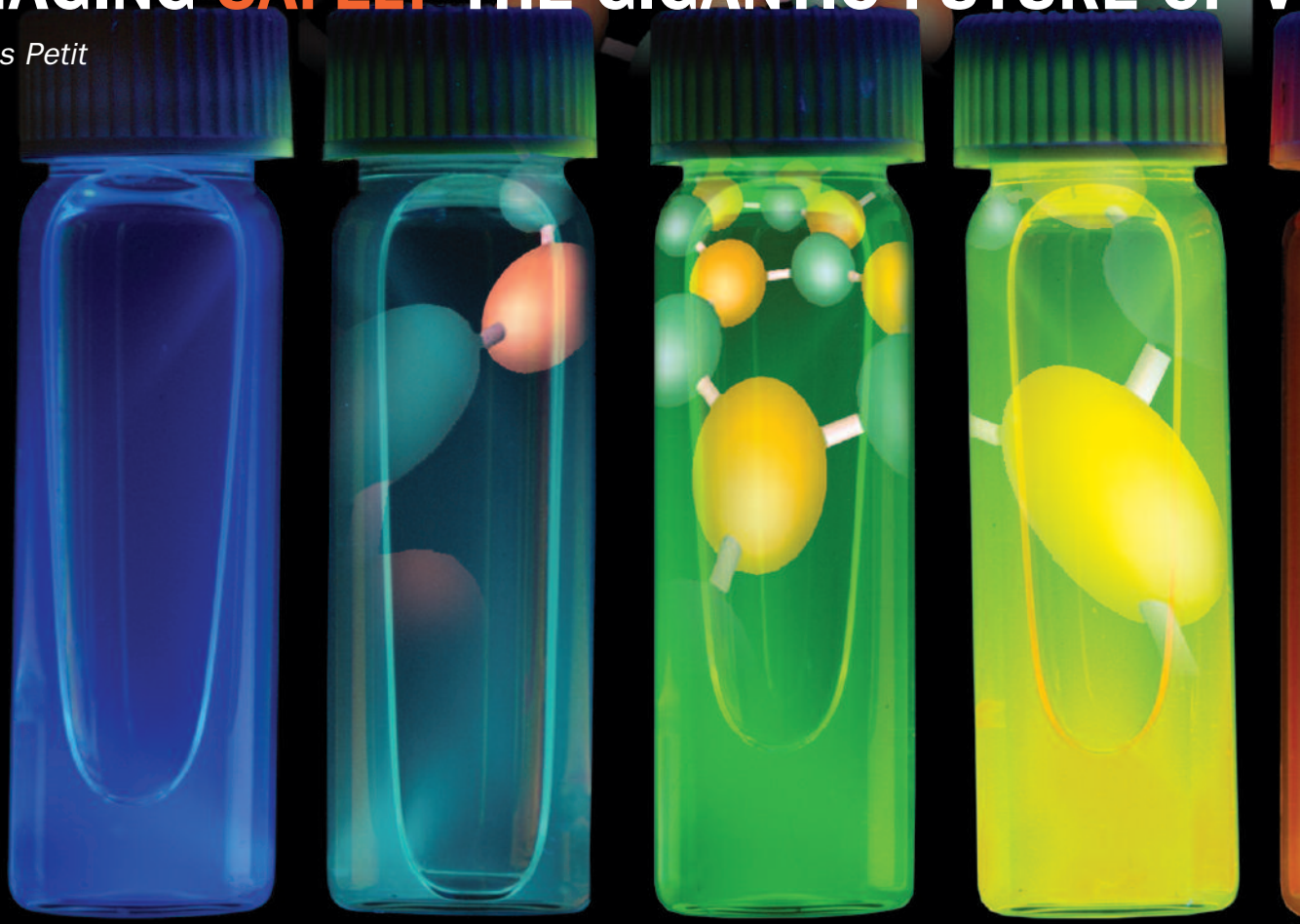
Cover: A few nanotech products—very soon to be many more.



MANAGING SAFELY THE GIGANTIC FUTURE OF V

By Charles Petit



The vials: Fluorescing nanocrystals known as quantum dots give the vials colors. Each quantum dot contains just a few hundred atoms, with the color determined by the dot size. Image by Felice Frankel.

The spiral: a view down the middle of a boron nitride nanotube.

ERY SMALL THINGS

Nanoscale Informal Science Education Network

The Project on
Emerging Nanotechnologies
supports nano development—
and the public's health
as this new science matures.

While sitting in his home office not long ago, Paul Alivisatos was startled to hear one of his daughters racing up the stairs from the TV room. She burst in, her eyes big. "Dad! Dad!!" the youngster exhaled. "The bad guy is taking over the world. And he's a nanotechnologist!"

Oh just terrific, he thought.

Alivisatos is a nanotechnologist of the first rank: a professor of both chemistry and nanotechnology at the University of California at Berkeley and associate director for physical sciences at the Lawrence Berkeley National Laboratory, up the hills just east of campus. A stickler for safety in his 25-person research team, he oversees the national lab's "lessons learned" program that scrutinizes every accident or near-miss.

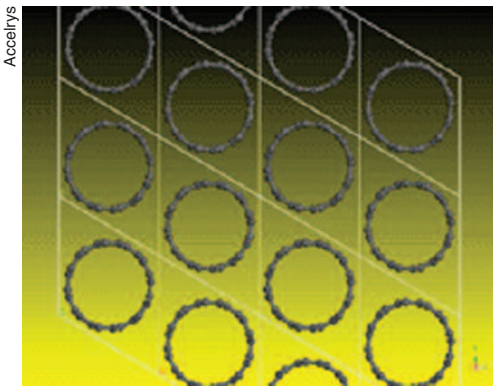
Nanotechnology deals with matter at the level of the molecule on the scale of nanometers. A nanometer is a billionth of a meter. A nanometer is to a meter as a marble is to the Earth, noted Jennifer Kahn in an article in *National Geographic*. A man's beard grows a nanometer, she added, in the time he raises a shaver to his face.

Here are other ways of looking at it. A sugar molecule is a nanometer across, and it would take 300 trillion of them to cover the surface of a penny. The common cold virus is about 20 times wider than a sugar molecule and a human hair 80,000 times wider. The unaided human eye can see items as small as 10,000 nanometers.

Nanotechnologists produce and use distinct components—nanoparticles, string-like nanotubes, nanocircuits and


Hydrogen Solar

Hydrogen Solar's Tandem Cell uses sunlight to split water into hydrogen—potentially a clean source of fuel—and oxygen. The cells have nanocrystalline metal particles on their surface, giving them a vast area with which to collect the sun's energy.


Accelrys

A computational nanotechnology image, generated using molecular-modeling software.

nanofilms (components that may not be more than 100 nanometers in size)—and assemble them into machines. Perhaps 100 groups within half a mile of Alivisatos's own lab spaces are involved, not to mention many other universities, research institutes and private companies and labs around the country.

Indeed, an immense worldwide effort is underway to design and build chemical, electronic and mechanical systems from the atom up. Lux Research, which analyzes trends in technology, estimates that 15 percent of global industrial output, about $2.6 trillion worth, will have some nanotech content by 2014. At last count in mid-2007, more than 500 consumer products already claim to have something derived from nanotechnology in their composition, and the number is doubling every year or so. Components include silicon nanoparticles in electronic switches; tiny blobs of zinc oxide in sunscreens; carbon nanotubes, stronger and lighter than steel, embedded in lightweight tennis rackets or bicycle frames for stiffness; nano-motes of hydroxyapatite in toothpaste to beef up enamel; and sub-cellular-sized capsules for delivery of medicine a few molecules at a time where the body needs them most.

"UNPRECEDENTED PRE-EMPTIVE ACTION" IS NEEDED TO REALIZE NANO'S POTENTIAL WHILE MINIMIZING ITS RISKS.

Alivisatos's group in Berkeley has spawned important advances in the burgeoning field. Among its core claims to fame is development of quantum dots—clusters of 100 to several thousand atoms. The electronic, crystalline innards of quantum dots absorb and emit light of colors that can be selected almost at will just by slightly adjusting their sizes and thus the wavelengths of photons and electrons that resonate inside them. In their energy behavior, they have been compared to artificial atoms. But more practically, they are like colored sticky notes affixed to molecules or viruses and can highlight active genes and metabolic processes inside living tissue. Non-biological applications include high-efficiency solar power cells.

While polls show only a tiny percentage of Americans have a glimmer of what nanotechnology is, the new science's practitioners, it would seem, have made the grade into at least one animator's axis of techno-villains, thus joining such staple, perverse Prometheans as atomic physicists, genetic engineers and builders of giant robots that shoot death rays out of their eyes.

And there stood the professor's anxious little daughter. "So, we had a little talk about what I do," he said. She seemed satisfied. It was only a cartoon.

Yet, and yet . . . . Alivisatos sat in a recent interview in his underground office below one of U.C. Berkeley's chemistry halls, with the tools of nanotech in the next room over. "We are making building blocks at the same size as those that compose our bodies," he says. Mankind's inventions are, like life itself, getting complicated all the way down. The lines dividing the living from the mechanical are blurring. For instance, a manufactured thing can be so small that it can pass right through the pores in our cells' membranes. Sooner or later, if one is not careful, nanoparticles or other nanodevices could possibly cause serious trouble—like monkey wrenches and power tools applied randomly to the gears, nuts, switches and relays in a bustling factory. "We have to do this right," he says.

That is a feeling broadly shared among scientists as well as public interest groups. Many are concerned that the potential risks in a new technology flooding the marketplace with products—while in its infancy—will not get the public-health scrutiny they merit.

Such concerns are why the Woodrow Wilson International Center for Scholars (an arm of the Smithsonian Institution), in partnership with Pew, embarked in 2005 on the Project on Emerging Nanotechnologies (PEN), which is devoted equally to making sure the technology's benefits can be realized and to addressing potential concerns.

"This is the new industrial revolution," says PEN's director, David Rejeski, who served for six years at the White House Office of Science and Technology Policy and as the representative of the U.S. Environmental Protection Agency to the White House Council on Environmental Quality. "My hope is that if you have enough smart

Wilson Sporting Goods

Nanotech extends the life of a tennis ball's bounce. Inside, a coating of nano-thin platelets forms a barrier that keeps air in longer.

people thinking ahead, you can maximize benefits and minimize risks. But there will always be some risk."

At Harvard University earlier this year, he described PEN's determination to help nanotechnology move forward rapidly and also warned about the risk. "Somewhere out in the fast-growing world of nanosciences is an accident waiting to happen," he said. "This mishap will chill investment, galvanize public opposition and generally lead to a lot of hand-wringing on the part of governments who are betting large sums of money on the nanotech revolution. Will it be just bad luck or bad practices? Probably the latter."

PEN's aim is to ensure that the right risk research is being undertaken by the U.S. Government and that oversight mechanisms are working for the environment, consumers and business.

In its first two years, the project helped support the development of an agreement between the DuPont Corporation and the consumer-activist organization Environmental Defense to craft a voluntary standard for recognizing and dealing with risks from nanoscale materials. The result, a "Nano Risk Framework" tool, is now being distributed industry-wide.

PEN also developed the first inventory of nanotech research activities in the United States, listing more than 800 companies, labs at universities or federal agencies and elsewhere engaged in nanotech-related work, and developed a Google-world "mashup" map showing their zip codes.

Last May, it produced the first systematic analysis of the federal government's policy approach to nanotechnology. Authored by J. Clarence (Terry) Davies, senior advisor at PEN and senior fellow at Resources for the Future (he co-authored the plan that created the EPA), the report says that regulatory oversight of nanotechnology is urgently needed; it calls for immediate action to identify and minimize any adverse effects of nano materials and products on health or the environment. The report spells out more than 25 steps the EPA, Congress, the president, the U.S. National Nanotechnology Initiative and the nanotechnology industry as a whole should take to improve the oversight of developments in the field.

William D. Ruckelshaus, who twice served as an EPA administrator, commented on the report, saying, "Nanotechnology holds tremendous potential—for breakthroughs in medicine, in the production of clean water and energy, and in computers and electronics. It may be the single most important advance of this new century. But with its ability to fundamentally change the properties of matter, nanotechnology also may pose both the greatest challenge and biggest opportunity for EPA in its history. EPA needs to seriously consider the constructive and thoughtful changes that Davies puts forward in his report."

PEN's staff have been active in disseminating the project's message. Rejeski testified before Congress twice in just one 10-month period, and other members of the staff have met with their counterparts in Congress and in federal agencies, including the Food and Drug Administration, the EPA, the National Science Foundation and the National Institutes of Health.

PEN's Web site has proven useful, too. Recent statistics show about 840 unique users per day, with an average user session of 22 minutes. As of early fall, the first 10 PEN reports had been downloaded 26,823 times.

Andrew D. Maynard, Ph.D., PEN's chief science advisor, was the lead author of an article in the journal *Nature* last year that set forth five "grand challenges" for research into nanosafety. "The specter of possible harm, whether real or imagined," the team wrote, threatens to slow the development of nanotechnology unless sound, independent and authoritative information is developed on what the risks are and how to avoid them. They called for industry, government and research organizations to take "unprecedented pre-emptive action" to realize the potential of nanotechnology while minimizing potential risks.

The challenges that Maynard and his co-authors enunciated to get the job done are:

- Develop instruments to assess exposure to engineered nanomaterials in air and water, within the next 3 to 10 years.
- Develop and validate methods to evaluate the toxicity of engineered nanomaterials, within the next 5 to 15 years.
- Develop models for predicting the potential impact of engineered nanomaterials on the environment and human health, within the next 10 years.
- Develop robust systems for evaluating the health and environmental impact of engineered nanomaterials over their entire life, within the next five years.
- Develop strategic programs that enable relevant risk-focused research, within the next 12 months.

The paper received a warm reception but, nearly a year later in late summer 2007, Maynard laments that measurable progress has been scarce, particularly on the fifth challenge with its one-year deadline. Nonetheless, he notes that the European Union's 7th European Research Framework called for similar programs. And last April, the European Commission called for public consultation on a nano-safety initiative and related research.

In the United States, he says, the federal National Nanotechnology Initiative is still working on its list of research priorities, a "process that looks systematic, on paper, but is by no stretch of the imagination a research strategy that will deliver results.

"Yet, with the rapidity with which nanotech is moving into products, it is a pretty important timeline—we don't have the luxury of dallying over what to do while people are already being exposed to these materials."

The special feature of nanoscience's products, and the reason some worry they need special scrutiny from the start, is not merely that they are small. Often, new properties emerge at very small dimensions that are not simple extrapolations of their behavior as bulk matter (or even as more routine bits of dust). These include quantum effects in atomic behavior and interactions, dramatically increased mobility or chemical reactivity, color and electrical conductivity. Regulations that govern exposure to toxic materials as a function of their total burden, or mass, may need revision for particles so small that a fifth of their atoms are on their surfaces, vastly increasing their rates, per ounce, of chemical impact.

Many avenues of basic research reveal how nanoparticle behavior brings special safety challenges. At the University of Rochester's Department of Environmental Medicine, a team led by Günter Oberdörster, D.V.M., Ph.D., tracked the paths of nanoparticles inhaled by rats. His team found the motes can travel from the respiratory tract to the liver in just four hours, passing easily through the thin walls of blood vessels. Some penetrated the olfactory nerves in nasal passages. Over the course of a week, they migrated up the slender fibers to the olfactory bulb in the brain, circumventing the blood-brain barrier that repels most unwanted molecules from the central nervous system. They penetrated tissues as a breeze goes through a fence. "It means [we need] some additional regulatory concepts in nanotoxicology," says Oberdörster. "We need better assays or ways to assess it. The ones we have are very valuable, but we need more."

The campaign to set up robust safety systems during nanotech's infancy runs somewhat counter to history. More commonly, societies waited until bodies began to pile up before thinking about regulations. The Food and Drug Administration was born in large part because muckraking writers, including Upton Sinclair in his 1906 book *The Jungle*, exposed the horrors not only of industrial exploitation of immigrant labor but also of the filthy conditions in meatpacking plants. Seat belts, padded dashes and air bags may be standard today, but for its first half-century-plus, the auto industry had hardly anybody checking the safety of its products. Rates of highway carnage for the last several decades have steadily dropped, largely in response to safety requirements.

"I'm crossing my fingers that there is no nanoparticle out there that is truly dangerous," says chemist Vicki Colvin, director of the Center for Biological and Environmental Technology at Rice University. "History is littered with really good technologies that got really obliterated by accidents or other problems—like with DDT. The public reaction to an environmental problem [drastic decline in some bird species and thinning of eggs due to DDT contamination] forced a complete shutdown." It has taken decades for DDT to work its way back, under careful controls, as a potent weapon against malaria.

The only good parallel to putting up safety curtains during an industry's infancy comes from genetic engineering and biotechnology, another new arrival on the scene. Novel organisms created by swapping genes among species, or by designing entirely new genes for them, are unevenly monitored. GMOs, or genetically modified organisms, regularly trigger public outcry in many countries. With nanotech, Colvin says that public agencies, especially in the United States, have an even higher obligation of vigilance. "It is really a government initiative . . . through billions of dollars of investment in R&D," she says. She is referring to the National Nanotechnology Initiative, created in the Clinton administration and embraced in the Bush administration, with nearly $1.44 billion in federal nanotech research in the 2008 budget alone.

MOST FEDERAL AGENCIES AND COMPANIES EXPECT EXISTING REGULATIONS TO COVER NANOTECH. PEN IS LOOKING BEYOND FOR NEW SOLUTIONS.

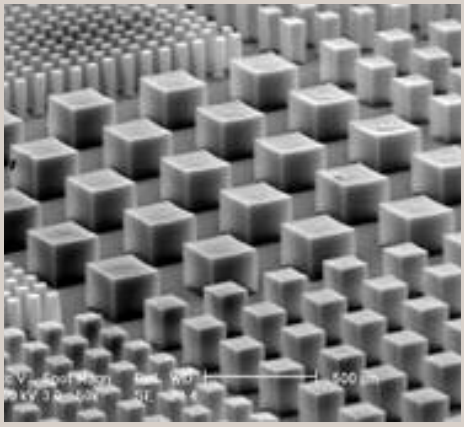
As for safety, right now "federal agencies and companies are all looking to existing regulations to work for nanotechnologies, without a lot of coordination," says PEN director Rejeski. "But will they? And if not, what options do we have? Given the novel properties of many nanomaterials, do we have the right tests and are we even asking the right questions? For the past two years, PEN has undertaken a comprehensive review of what federal agencies already have on the books, including the EPA

Stanislaw Mitura, Technical University of Lódz, Poland

The steel screws holding this fractured bone together are coated with a layer of nano-sized diamond crystals one-thousandth of a millimeter thick. The coating makes normal steel ultra-strong, and bodies are less likely to reject the foreign implant because diamond, like a human body, is a pure form of carbon.

Eric J. Heller, Harvard University

Electrons launched from the upper right fan out and then form branches, as an indirect effect of traveling over bumps.



Nanobliss

Metropolis, created by the self-organization of carbon nanotubes as they grow upward from a silicon substrate on a catalyst layer. The nanotubes "push" and "pull" each other to produce an "architecture" that may resemble everyday objects and landscapes. The density of nanotubes growing from a substrate is about 20 billion per square centimeter.

University of Texas at Dallas

Old Glory at 7,000 nanometers, less than a tenth the diameter of a human hair. It is the work of electrical engineering graduate students Jang-Bae Jeon and Carlo Foresca at the University of Texas at Dallas. They placed it on a silicon wafer, used an ion beam (acting as a microscopic laser) to cut it, and innovatively lifted it into a standing position with a nano manipulator.

In the PEN report *Nanotechnology: A Research Strategy for Addressing Risk*, Andrew Maynard proposed a comprehensive framework for systematically exploring possible risks. He concluded with these recommendations:

- Changes need to be made in risk-research responsibility within the federal government. There should be top-down authoritative oversight, and nanotechnology risk research must shift to federal agencies with a clear mandate for oversight and research into environment, health and safety issues.
- Adequate funding must be provided for highly relevant risk research. Agencies must have sufficient budget to develop critical knowledge, and there should be investment to inform the public's understanding of risk.
- A short-term strategic risk-research plan should be developed and implemented. Top priorities involve nanotechnologies in or close to commercial use, with long-term research into predictive toxicology to provide the scientific basis for addressing new risks.
- Mechanisms should be developed for joint government-industry risk-research funding.
- Nanotechnology risk research must be coordinated internationally. There should be mechanisms to facilitate the free exchange of information on research needs, activities and priorities, and mechanisms for sharing costs and resources.
- An interagency oversight group should be established with authority to set, implement and review a strategic risk-research framework. This group would set and implement the agenda, assure the allocation of appropriate resources and direct efforts to provide a strong scientific basis for regulatory decisions.
- A rolling, independent assessment of long-term research needs and strategies should be established.

The full description of these recommendations, as well as the full report, is available at www.nanotechproject.org/reports.

and FDA, for instance, and looked beyond existing regulations for new solutions."

European countries, especially the United Kingdom, are moving ahead more aggressively than the United States to impose controls on nanoscale science and technologies. There, the precautionary principle of regulation—an assumption that new products and practices are considered a potential threat until shown they are not—holds greater sway, says chemist Kristen Kulinowski, director of the International Council on Nanotechnology at Rice University.

Three years ago, a report from Britain's Royal Society, its foremost science body, flatly recommended that release of manufactured nanoparticles and nanotubes into the environment be avoided as far as possible. Until proven otherwise, it said, all should be regarded as hazardous. It urged that all agencies immediately review their regulations to find any gaps through which threats from nano products or research might sneak.

HUMAN INVENTIVENESS AND POTENTIAL PROFITS—AND APPROPRIATE OVERSIGHT—MAY MAKE NANO AS CONSEQUENTIAL AS THE INDUSTRIAL REVOLUTION.

In America, Kulinowski says, "the attitude is somewhat more relaxed. Agencies are mostly saying they don't need any more authority for nano than they already have for any potentially hazardous substance." Last July, the Food and Drug Administration, after long gestation, released a report that Commissioner Andrew von Eschebach said would foster "the continued development of innovative, safe and effective FDA-regulated products that use nanotechnology materials."

Yes, he acknowledged, such materials "present challenges," but they are "similar to those the FDA faces for products of other emerging technologies," and the rules in place, along with appropriate research to keep up with the science, appear adequate.

It is not as though nanosciences have no top-level scrutiny in this country. Papers on potential hazards have emerged from U.S. labs, and virtually every technical agency has held workshops on them and formed special offices to watch for any developing perils.

But among the recommendations that the PEN program made back in 2005 was that at least $100 million in the subsequent two years go into safety-related research. And while federal overseers of the national nanotech program said they were spending $40 million to $100 million every year on such matters, PEN analysts put the true figure at only about $11 million. For instance, an internal National Science Foundation budget analysis claimed a $24-million expenditure on risk-related research in 2005, but PEN's closer look at the figures found only $19 million went to research relevant in any way to understanding potential risks, and only $2.5 million to work that could be considered highly relevant.

Maynard's 2006 *Nature* article proposed specific, short-term nano safety budgets for U.S. agencies, including $46 million for the National Institute for Occupational Safety and Health and $20 million for the EPA.

Although no nanotech accident has occurred, there has been a false alarm. In March 2006, the German manufacturer of a spray for sealing ceramic tiles—called Magic Nano—pulled the product from the market after several buyers ended up in the hospital with fluid in the lungs and nearly 100 had bad but less severe reactions. All recovered, but the incident looked like the first nano-induced public health crisis that some had been predicting. Several groups called the episode a wake-up call to regulate nanotechnology more carefully, but independent tests could not confirm anything nano about the spray. It now seems that a solvent in the product caused the lung distress and that the nano label was a mere marketing tool.

PEN's science adviser Maynard keeps track of new nano products and perked up upon discovery of a nano-kayak. Perhaps some new lightweight material in its hull, stiffened with nanotubes? Nope. "It was just a very small, one-person kayak," he says.

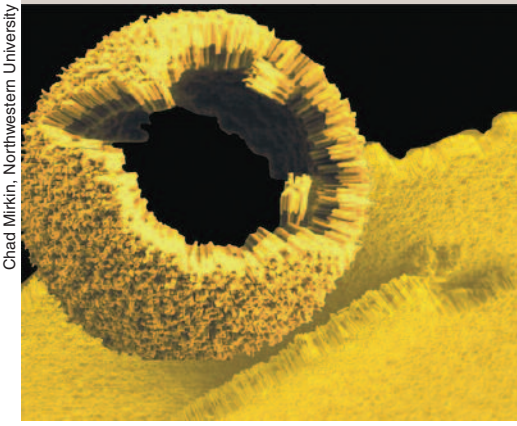
Labeling works the other way around, too: Many products that

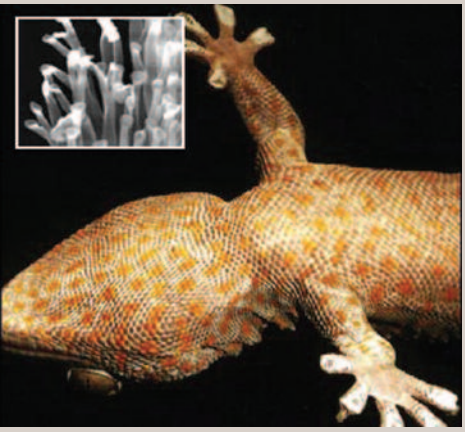
QinetiQ Nanomaterials Ltd.

There are five grams of nanoparticles in this beaker, enough for every person on Earth to have three million particles each.

The self-assembly of polymer nanorods results in a curved structure.

Chad Mirkin, Northwestern University





Kellar Autumn, Lewis and Clark College, and Robert J. Full, University of California at Berkeley

How does the gecko walk up glass and hang upside down? The hairs on its feet are so small that they can exploit forces that pull molecules together, enabling the lizard to hold on. Scientist Keller Autumn and colleagues have patented a sticky tape lined with nanofabricated hairs that can do the same job.

contain nanotech don't mention it in their sales literature—raising questions about truth in labeling and potentially hampering surveillance.

As for real nano and its potential hazards, scrutiny so far has focused on the most easily foreseen problem areas. These are mainly nanoparticles dispersible in the environment, typically in the air or water, or via medicines or cosmetics that people might take in orally or through the skin.

But in the long run—years, decades and even centuries to come—vigilance may need to aim at more exotic issues.

It's worth a look back to see how the long future of nanotech may unfold. The field's historians trace its origins to a talk titled "There's Plenty of Room at the Bottom," by Caltech physicist Richard Feynman in 1959. He noted that no physical laws forbid manufacturing of goods from the bottom up, atom by atom. More than mere chemistry, he envisioned atomic-scale factories complete with automated assembly lines, lathes, forges, coils, jigs and drill presses as tiny as the smallest organelle sub-units in living cells, but not necessarily bathed in watery environments. He supposed they could be developed through a series of miniaturizations. Big tools would make smaller copies of themselves, which in turn would make a yet-smaller generation, and so on. (Such self-reproducing machines had been imagined before, notably by mathematician and computer pioneer John von Neumann.)

In the 1980s and 1990s, engineer K. Eric Drexler, then at the Massachusetts Institute of Technology, began fleshing out Feynman's ideas. He forecast a dawning age of molecular manufacturing, drawing parallels between its operation and the biological machinery of living cells. Drexler's was in large part an optimistic look forward. But he also mused, in his 1986 book *Engines of Creation*, that microbe-like, self-copying micromachines might run amok. They might consume raw materials from all available sources and spread across the earth in a smothering, planet-wide infection he called "gray goo." This grabbed the public imagination, eliciting a response from PEN (not a danger) and a repudiation of its possibility from Drexler.

Nonetheless, the future is long, human and machine-aided inventiveness hard to predict, and the potential profits from truly conquering the nanoscale, mass manufacture of materials and products enormous. "Molecular manufacturing will be as big as the invention of computers, as big as the industrial revolution," says Chris Phoenix of the Center for Responsible Nanotechnology in Brooklyn, N.Y. Its greatest impacts, he adds, will arise from its eventual ability to transform the nature of industry and the speed with which ideas become products. One forecast is, within decades or even less, the presence of tabletop nanofactories "with many zillions of manufacturing stations and a smaller order of zillions of assembly stations that put together tabletop products that are perfect, down to the atom." It won't be a question of how many nanoparticles can stand on the head of a pin, but how many supercomputers can be housed there.

For now, the field's safety perils may be different from and perhaps frightening compared to those of other new fields. They are not, however, dramatically beyond the scale of hazards to which industrial societies are accustomed. "Our goals are to stimulate research, oversight and foresight," says Rejeski. "Will it slow down innovation? I don't think so. I'm very optimistic. We are addressing safety and environmental issues so much earlier than with other technologies. The intention is to move nanotechnology into the marketplace without significant speed bumps." T

The Project on Emerging Nanotechnologies is located in Washington, D.C. Its Web site, www.nanotechproject.org, features nine topic areas: business; environmental health and safety; environment and green nano; looking ahead; multimedia/podcasts; perspectives series; policy; public perceptions; risk; and research. In addition, Andrew Maynard has a new blog: http://community.safenano.org/blogs/andrew_maynard.

Charles Petit, science writer for U.S. News & World Report *for 26 years, now freelances, with recent credits in* National Geographic, Smithsonian Magazine, Nature, *and* The New York Times. *His honors include awards from the American Association for the Advancement of Science (for newspapers and for magazines) and the Science-in-Society prize from the National Association of Science Writers, an organization he later headed as president.*

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A Latina at a Hispanic Muslim Day event in Union City, N.J.

Muslims in America

By Sandra Salmans

Who Are They? What Do They Think On Important Issues? A Ground-Breaking Survey Finds Out.

Farah Nosh/Getty Images

Muslim Americans vote during the 2004 election in Dearborn, Mich.

For many Muslim Americans, as for many other Americans, modern history is divided into two periods: Before 9/11. And after.

Before 9/11, Muslim Americans were "largely invisible," as *Newsweek* magazine noted earlier this year. The only Muslims most Americans knew by name were Malcolm X, Louis Farrakhan and Muhammad Ali. One measure of the extent to which things changed after 9/11 is that *Newsweek* related these observations recently in a special report, "Islam in America" and featured dozens of Muslim Americans on its cover.

Providing the statistical unpinning for that story was the first-ever, nationwide, random sample survey of Muslim Americans—conducted by the Pew Research Center. The scale was ambitious: To obtain a national

sample of 1,050 Muslims living in the United States, the center conducted more than 55,000 interviews, and—also a first—held them in Arabic, Farsi and Urdu as well as English. (The executive summary of the report was translated into Arabic.)

The survey—"Muslim Americans: Middle Class and Mostly Mainstream"—estimated that some 1.5 million adult Muslims live in the United States; combining that projection with the Census Bureau data, it estimated the total population of Muslims in the U.S. at 2.34 million. Beyond the numbers, it found them to be highly assimilated. Whether foreign- or native-born, they are decidedly American in their outlook, values and attitudes, and believe on balance that Muslims coming to the U.S. should try and adopt American customs, rather than trying to remain distinct from the larger society. Of immigrants, 65 percent are citizens, and, of those who arrived prior to 1990, 92 percent are citizens.

In general, Muslim Americans have a generally positive view of the larger society. Most say their communities are excellent or good places to live. Moreover, 71 percent of Muslim Americans agree that most people who want to get ahead in the U.S. can make it if they are willing to work hard. This belief is reflected in Muslim-American income and education levels, which generally mirror those of the public. And 63 percent (to 32 percent) of Muslim Americans do not see a conflict between being a devout Muslim and living in a modern society.

At the same time, they are unhappy with the ongoing war on terror and suspicious of the U.S.'s motives. Younger Muslims particularly, especially African-American Muslims, are more sympathetic to Islamic extremism, and American Muslims under the age of 30 are less opposed to suicide bombing than the general population. Still, American Muslims overall seem much more moderate and assimilated than their counterparts in Europe, as data from other recent Pew Research Center surveys indicate (see box, right).

Getty Images

A Muslim street vender in New York City takes a few moments to pray.

"Overall, this is a very, very positive story for the vast majority of Muslim Americans," says Andrew Kohut, president of the center. "This is a mostly middle class and mainstream public. They're happy with their lives."

Other key findings of the survey:

- Muslim Americans are a highly diverse population, composed largely of immigrants; in fact, those surveyed came from 68 different countries. "Next to the yearly pilgrimage to Mecca, this has got to be one of the most representative Muslim communities anywhere in the world," quips Luis Lugo, director of the Pew Forum on Religion & Public Life, who oversaw the project with Kohut.

  Nearly two-thirds (65 percent) of adult Muslims in the U.S. were born elsewhere. A relatively large proportion of Muslim immigrants are from Arab countries, but many also come from Pakistan and other South Asian countries.

EUROPE'S MUSLIMS: A

Assimilation isn't the norm for Muslims in other Western countries. While more than half of American Muslims think of themselves as Americans first, the picture is quite different in most of Europe, where Muslims tend to identify themselves primarily as Muslim rather than as British, Spanish or German, for example. The exception is France, where Muslims are split almost evenly on this question. In fact, the level of Muslim identification in Britain, Spain and Germany is similar to that in Pakistan, Nigeria and Jordan, and even higher than levels in Egypt, Turkey and Indonesia.

Those are some findings of the Pew Research Center's Global Attitudes survey last year. The study, conducted in 13 countries, did find that Muslims in Europe were generally positive about conditions in their host nation, and substantial majorities in all four countries favored a moderate version of Islam. However, European Muslims expressed more

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DIFFERENT PICTURE

reservations about blending in than their U.S. counterparts. Asked whether Muslims coming into their country today wanted to assimilate, only 30 percent of German Muslims said they wanted to adopt national customs; it was 41 percent in Britain, 53 percent in Spain and 78 percent in France. Most Muslims surveyed felt that Islamic identity among Muslims in those countries was growing.

The belief that terrorism is justifiable in the defense of Islam had a sizable number of adherents among Europe's Muslim minorities. Roughly one in seven in France, Spain and Great Britain (but one in 15 in Germany) felt that suicide bombings against civilian targets could at least sometimes be justified to defend Islam against its enemies. But while the numbers for American Muslims are far lower, in one significant respect they agree: Fewer than half of the Muslims in Europe and the U.S. said they believed that Arabs carried out the 9/11 attacks.

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Above: Daily life in Clifton, N.J., and *(below)* at the school lockers in Sycamore High School, near Cincinnati, Ohio.

Among native-born Muslims, roughly two-thirds are African American (20 percent of U.S. Muslims overall), and most are converts to Islam.

- Muslim Americans reject Islamic extremism by larger margins than do Muslim minorities in Western European countries. For example, just one in 20 people surveyed express a favorable view of al Qaeda.

However, some segments of the U.S. Muslim public—notably native-born African-American Muslims—are less likely to completely condemn al Qaeda or radical Islam. In addition, 15 percent of Muslims under the age of 30 say that suicide bombing could be justified "often" or "sometimes"—compared to 6 percent among Muslims over 30 years of age.

- A majority of Muslim Americans (53 percent) say it has become more difficult to be a Muslim in the U.S. since the Sept. 11 terrorist attacks. Most also believe that the government "singles out" Muslims for increased surveillance and monitoring.
- Relatively few Muslim Americans believe the U.S.-led war on terror is a sincere effort to reduce terrorism, and many doubt that Arabs were responsible for the 9/11 attacks. Even though Osama bin Laden proclaimed responsibility for the 9/11 attacks, only 40 percent of Muslim Americans say groups of Arabs carried out those attacks.

One area that came in for considerable attention was the extent of religious identity. Of those surveyed, 47 percent thought of themselves as "Muslim first" rather than American first. In this respect, as in many others, noted Lugo, Muslim Americans closely resembled other Americans. (A Pew Global Attitudes survey in 2006 found that 42 percent of Christians—and 62

percent of white evangelical Protestants—identified primarily as Christians rather than as Americans.) Muslim Americans' religion "is very important in their lives," Lugo notes. "Second, like most religious Americans, Muslim Americans do not see a conflict between being a devout Muslim and living in a modern society like the United States."

Another similarity, he adds, is the considerable internal differences within the Muslim American community—Sunnis, Shias—much like the many kinds of Christians, as well as different levels of religious commitment. Pakistanis are among the most devout, Iranians the least.

"The notion of Islam being a monolithic religion that by default supports extremism is not substantiated by what we've found here," says senior project director Amaney Jamal. "This is a very important and impressive finding."

A solid majority (61 per cent) of American Muslims say they believe it is possible to both guarantee Israel's right to exist and to guarantee the rights of Palestinians. That number, in sharp contrast to the view of Muslims elsewhere, is comparable to the view of U.S. non-Muslims (67 percent). However, while Muslim Americans agree with other Americans in disapproving of the war in Iraq, they also disapprove of the war in Afghanistan, which is not true of the general public.

The data on African-American Muslims and youth attracted particular attention. The poll found that only 36 percent of African-American Muslims have a highly unfavorable view of al Qaeda, compared to more than 60 percent of American Muslims overall. "They are clearly the most disillusioned segment of the Muslim American population," says Kohut. "They're far less satisfied with the way things are going in the country. They have lower incomes, lower education levels. They're much more skepti-

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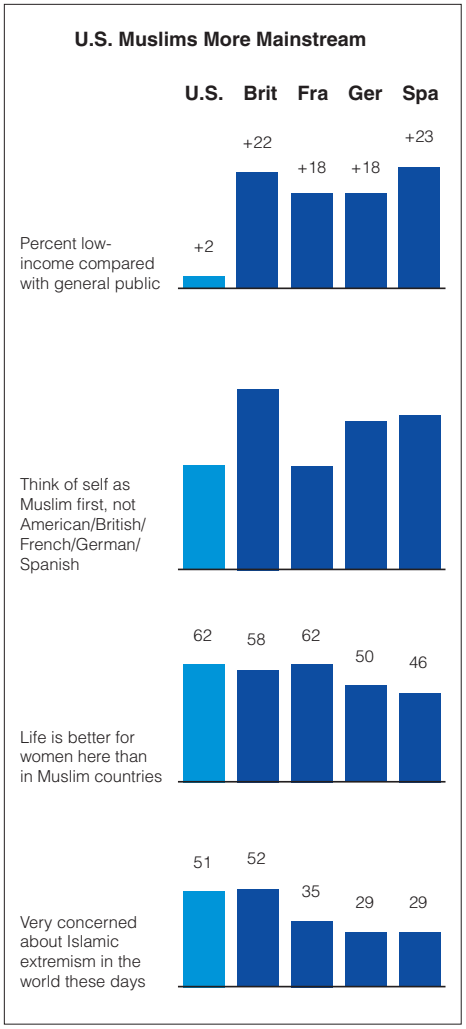
Shopping at Safeway in Washington, D.C.

John Lee/Chicago Tribune

In Chicago, students at a picnic sponsored by Loyola University's Muslim Student Association.



cal that hard work in this country really pays off."

On the other hand, African Americans are no more likely to favor suicide bombing than the general Muslim American population. Instead, it is younger Muslim Americans who are more likely to say that it can be justified. One reason, Kohut theorizes, is that it is simply a "youth phenomenon"—that is, that young people tend to be more inclined to violence than their elders.

A compounding factor, Jamal suggests, could be that younger people are subjected more to the stereotypes and name-calling that had followed 9/11.

And Farid Senzai, a project advisor who is director of the Institute for Social Policy and Understanding, notes that the data do not indicate that Muslim American youth are contemplating suicide bombing themselves. "They've been able to justify it as a last resort since they feel there is no other solution" against greater military occupying forces, he says.

The small size of the Muslim American population—approximately 0.6 percent of all Americans—and the difficulty of reaching this population presented unusual challenges to center researchers. For example, standard telephone survey approaches, such as random dialing, would have been prohibitively expensive. Accordingly, staff did considerable spadework before developing the questionnaire.

The project created a panel of eight leading experts on Muslim Americans to provide advice on the project. It was headed by Jamal, who is an assistant professor of politics at Princeton University specializing in the study of Muslim public opinion, both in the U.S. and abroad, and is herself a Muslim of Palestinian descent.

Two members of the advisory panel conducted six focus groups of Muslim Americans in four U.S. cities to explore topics and potential reactions to questions for the survey. These groups included Arab Americans in the Detroit area, African-American Muslims in Atlanta, a mixed group of Muslim Americans in Washington, D.C., and Iranian Americans in the Los Angeles area. The groups provided insights into terminology, nuances of language and issues, and strategies to help reach Muslims who might be reluctant to identify their religion.

The survey received wide media coverage, with some ambivalence about which findings to emphasize: Should they stress that most American Muslims reject extremism? Or that, in the under-30 group, only 69 percent said that suicide bombing could "never" be justified to defend Islam? Some newspapers switched back and forth between the two versions in a 24-hour period. "Poll: A quarter of younger Muslim Americans support suicide bombings in some circumstances," was an item on a *USA Today* blog on the day the study was released. But the next day the newspaper led with this headline: "American Muslims reject extremes."

The survey also attracted attention on Capitol Hill. Senator John D. Rockefeller IV referred to it during a Senate committee hearing on terrorist ideology; and Lugo, Senzai and Scott Keeter, the center's director of survey research, discussed results and implications before a bipartisan study group for Congress that examines the post-Cold War and post-9/11 security environment. Kohut was invited to brief senior officials in the Department of Homeland Security.

In part, the intense interest in the survey reflected the general dearth of information about Muslim Americans. "This is a population we've been only able to speculate about or base our understanding on limited surveys," says Jamal. "This is a groundbreaking project in all its aspects.

"What emerges from the study is the great success of the Muslim American population in terms of its socioeconomic assimilation and integration," she concludes. "In many respects, the population mirrors that of the mainstream American population. Given the fact that, for the past six years, Muslim Americans have been dealing with the backlash of 9/11, these numbers are extremely, extremely impressive." T

For the full report on Muslim Americans, plus FAQs, go to http://people-press.org/reports.

Sandra Salmans is senior writer of Trust.

EXTINCTION WAITI

By Callum Roberts

A PEW MARINE CONSERVATION FELLOW DOCUMENTS HUMANKIND'S TRAGIC HANDLING OF THE WORLD'S OCEANS. HE ALSO HAS A REMEDY.

Today's oceans are less diverse, bountiful, productive and beautiful than those of a century ago. The differences are chronicled in Callum Roberts's The Unnatural History of the Sea, *published in July by Island Press. Yet, despite massive evidence of human devastation of a world resource, this Pew fellow remains optimistic about the potential for the seas to recover.*

THE TIDE TURNS, FAVORING HIGH-SEAS FISHING—TUNA AS AN EXAMPLE

In the early 20th century, interest grew in fishing for high-seas fish where large animals like tuna and swordfish dipped into coastal waters. The largest species were initially targets mainly for recreational fishers, the meat being considered inferior to other species readily available.

One of the world's most valuable fish today is the Atlantic bluefin tuna. In the western Atlantic, spring sees these fish migrate north from winter spawning grounds in the Gulf of Mexico to their summer feeding grounds off the Gulf of Maine and Nova Scotia. They ride the warm Gulf Stream to where this current collides with the southward-flowing cold, nutrient-rich waters of the Labrador Current. Where southern and northern seas coalesce, their vernal union begets copious plankton growth, greening the waters and filling them with fish.

Tuna epitomize what it is to be a fish. Their sleek muscle-bound bodies cut through water with effortless mastery, driven by high crescent tails beating side to side in rapid staccato. Pectoral fins shaped like hydroplanes flick and twist on the unseen marine breeze, lending remarkable agility to such stiff-bodied creatures.

Bluefin tuna are the giants of the tuna tribe. I once spent a week at White Point Lodge on the south shore of Nova Scotia. Surveying the lounge from above a roaring log fire was a magnificent moosehead whose antlers seemed to span the room. According to an inscription, when this giant commanded the woods of Nova Scotia, it weighed in at over 1,000 pounds.

Below the head were faded photographs of big-game fishers of the 1930s and 1940s. Giant bluefin suspended from dockside gantries dwarfed exhausted, grinning anglers. These fish weighed up to 1,500 pounds and reached 13 to 14 feet, humbling the mighty moose.

Prime bluefin tuna fetch over $100,000 per fish at auction and realize double the price in restaurants. Almost all bluefin today are flash frozen and flown to Japan for immediate sale at Tsukiji, the great Tokyo fish market. In the dark of early dawn, buyers pick their way among bodies that lie in stiff rows, inspecting each fish for color and fat content. Fat fish are the most valuable, and buyers judge the best by rubbing a piece of meat between finger and thumb. Only a day before, these fish may have felt the rush of the cool Atlantic on their flanks as they rode the billows of the Gulf Stream, springing shoals of herring from the water with lethal dashes.

In the 1920s and 1930s, when the anglers of White Point Resort were charming bluefin tuna from Nova Scotia seas, the fish could be sold only for pet food. However, development of canning technology and the discovery that tinned tuna preserves wonderfully well created a product for which there was a ready market.

NG TO HAPPEN

Courtesy of Ed Pritchard-AntiqueFishingReels.com

Zane Grey eyes his bluefin, a world-record catch at the time (1924, in Nova Scotia).

During a *mattanza*, or "massacre," a net (in the waters behind the illustrated net) snares bluefin tuna off the Sicilian coast. Bluefin is on the verge of collapse in the Mediterranean Sea.

Jeffrey L. Rotman/CORBIS

Callum Roberts spent his teenage years in Wick, Scotland, and he chronicles the disappearance of the ocean bounty by the fishing vessels in the town's harbor over time.

Tuna fisheries developed first off the west coast of North America, targeting the large, white-fleshed albacore. Soon after, commercial fishers began to try their gear on east coast bluefin. One famous big-game angler of the day, Kip Farrington, lamented in 1942:

> Easterners also like to harpoon giant tuna, even though they are harder to strike than swordfish. I hold no brief for this so-called sport; and, as these grand fish bring but three or four cents a pound, there is even less reason for harpooning them than there is in sticking swordfish.

The distinctions between the sport fish and commercial fish of Farrington's world were at that time being turned upside down. The giant fish, top predators of the sea, were now prey for a growing cadre of commercial fishers. By the early 1940s, Americans had developed a taste for big fish. New Englanders then landed about 3 million pounds of swordfish a year, but a further 4 million pounds were imported from Canada and Japan.

Up to the Second World War, it was still too expensive to pursue these species far offshore. Like bluefin tuna, swordfish are seasonal visitors to New England waters, arriving to work the glittering seam of fish that separates Gulf Stream from Labrador Current. They could be caught close to shore, within sight of Long Island, Cape Cod and Nova Scotia. But the entire face of high-seas fishing changed after the end of hostilities.

Both Japan and the Soviet Union were desperate for food and possessed large fleets of ships in need of peacetime occupation. For Japan, fishing was already a way of life. In the 1930s, Japan became the world's largest fishing nation, with twice the landings of the United States, for example. The Japanese fished for crab in the Bering Sea, for whales in Antarctica and for croakers and bream in the South China and Yellow seas. Japan's sizeable distant-water fishing fleet had been pressed into war service and now was released to begin fishing anew.

For the first few years postwar, Japanese fisheries concentrated on waters close to the islands, stocks benefiting from the respite in fishing caused by the war, just as did fish stocks in Europe. Fishing technology advanced rapidly, including onboard freezers that gave fishing boats greater reach, and larger nets that enabled them to fish more economically. The era of high-seas fishing had begun.

LET NONE DARE CALL IT "FISHING"

Target species like tuna are not the only animals affected by high-seas fishing operations. Although drift nets, some reaching 56 miles long and dubbed "walls of death" for their indiscriminate massacre, were banned by the United Nations in 1992, the giant longlines that have largely replaced them also exact colossal mortality on non-target species: Loggerhead, leatherback and olive ridley turtles are being slaughtered in the thousands, as were albatross of all varieties until

new methods for setting lines were adopted to keep the bait away from hungry birds.

For the leatherback turtle in the Pacific, extinction may be a few breaths away. The leatherback is the largest living reptile, reaching over 1,540 pounds and over 8 feet in length. These harmless jellyfish feeders do not take hooks, but instead blunder into longlines where they get tangled and drown. Numbers of leatherbacks returning to Pacific beaches to nest—the best means we have of estimating their populations—fell from over 90,000 to less than 5,000 between 1980 and the present. Some rookeries have been lost altogether.

Boris Worm, the late Ransom Myers and colleagues used longline catch data to look at the effects of fishing on the open sea in another way. They calculated the number of different types of fish from the tuna and swordfish families caught per 50 hooks and mapped patterns across the global oceans. The study revealed rich and predictable congregations of life where ocean predators gather, with a dearth of species in others.

Areas of exceptional diversity represent oceanic crossroads and productivity hotspots such as places where warm- and cold-water currents meet. They include the mid-Atlantic east of Florida where the Gulf Stream leaves the Caribbean on its journey north; northeastern Australia in the Coral Sea; the central eastern Pacific; and the seas bordering Japan's Kuroshio Current.

These congregations have also drawn the attention of the world's fishing industry, to the detriment of the animals that live in them. Worryingly, depending on the area considered, there were declines of between 10 and 50 percent in species diversity between the 1950s and the 1990s.

Fishing is impoverishing the global oceans. After the study was published in 2005, Worm described his feelings on making this discovery:

> Finding these oceanic oases was like solving a giant puzzle and seeing the night sky in constellations for the first time—even as the stars are blinking out. It's beautiful and tragic at the same time. . . . Everywhere you go, in every ocean basin, our "hotspots" today are only relics of what was once there.

Fishing is transforming the high seas. Giant predatory fish are today following the fate of the great whales, disappearing place by place, species by species. Bycatch is killing other titans of the waves: the leatherback turtle, dolphins, porpoises, whale sharks, albatross . . . the list is long.

The leatherback has a 100-million-year evolutionary history. Today we are on the point of ending it all for the leatherback because of our unbridled desire for tuna, swordfish and marlin.

Some effects of fishing are unexpected. Tuna hunt by driving schools of their prey fish toward the surface where there is no escape. Seabirds home in on these fish boils to take advantage of easy prey pressed into the shallows from below. With the decline of tuna, prey-fish boils have become sparse, and birds find it harder

to catch prey. Some species now subsist on offal discarded from fishing boats while others go hungry.

Yet other species have benefited from gaps opening in food webs as competitors are removed, but overall the trends, like those in coastal seas, are of loss. We can only guess where this will end if high-seas fisheries continue unfettered.

When nations of the world declared 200-nautical-mile Exclusive Economic Zones through the 1970s and 1980s, a third of the ocean was brought under national control for the first time. In these waters, the cherished principle of freedom of the seas was restrained as countries sought to limit access to their fisheries and other resources like oil and gas.

In waters beyond, freedom of the seas prevails almost unchanged since the 17th century. High-seas waters are governed today by international fishing agreements operated under the United Nations Law of the Sea by regional fishery management organizations. These bodies supposedly control catches from the high seas and are responsible for conserving fish stocks. Most, like the International Commission for the Conservation of Atlantic Tuna, are ineffective.

And, just as in the 16th and 17th centuries, there are still pirates at large on the high seas. Pirate fishing vessels—working beyond law and regulation—are estimated to account for up to half of the global catch from the high seas, drawn by the large profits that can still be made. They sail under flags of convenience bought from nations that have not signed up to conventions whose aim is to protect the high seas.

They land their catches in clandestine operations at least as lucrative as international drug smuggling, often with the tacit blessing of national authorities who care little for what goes on beyond their national limits. Until they are brought under control, there is little hope for rational fishery management on the high seas.

If Kip Farrington were alive today, how he would rue the loss of his beloved game fish. The waters of New England and eastern Canada no longer throng with giant bluefin and swordfish.

It is hard to know just exactly how scarce bluefin are today compared with the interwar heyday of game fishing. Since records began to be kept in the 1970s by the misnamed International Commission for the Conservation of Atlantic Tuna, bluefin have declined by over 90 percent.

But this was not the beginning of their decline. The fishery commenced over 40 years earlier. Using Ransom Myers and Boris Worm's estimate of 80 percent decline in stocks in the first 15 years of the fishery as a conservative lower bound for pre-1970 decline, there is probably only one bluefin left for every 50 present in 1940.

The last of these regal fish are today pursued more relentlessly than ever by the descendents of the harpooners that Farrington railed against. The fish are now so valuable that it pays to employ planes and helicopters to scan the ocean, guiding boats in for the kill when fish are spotted. This isn't fishing any more—it is the extermination of a species.

PICKING THE TABLE CLEAN

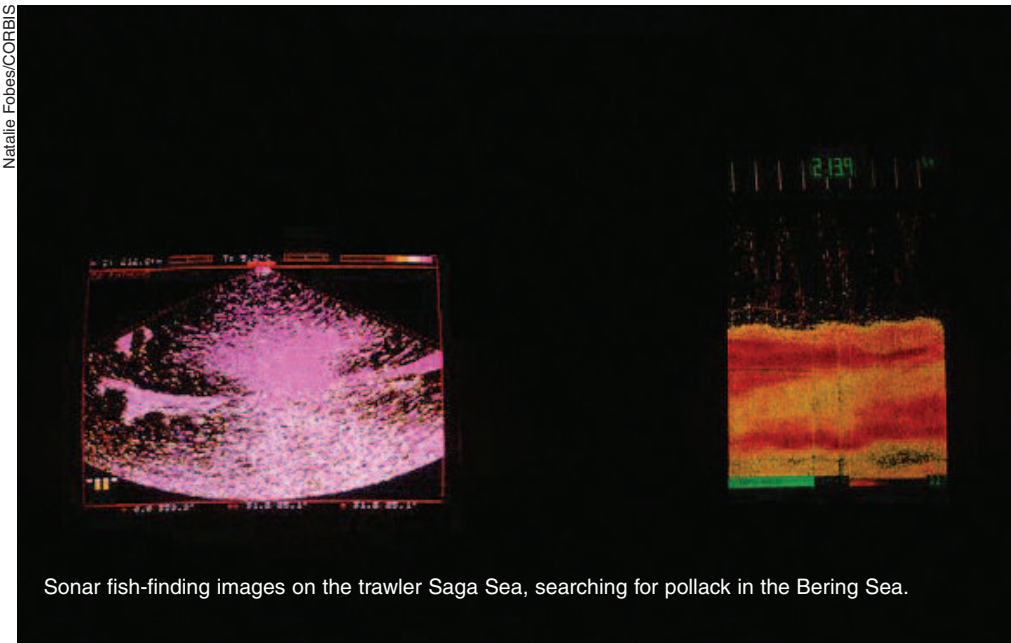
Somewhere off the West African coast, in a sea that is empty from horizon to horizon, a floating log bobs up and down with the passing waves. From above, it is the only object in an endless spread of water, adrift and isolated. From beneath, it is landmark and focus in the lives of countless fish and other animals.

Shoals of tiny baitfish hang beneath the log, darting back and forth in nervous shimmering masses as it shifts with the waves. Jellyfish pulse in the gentle current, trailing curtains of tentacles among which juvenile fish shelter, looking like silver baubles. A school of skipjack tuna circles languidly in the water around the log, while shadowy forms of blue sharks lurk in the distance. A loggerhead turtle breaks the surface nearby to breathe and with ancient dewy eyes surveys the log for a moment.

Unknown to the turtle, the log carries a satellite beacon that will guide a purse-seine boat to this spot a few days later.

Nobody knows exactly why fish gather around floating objects in the open sea. It cannot be because the objects provide protection for the schools of baitfish that gather around them, for how much protection can a

Natalie Fobes/CORBIS



Sonar fish-finding images on the trawler Saga Sea, searching for pollack in the Bering Sea.

log or a mat of floating vegetation provide? Perhaps it is simply because they provide some reference point, however slight, in this boundless, seemingly featureless liquid world. Purse-seine boats have long sought out floating logs and other objects around which to set their nets, knowing that catches will be good.

It would not be long before somebody thought of putting their own logs into the sea, but how would they find them again in the trackless waters of the high seas? Far-sighted fishery scientists of the 1960s, whose imaginations concocted the idea of using submerged nuclear reactors to create upwellings, thought of a way. In 1964, just seven years after the first artificial satellite, *Sputnik I*, was launched, they suggested attaching satellite-positioning beacons to logs that would float for a week or two, concentrating fish before the purse-seiners returned for the bounty.

In today's electronic age, the technology they imagined is reality. Purse-seine boats now seed the ocean with veritable forests of floating decoy logs and other fish-aggregating devices to bring together scattered shoals of fish. When they return, they scoop up the fish with ruthless efficiency, taking with them turtles, sharks and dolphins—whatever happens to be there.

For some reason, logs preferentially attract juvenile tuna, so their take even of the target species is wasteful. By catching young tuna before they reach adulthood, purse-seiners forgo much higher catches for themselves later, and they are also denying these tuna the chance to reproduce, putting future catches at risk. Where once the vast canvas of the sea was great enough for fish to lose themselves in, escaping capture, today even the high seas afford little refuge. New technology has given old fishing methods a far more lethal edge.

The fishing industry has been lent a hand in the search for fish from some surprising quarters. Sonar depth sensors and fish finders were first introduced in the 1930s but were much improved during the Second World War. They work by beaming pulses of sound into the water below the boat and recording the echoes from the seabed and any shoals of fish in between.

Sonar was further developed during the Cold War when submarines skulked in foreign waters. The fishing industry gained an unexpected dividend when East-West relations improved and military technologies were declassified. Apart from enhanced fish-detection capability, sonar is now used to create visual images of the structure of the bottom. Modern multibeam side-scan sonar equipment can map the seafloor in exquisite detail. In just a few weeks, a ship fitted out with this equipment can map hundreds of square kilometers of the bottom, revealing every crease, wrinkle and boulder.

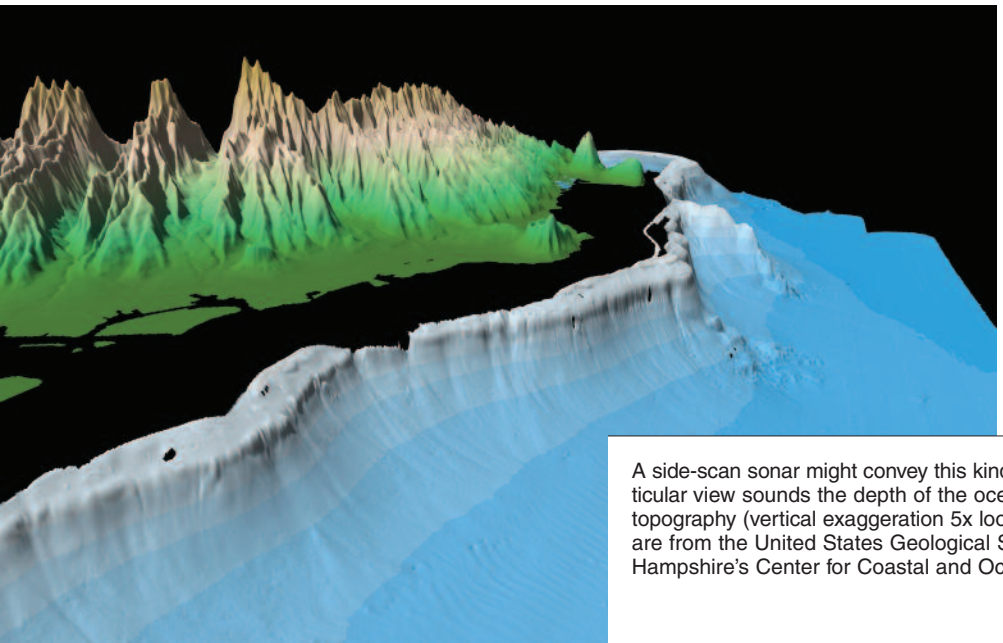
Geologists have adopted the technology with great enthusiasm, embarking on a mapping spree not seen since the 19th and early-20th centuries when cartographers systematically mapped the contours of land. In the United States, for example, the U.S. Geological Survey is publishing maps that give fishers a new look at familiar terrain, allowing them to pick out previously unsuspected seamounts and canyons.

Coupled with high-precision global positioning systems, another part of the peace dividend from the end of the Cold War, fishers can now land hooks or drag nets through places that were much too risky to fish in the past, penetrating deep into the ocean's last refuges from fishing. Where previously nets were almost invariably lost, catches can be taken in relative safety.

The large catches yielded from these former *de facto* fishing refuges make it worth the residual risk. A Gulf of Maine fisherman describes the benefits new technology brought him:

> This stuff has turned the ocean into a glass table. The stuff's so good you can find [some pinnacle], which would be completely surrounded by cod—cod just about clinging to it—and which before you would have steered clear of for fear you'd lose your net, and you can fish it so closely, going around and around, that you can pick virtually every last fish off the thing.

Not surprisingly, the fishing industry is impatient, wanting seabed maps faster than government agencies can



A side-scan sonar might convey this kind of underwater view to a fishing captain. This particular view sounds the depth of the ocean south of Oahu, Hawaii, as well as the island's topography (vertical exaggeration 5x looking northeast). Bathymetry data and topography are from the United States Geological Survey, image generated by the University of New Hampshire's Center for Coastal and Ocean Mapping/Joint Hydrographic Center.

Dr. Manfred Krautter, Universitaet Hannover, Germany

The impact of trawling: untrawled and trawled sections of sponge reefs in Hecate Strait, British Columbia.

produce them. Private companies are weighing in, selling the secrets of the seabed for profit. For a price, they will map the seabed wherever a captain desires.

Most fishing vessels carry their own bottom-imaging devices these days, albeit less sophisticated ones than advanced side-scan sonar. The bridge of a modern fishing vessel more closely resembles the cockpit of a jumbo jet than that of a boat.

Sonar systems onboard show the shape and texture of the seabed in real time, allowing fishers to choose the best fishing sites and avoid obstructions. New computer software allows captains to "fly" trawl nets, with net-based sensors beaming up data on the spread of the net, its fullness and what lies ahead of it. Some nets are equipped with powered units to adjust gape and trim. Skilled captains can steer their nets toward shoals of fish they can "see" as if they were riding on the net itself.

THE "FLYING DUTCHMAN" AS A FISHING NET

It isn't just the relentless intensity of fishing today that is harming the oceans, it is the destructive and wasteful way in which we fish. In landing 80 million tons or so of wild fish a year, fishers throw away another 16 to 40 million tons.

The uncertainty over the exact amount discarded is because few countries consider it important enough to warrant the expense of collecting accurate figures. The best guess that scientists have come up with is that a quarter to a third of all animals caught are simply tossed back into the sea, most of them dead or dying.

If statistics on discards are hard to find, estimates of how much is killed below water but never brought on deck are even more difficult to come by. Videos of bottom trawls in action, and study of the seabed after the passage of trawls, show that many animals that escape capture are injured or killed.

Ghost fishing by lost gear can also be severe. Michael Dwyer joined a hellish deep-sea gill-netting trip to northern Labrador in 1998. He wrote of his experience in *Sea of Heartbreak*, the most chilling account of destructive fishing I have ever read. His descriptions both reveal the indiscriminate waste of fish killed as bycatch and highlight just how much fishing gear is lost to continue killing fish unseen at the bottom of the sea:

> The past four days and nights offshore had not been profitable. We had spent endless marrow-freezing hours on the lurching bridge searching for buoys in the foulest of conditions—and yet more hours toiling to pull gear that yielded little number one turbot but seemed full to bursting with other sea creatures, including a dozen ground sharks and what appeared to me to be squadrons of manta rays.
>
> To add salt to the wounds, one fleet [of nets] had broken free after we had battled back 20 nets. We lost 50 nets, and we spent the rest of the day in a futile attempt to find the southern end.
>
> Another fleet parted on the very next haul. Wayne knew the webbing was snagged on the bottom. The wheel spun around another ragged end, and suddenly 50 nets were gone.

The fishing gear is designed, made and set in a deadly efficient way. Set like a fence across the bottom, the webbing eventually fills with sea creatures and "lies down." Crabs, the scrubbing action from contact with the seafloor and time serve eventually to consume and break down the sea creatures. When this happens, the nets rise up again and fish indiscriminately. They fill up and lie down, over and over, forever. Stories have been told of draggers finding old, lost gear, and the nets are filled with skeletons of every kind. As horrible as it is, it's legal—and it's a common form of commercial fishing.

Dwyer describes the horror of pulling in a net that had been left out too long:

> I tried not to let the smell of rotting fish and sea sponges make me too sick. Often the floodgates clogged with the dead. The picking table piled high with tangled webbing. Production was at a snail's pace. We had rock crabs by the hundreds, chimaera [also called rabbit fishes] by the score.
>
> Parts of the rocky bottom came round the wheel with the nets—hard coral fragments in all their

Swim Ink 2, LLC/CORBIS

colors, shades, shapes and sizes. Every piece had to be picked out because even a small fragment could tangle up three or four nets as they were being set. It was a sea of heartbreak.

At the end of the trip, the fishers simply threw all their used gillnets into the sea. While this practice was illegal, it was unwittingly encouraged by Canadian government subsidies that gave fishers nets almost for free.

A recent study of deep-sea fishing in the North Atlantic for sharks and monkfish suggests that some 3,600 to 5,400 miles of gillnet are in constant contact with the bottom there. Over 780 miles of nets are lost or discarded every year—nets left to fish on and on, unknown and unattended.

AN IMMODEST PROPOSAL

We cannot return the oceans to some primordial condition absent of human influence. But it is in everyone's interest to recover some of the lost abundance of creatures in the sea. Fishers, seafood lovers, snorkelers and scuba divers are obviously high on the list of beneficiaries, but everybody has a stake in healthy oceans.

For generations, people have admired the denizens of the sea for their size, ferocity, strength or beauty. But we are slowly realizing that marine animals and plants are not merely embellishments to be wondered at. They are essential to the health of the oceans and the well-being of human society. Diverse and intact marine ecosystems are more productive, healthier and more resilient than degraded ones.

Overfishing is an important contributor to many of the adverse changes to oceans and coasts in recent times—dead zones, toxic algal blooms, flesh-eating microbes, beaches covered with slime and jellyfish explosions, to name a few. Today, we are paying the price for over a hundred years of negligence in ocean conservation. We need to restore the abundance of sea life and give marine ecosystems a chance to repair themselves if the planet is to remain healthy.

This book is not a requiem for the sea. We still have time to reinvent the way we manage fisheries and protect life in the oceans. I am optimistic for the future. The creation of national and international networks of marine protected areas, together with some simple reforms in the way we fish, could reverse this run of misfortune.

It will take concerted public pressure and political will to change attitudes that have become entrenched over hundreds of years. But if today's generations do not grasp this opportunity, tomorrow's may not get the chance because many species now in decline will have gone extinct. T

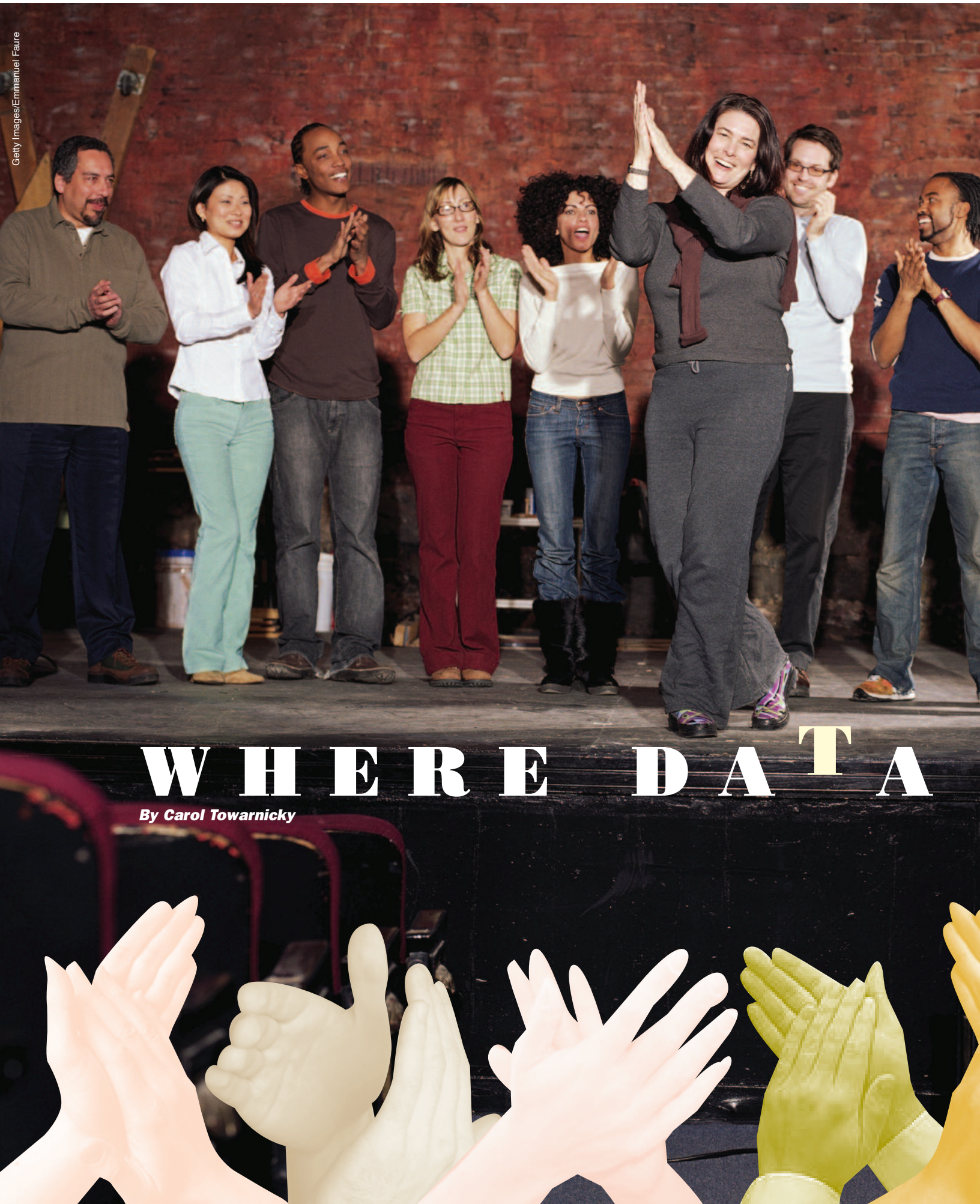
National Oceanic and Atmospheric Administration/Department of Commerce

The face of "bycatch," fish netted but not wanted. The fishermen were seeking shrimp off the Florida coast.

Pew's Environment Group works to preserve the biological integrity of marine ecosystems, focusing primarily on efforts to curb overfishing, reduce bycatch and prevent the destruction of marine habitat. For information on the group's initiatives in marine policy, conservation and science, visit www.pewtrusts.org and click on Protecting Ocean Life.

Callum Roberts is a marine conservation biologist at the University of York, England. He studies protected areas and has assessed the rapid recovery of fish and other animals after protection. His findings show the scale of human impact on ocean wildlife and the ability of protected species to recover.

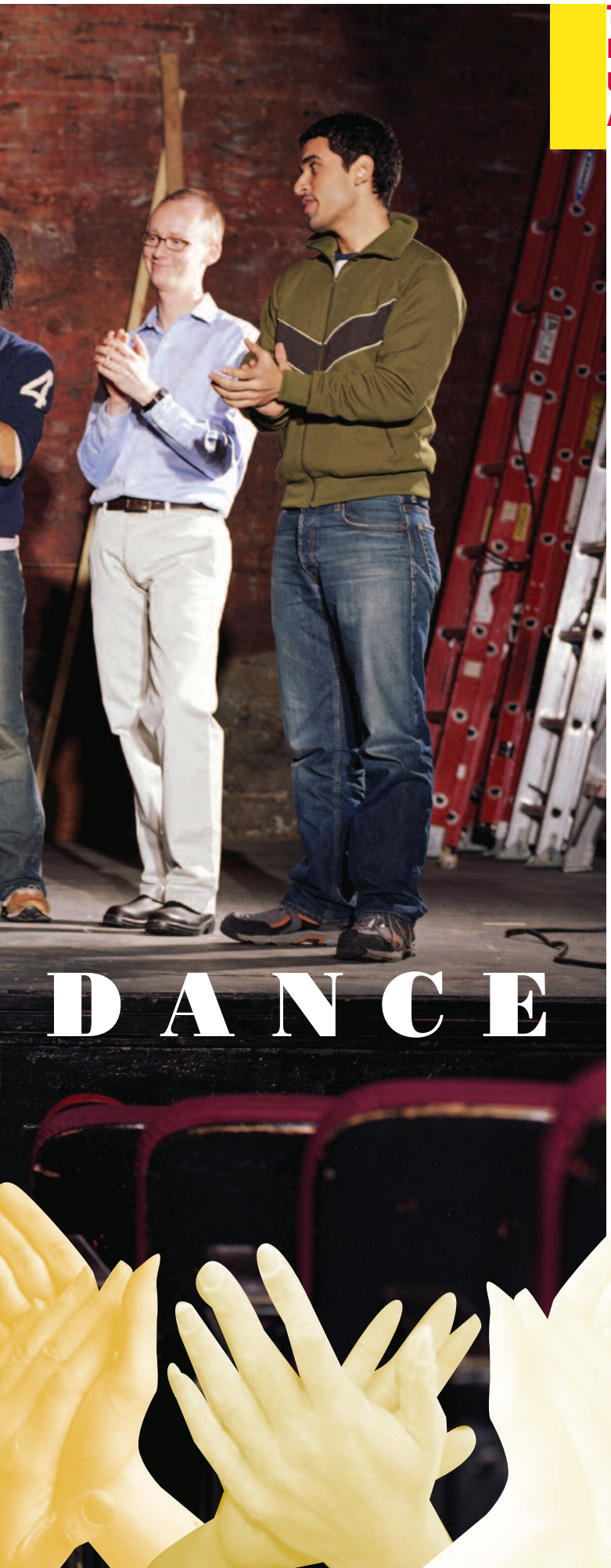
In 2000 he was awarded a Pew Fellowship in Marine Conservation to study the design of reserves. The award supported him in the early stages of writing the book excerpted here. For more on the fellowship program, visit www.pewoceanscience.org and then click on Pew Fellows.



Getty Images/Emmanuel Faure

WHERE DATA

By Carol Towarnicky



THE CULTURAL DATA PROJECT HELPS ARTS AND CULTURE GROUPS UNDERSTAND THEMSELVES AND THEIR SECTOR.

"I have no data yet," lamented Sherlock Holmes in the early short story "A Scandal in Bohemia." Then he generalized: "It is a capital mistake to theorise before one has data."

Information was always Holmes's best weapon as he applied his forensic talents in the interest of justice. And information remains the basis for sound decision-making in virtually any realm. Data—the facts themselves—inform our choices and influence our best decisions.

This fact is already a constant in the for-profit world, which runs on the relentless gathering, comparison and analysis of data to determine the success of a product, the response of the consumer and the percentage of business risk. Now, the nonprofit arts community has access to a comparable, knowledge-creating database, thanks to the potent combination of technology, innovation and guidance provided by the Cultural Data Project.

This initiative is a standardized online system that asks cultural organizations, big and small, to enter a wide range of data on topics that include revenue, employment, staffing, attendance and fundraising. In effect, it gives organizations a vast spreadsheet, helping them arrange figures that otherwise might amount only to a bewildering array of operational statistics.

The Project's Governing Group

The Cultural Data Project, administered by Pew, is a collaborative initiative of the Greater Philadelphia Cultural Alliance, the Greater Pittsburgh Arts Council, The Heinz Endowments, the Pennsylvania Council on the Arts, Pew, The Pittsburgh Foundation and the William Penn Foundation.

They can use this streamlined system to apply for grants to the funders that agree to accept this single form, thus simplifying the application process to already-lean office staffs. On a

larger scale, it provides an aggregate picture of the cultural sector's assets, impact and needs.

Here are just a few facts that the Greater Philadelphia arts and culture community knows now that it didn't know—couldn't know for sure—before the development of the Pennsylvania Cultural Data Project:

- Every day in the Philadelphia region, there are more than 150 cultural events. That's almost 56,000 a year.
- Cultural spaces in the region fill 8.7 million square feet, equal to Philadelphia's seven largest skyscrapers.
- The region's 218 nonprofit arts and cultural organizations whose data are entered into the project provide 14,000 full- and part-time jobs, second only to food manufacturing, plus 17,000 volunteer positions.

These data add up to an important, impressive dossier because they are accurate and trustworthy and, added together with many more facts and figures, give an unprecedented picture of Southeastern Pennsylvania's nonprofit arts and culture sector.

Business managers and policy makers expect this kind of scope and precision before committing resources. And cultural leaders have hungered for it—because they could assume that the arts are important both socially and economically but, up to now, had difficulty making a fact-based case for the culture scene as a whole.

Last year, the Greater Philadelphia Cultural Alliance released *Portfolio*, a report on the region's cultural resources based on the project's detailed financial and other organizational information; the study was the first of its kind in the nation.

Nancy Haragan, executive director of the Baltimore Cultural Alliance, saw it and recalls: "Really, once I understood what they had done, it was: 'How fast can we do what we need to do to get this here?' We wanted to be the first to adopt it."

Haragan got her wish. Public and private foundations raised the startup costs, and Maryland rolled out the Maryland Cultural Data Project in June. The California Cultural Data Project, ten times the size of Pennsylvania's with potentially 5,000 nonprofit cultural organizations, should be online in January. Several other states are also interested in the program, which has been and will continue to be administered by Pew in Philadelphia.

Like several other arts funders who saw a presentation of the project last fall, Paul Botts, director of the Chicago program of the Gaylord and Dorothy Donnelley Foundation, ran to the front of the room waving his business card. "It instantly felt to me like a hammer for about four different nails at once," he says.

It took years of planning for the Cultural Data Project to become a success. The initiative began in 2001, in part because some grant makers—Pew among them—realized that the application process had become complicated and time-consuming. Each funder wanted information in its own format, requiring organizations to fill out many different forms, each time adapting facts and figures to the specific model, a particular hardship on smaller organizations. Turnover often meant that the person who filled out the previous grant application was no longer around to do it again. There were a lot of wheels being reinvented to push up steep learning curves.

Arts and culture organizations rarely have financial experts on staff, so some information was of questionable reliability. The variety of requirements meant grant-making organizations didn't have an accurate, fair method for comparing applicants.

The limitations of the grant-applications process mirrored problems collecting complete, credible data about the industry: Researchers depended on surveys that in turn had to be filled out by the same overworked, overwhelmed people in the nonprofits. The surveys usually were completed by only a fraction of the organizations.

"You weren't getting apples to apples," says Peggy Amsterdam, president of the Greater Philadelphia Cultural Alliance. "Everybody was accounting for things in different ways. The people who were doing the surveying were frustrated. The arts groups were burned out."

After three years of planning, development and testing and another three years of training, consulting and data input, the application process is rational. It now is possible for hundreds of nonprofit arts and culture organizations in Pennsylvania to fill in organizational and financial information just once a year and, with the click of a computer mouse, use that data as part of their grant application to The Philadelphia Cultural Fund, The Pennsylvania Council on the Arts, The William Penn Foundation, The Heinz Endowments, the Pennsylvania Historical and Museum Commission, The

Pittsburgh Foundation, the Independence Foundation and Pew. The grantmakers get the information they want in the form they want it.

It doesn't end there, though. Individual nonprofit organizations are themselves reaping new benefits from the project, and the arts and culture sector has a powerful new tool to tell its own story..

For the first organizations in Southeastern Pennsylvania to participate, in September 2004, the Pennsylvania Cultural Data Project required, if not a leap of faith, at least the suspension of a few doubts. Much of the information requested is available in most organizations' audits and their IRS Form 990s, the annual tax returns filed by nonprofits, but filling out and checking the 11 sections of the project's form took time.

"We don't have a huge staff, and of course we were doing other work and trying to fit it in," says Julia Rubio, director of development for Astral Artistic Services, a Philadelphia nonprofit that offers customized services for emerging classical music artists. "It felt a little like it was going into an 'information abyss.' We were unsure how this whole project was going to unfold."

It all came together when Rubio saw the final product last spring. The questions she had answered about the money earned under such headings as Admissions, Ticket Sales, Tuitions, Workshops and Lecture Fees were returned as a credible snapshot of her organization, allowing her to track trends and compare Astral Services to other groups in Philadelphia and around the state, and then print out the information for a board member. "We were truly amazed by the level of sophistication and the user-friendly format," she says.

For example, a theater company can, in just a few clicks of the mouse, call up a Trend Report on how its marketing expenses stand as a percentage of total expenses and program revenue for three consecutive fiscal years. The information is provided in a table as well as in a colorful line graph.

With a few more clicks, the organization can compare its personnel expenses—like the number of full-time-equivalent employees, salaries, even shared health-care costs—to aggregate information from at least three other theaters with similar budgets, or to smaller ones, or to nonprofits in other artistic disciplines—in tables, pie charts and other forms.

Using one of the 77 distinct reports made possible by the project, mid-sized organizations can compare themselves to groups the same size and located around the corner or at the other end of the Pennsylvania Turnpike. A small museum can learn how its ticket prices match up to a museum three times its size. Dance organizations can look up how much outreach is done by community orchestras. To preserve privacy, the comparisons can be made only to aggregate data for at least three organizations.

The Cultural Data Project also allows an organization to institutionalize memory, providing a repository not only for statistics but also for notations from staff members, who can provide explanations and context to their successors in the organization, says Barbara Lippman, senior officer for Culture at Pew and director of the project.

"It can tell you everything except whether your product's any good or not," observes Thomas Schorgl, president and CEO of the Cleveland-based Community Partnership for Arts and Culture.

The project amounts to one data-gathering tool with a variety of uses—"like a hammer for about four different nails at once," as one enthusiast notes.

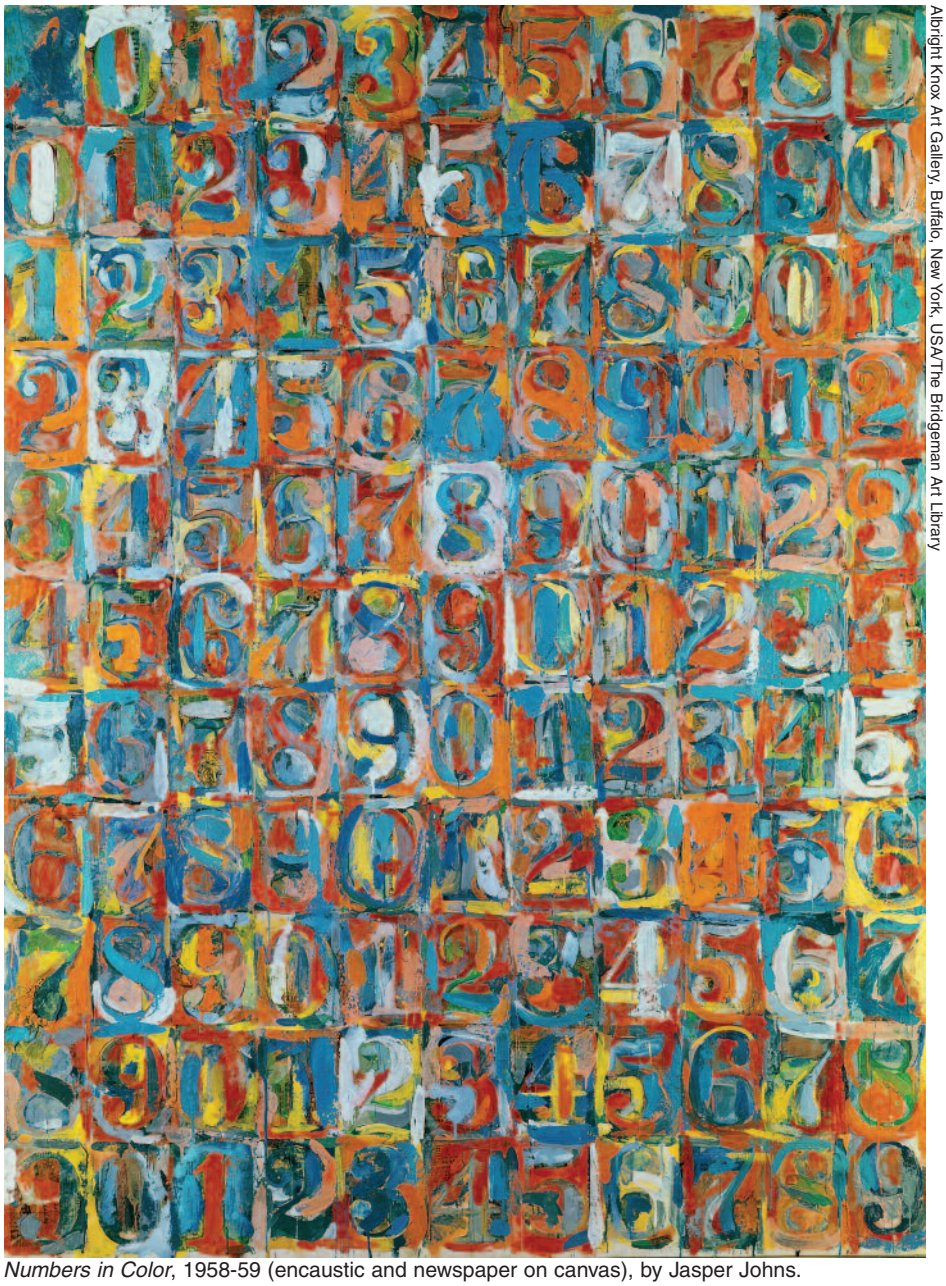
The standardized data collection can also help arts and culture organizations test the truths of conventional wisdom.

Paul Botts of the Donnelley Foundation was particularly interested in revenue line item No. 8 on the project's Data Profile-Food Sales/Concessions Revenue. As manager of a start-up theater organization, he once created a business plan that assumed the theater would make a significant profit from refreshments at intermission. Theater people and business professionals alike were sure of it, even though they were basing their optimism on anecdotes. Over several seasons, the expected revenue didn't materialize.

Only after Botts made a special trip to the Illinois attorney general's office to look at the annual reports of other theaters did he learn that the assumption was wrong: Concession revenue did not represent the kind of profit everyone had expected. It was a fact the project could have told him in seconds.

The Pennsylvania Cultural Data Project offers the same sophisticated information to the world-class Philadelphia Museum of Art as it provides the locally respected, though more modest, New Arts Program in Kutztown. The computer is the great equalizer. In addition, says Lippman, the project is designed to level the playing field for different generations of computer users with varying levels of technological comfort. If an Internet training program can be called "gentle," the Walk-Through available on the project's Pennsylvania and Maryland Web sites feels that way. It even gives wary users the express permission to print out the instructions.

The statistics compiled in any one state's Cultural Data Project yield information that is valuable because it is so specific to a state or region.



Albright Knox Art Gallery, Buffalo, New York, USA/The Bridgeman Art Library

Numbers in Color, 1958-59 (encaustic and newspaper on canvas), by Jasper Johns.

All data submitted by the organizations are checked for errors through a rigorous process conducted by the project staff, who search for inconsistencies and then notify the groups of any errors. The project supports its Internet and in-person training workshops with ready access to actual human beings. During business hours, it staffs a call-in Help Desk that can handle questions as simple as "What's my password?" to the more complicated "How do I translate my part-time staff members into full-time-equivalent employees?" For truly challenging questions, the project has an on-call financial consultant who can be patched into the phone conversation.

The Cultural Data Project represents a way to more fully harness the power of technology in the service of culture, but it also can serve as a check against distortions created by the Internet, including a new trend that at least one project participant considers disturbing: "charity evaluator" Web sites. Robert Neu, executive director of the Kelly-Strayhorn Theater in Pittsburgh, worries about the effect of such sites awarding "star" ratings based on criteria like organizational efficiency and program expenses, without regard to an organization's mission or history. Neu hopes that, by providing unfiltered, starless facts that have been checked for accuracy, the project will serve as an antidote to the syndrome.

The initiative also takes sharp, clear snapshots of the entire arts and culture sector. To page through *Portfolio* is to see "the next big thing" in that area: hard numbers to back up what previously had been a subjective assertion that the arts are a vital component of civic life.

Portfolio showed convincingly that the arts and culture sector in the Philadelphia region is big, that it is well-supported by the community, that it is fragile and, most important, that local government and businesses aren't doing enough to support it.

The study revealed that individuals in the region are generous, but their governments are not. The average contribution to an arts or culture organization from a (non-board) individual was $300. At the same time, city and county governments kicked in less than 3 cents on every dollar of arts and culture funding in the region. *Portfolio* helped make support of arts and culture an issue in Philadelphia's mayoral primary this year.

Business leaders in particular were impressed, says Amsterdam. "They said, 'Wow, we knew you ran on a slim margin but it's really slim.' The report gave us good points that people could relate to." Especially, perhaps, when they consider that corporations in Greater Philadelphia gave only 2 percent of the private contributions to arts and culture.

The impact of *Portfolio* in Greater Philadelphia impressed Nancy Haragan in Baltimore. "I hope to be able to be waving one of those reports around in a year," she says.

The Greater Philadelphia Cultural Alliance plans to produce a second *Portfolio* in 2008 and has used project data for an economic impact study this fall. Carnegie Mellon University and the Center for Arts Management and Technology used the project's data from Southwestern Pennsylvania institutions for a report on the financial and operational status of cultural nonprofits in that part of the state.

As cultural groups in other states enter their own data, the research ought to become exponentially more valuable. For example, when they come on board, other communities will be able to track the effects of expenditures for arts and culture that are particular to a single state or region.

For instance, was there a new tax that earmarked the arts? "I want to be able to say, 'Here's what was happening before they got the tax, and here's what happened after they got this infusion,'" says Amsterdam.

The Cultural Data Project should pay dividends in quality of life far beyond the initial investment of $3 million from its partners. The wider the participation spreads, the greater benefit it will return to all contributors. As Robert Neu of Pittsburgh's Kelly-Strayhorn Theater says, "We're hoping it becomes a bandwagon onto which everyone hops." T

The Cultural Data Project is housed at Pew in Philadelphia and can be found on the Web at www.pacdp.org.

Carol Towarnicky, former chief editorial writer at the Philadelphia Daily News, *is now a freelancer who often writes about nonprofit organizations.*

Participating Funders of the Cultural Data Project

Pennsylvania Cultural Data Project

Allegheny Regional Asset District
The Heinz Endowments
Independence Foundation
Pennsylvania Council on the Arts
Pennsylvania Historical and Museum Commission
The Pew Charitable Trusts
Philadelphia Cultural Fund
The Pittsburgh Foundation
William Penn Foundation

Maryland Cultural Data Project

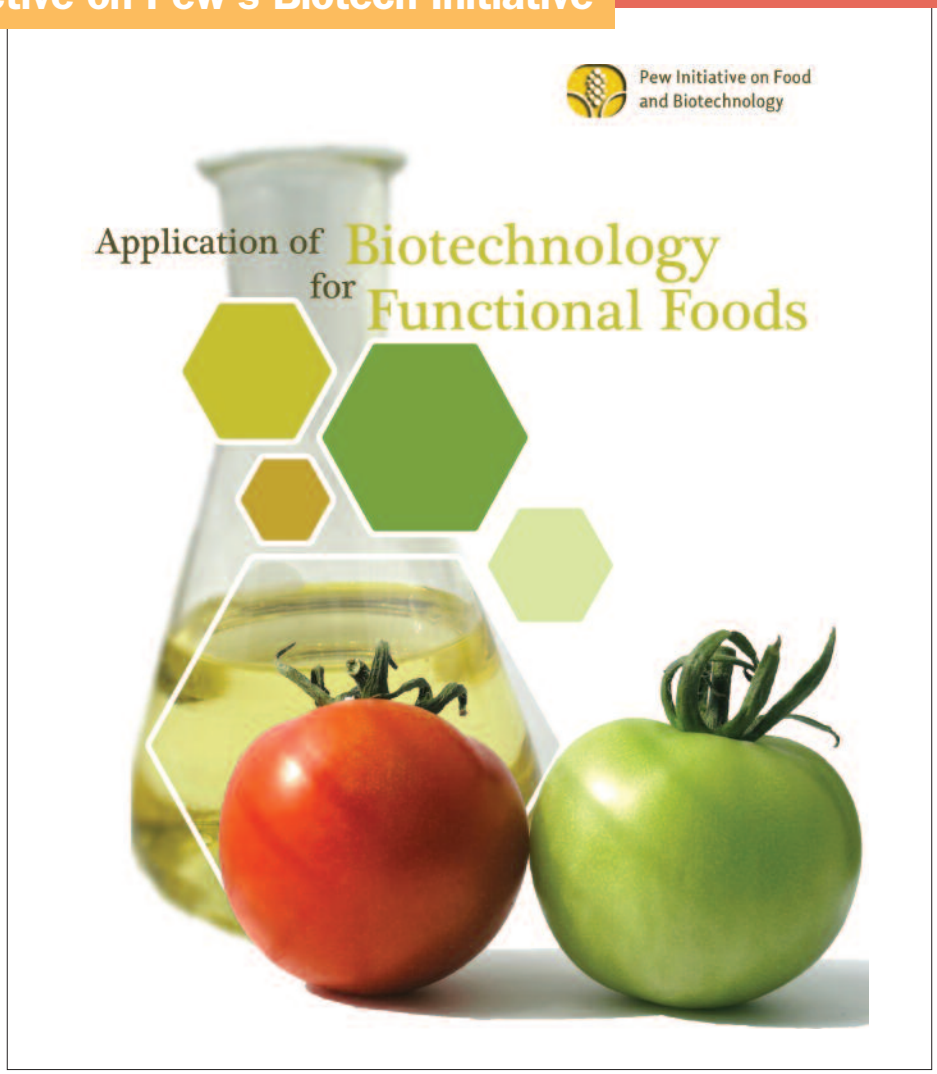
Alex. Brown & Sons Charitable Foundation
Baltimore Community Foundation
Cooper Family Fund at BCF
Greater Baltimore Cultural Alliance
Harry L. Gladding Foundation
Maryland Heritage Areas Authority
Maryland Historical Trust
Maryland State Arts Council
The Morris and Gwendolyn Cafritz Foundation
T. Rowe Price Associates Fund at BCF
William G. Baker, Jr. Memorial Fund

California Cultural Data Project
Committed and Anticipated Supporters

Alliance for California Traditional Arts
Arts Council for Long Beach
Arts Council Silicon Valley
California Arts Council
California Community Foundation
Culver City Cultural Affairs Division
David & Lucile Packard Foundation
Durfee Foundation
East Bay Community Foundation
Fleishhacker Foundation
The Getty Foundation
The James Irvine Foundation
Los Angeles County Arts Commission
Los Angeles Department of Cultural Affairs
Marin Community Foundation
Pasadena Cultural Affairs Division
Sacramento Metropolitan Arts Commission
San Diego Commission for Arts & Culture
San Diego Foundation
San Francisco Arts Commission
San Francisco Foundation
San Francisco Grants for the Arts
San Jose Office of Cultural Affairs
Santa Monica Cultural Affairs Division
The Wallace Alexander Gerbode Foundation
Walter & Elise Haas Fund
West Hollywood Arts and Cultural Affairs Commission
The William and Flora Hewlett Foundation

Food for Thought and

A Trade Journal's Perspective on Pew's Biotech Initiative



A month before the Pew Initiative on Food and Biotechnology concluded its work last March, Nature Biotechnology *published this editorial, "Hearts and Minds," in its February issue. Published with permission of the Nature Publishing Group. Copyright © 2007 Nature Publishing Group.*

The nonprofit Pew Initiative on Food and Biotechnology is closing, but the need for an independent and neutral body to facilitate dialogue on U.S. biotech policy has never been greater.

For the past six years, the Pew Initiative on Food and Biotechnology has provided a unique sounding board for stakeholders engaged in the contentious debate on policy oversight of agricultural biotech products in the United States. When it closes its doors next month, one of the main U.S. outlets for open discussion of the complex economic, legal, societal, regulatory and political issues surrounding these products will disappear.

The initiative has served a central role in curbing the excesses of debates about biotech and its products. Its closure will create a dangerous vacuum that will probably be filled by ludicrous hyperbole unless something more structured is put in place first.

The food and biotech project was created in 2001 by The Pew Charitable Trusts, through an initial grant of $11.9 million to the University of Richmond (later extended to $17.4 million). At the time, agbiotech was seemingly mired in controversy: Monsanto was widely portrayed as a corporate bully, railroading its products onto world markets opened up by the General Agreement on Tariffs and Trade. Starlink corn had just been discovered in the human food supply. Public antagonism to agbiotech products across the Atlantic was setting European legislators firmly on the path to confrontation with the United States.

Against this background, the initiative was established as an independent and objective source of credible information on agbiotech for the public, media and policy makers. It has produced over 20 reports, fact sheets and briefings that cover safety issues and the social, economic, political or ethical impacts of genetically manipulated flora and fauna—from transgenic trees to cloned cows.

One of its major contributions was a deep, critical analysis of the U.S. Coordinated Framework, which highlighted potential loopholes and gray areas for current and future products. This, together with a "Legislative Tracker" database collating available data for ongoing U.S. state-level legislative initiatives pertinent to biotech products, helped establish the project as the go-to resource for neutral and trustworthy information on agbiotech.

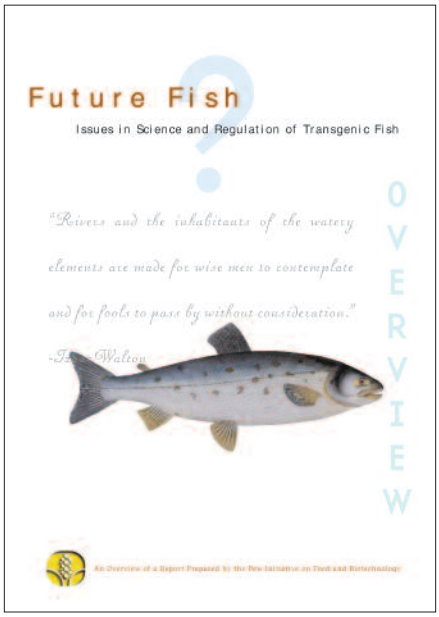
But it is the project's success in bringing together stakeholders with divergent opinions that is likely to be its most valuable but fragile legacy. This was achieved, despite initial reservations on the part of industry that it

Discussion

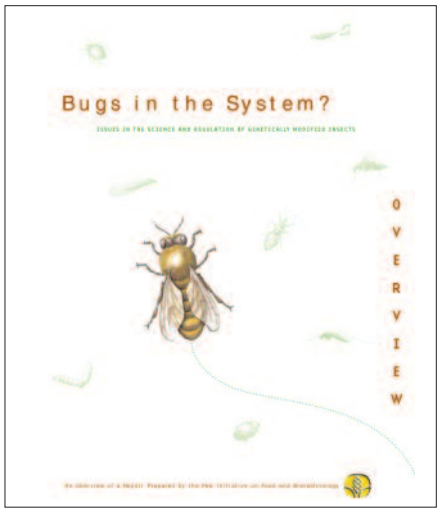
might be "ambushed" by opponents when participating on such panels.

One of the earliest and most ambitious initiatives, the Stakeholder Forum, assembled representatives from industry, academia, consumer and environmental groups to find consensus on recommendations to enhance U.S. regulatory oversight of agbiotech products. Although this effort ultimately foundered in May 2003 without achieving consensus, many participants felt the exercise provided a richer understanding of other stakeholders and helped build professional relationships for the future.

One criticism of the project is that too often it placed undue emphasis on the perceived risks of recombinant technology without providing sufficient context on the risks of other conventional approaches, creating an impression of controversy where none exists. What's more, to get people with divergent views to sit around the same table, the initiative provided all comers with equal time and weight in the policy discussion, regardless of whether their opinions were backed by scientific data; in some instances, detractors argued this gave certain viewpoints more credence and validation than they deserved.



But those who dogmatically dismiss a dialogue on biotech products because it strays outside science are fundamentally in error. The discussion has moved beyond inventions or discoveries or regulatory systems. It involves products. And biotech products, like the products of any other business, need markets—markets where the values expressed by consumers clearly trump scientific arguments every time.



One need look no further than what has happened in Europe in recent years. Although industry did an abysmal job of preparing the political and professional ground for the arrival of its products, the real benefits of the technology to agriculture and the environment were lost because consumer values were ignored. And when public acceptance and trust collapsed, serious support for the products evaporated. Food companies and politicians alike rely on branding, and neither can afford to sully their image through intervention in a values debate that doesn't appear to be winnable.

Now that the initiative's funding is coming to an end, the biotech industry must ask itself whether it needs a neutral and independent U.S. forum to continue a broad and inclusive policy debate for its next generation of products. We would argue it does. The issues aren't going to go away. Indeed, at least three key drivers will ensure that debates become more frequent and more complex.

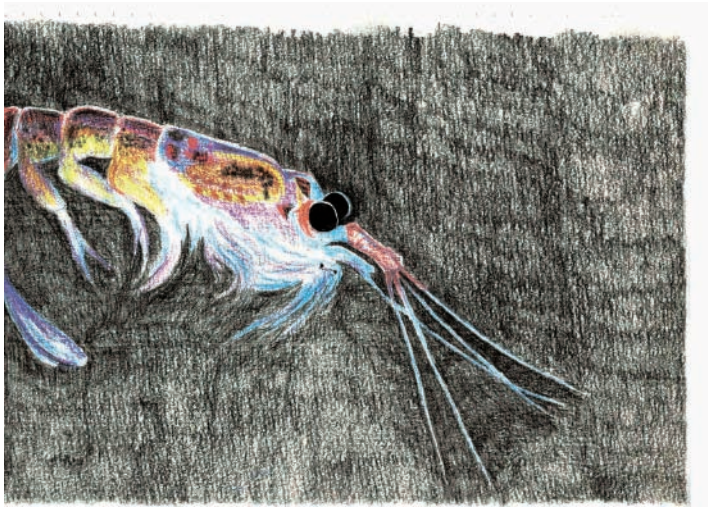
Biotech products are moving on from simple modifications of plant cells to manipulation of mammalian and even human cells, encroaching further into areas of moral or psychological discomfort.

Then, there is the increasing speed with which information and misinformation about biotech products is traveling electronically around the globe in e-mails and blogs and chat rooms. This means opinions are likely to become entrenched more quickly, often on flimsier evidence, and industry will need a means of anticipating controversies and responding more rapidly.

And finally, the increasing internationalization of trade and technical capability will mean that new biotech products will be adopted by economies somewhere, even if the U.S. or Europe remains embroiled in an ethical/policy debate.

Industry's preference for working behind the scenes and in the lobby halls is all very well. But the values debate is also part of market reality. These issues need to be addressed in a moderating body similar to the Pew initiative. Waiting until they are raised by a congressional committee loaded with opponents, when public opinion is antagonistic and the media start to smell blood, will be too late. By then, the battle for hearts and minds will already have been lost. T

The materials developed by the Pew Initiative on Food and Biotechnology remain available to the public through its Web site, http://pewagbiotech.org.



Krill.

IMPROVING PUBLIC POLICY

Environment Group

Conservation of Living Marine Resources

Chesapeake Bay Foundation, Inc.
Annapolis, MD, $250,000, 2 yrs.
To support ecosystem-based fisheries management policy reforms in the Chesapeake Bay.
Contact: Roy A. Hoagland
443.443.2165
www.cbf.org

The Pew Charitable Trusts for Antarctic Krill Conservation
Philadelphia, PA, up to $1,052,500, 8 mos.
To require the Commission for the Conservation of Antarctic Marine Living Resources to manage krill using the same oversight, control and monitoring measures as it mandates for all other fisheries; and approve precautionary, ecosystem-based catch limits at sufficiently small scales to protect living marine resources.
Contact: Andi Pearl 202.552.2162
www.krillcount.org

The Pew Charitable Trusts for the Federal Fisheries Policy Reform Project
Philadelphia, PA, up to $3,200,000, 2 yrs.
Contact: Lee Crockett
202.552.2065
www.pewtrusts.org

A peer-reviewed report last year by the Lenfest Ocean Program concluded that overfishing and depletion of important ocean fish stocks remain a widespread problem in the United States, despite the 1996 Sustainable Fisheries Act, which was passed for the express purpose of ending overfishing and promoting the sustainable use of our nation's living marine resources by protecting important habitats and minimizing the killing of non-target species.

Earlier this year, President Bush signed legislation reauthorizing the Magnuson-Stevens Fishery Conservation and Management Act, which includes strong new provisions to end overfishing by requiring managers to set enforceable annual catch limits that are based on sound science, not politics. The National Marine Fisheries Service has begun a two-year process to develop regulations and guidance documents to implement those conservation provisions of the revised act.

This project will focus on national-level action to ensure that the conservation requirements of the revised act will be achieved in an effective and timely manner. It seeks to end overfishing of all federally managed species within five years, to promote science-based decision-making by the nation's eight regional fisheries management councils, and to maintain comprehensive environmental reviews of fisheries management decisions consistent with the National Environmental Policy Act.

Global Warming and Climate Change

Bipartisan Policy Center, Inc.
Washington, DC, $2,200,000, 1 yr.
For the National Commission on Energy Policy to conduct nonpartisan research and outreach to key constituencies on energy security and climate change solutions.
Contact: Jason Grumet
202.637.0400 x12
www.bipartisanpolicy.org

The Energy Foundation
San Francisco, CA, $1,800,000, 1 yr.
To support efforts to promote the adoption of state and regional policies to reduce greenhouse gas emissions through nonpartisan research and analysis, public and policy-maker education, and outreach.
Contact: Marcus Schneider
415.561.6700 x134
www.ef.org

Health and Human Services Policy

Biomedical Research and Training

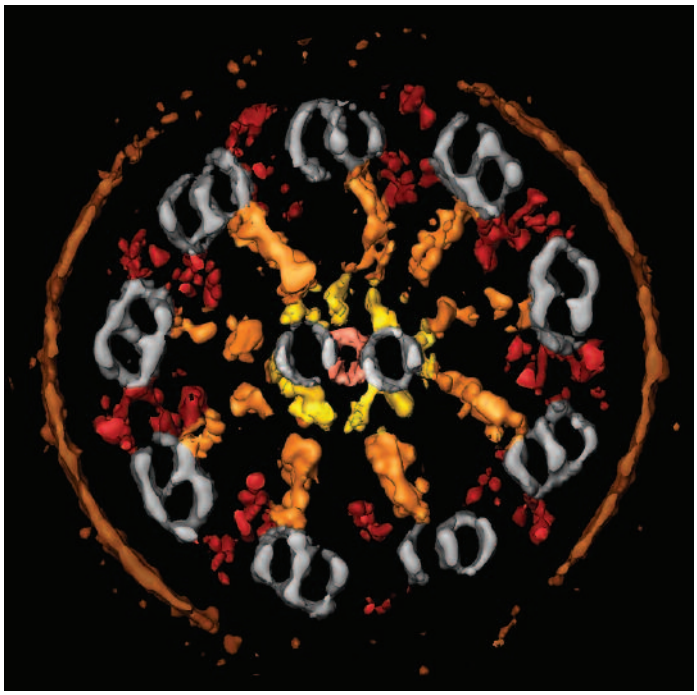
Regents of the University of California, San Francisco
San Francisco, CA, $950,000, 3 yrs.
To support the research activities of the 2008 class of the Pew Latin American Fellows in the Biomedical Sciences.
Contact: Edward H. O'Neil, Ph.D.
415.476.9486
www.futurehealth.ucsf.edu/pewlatin.html

Regents of the University of California, San Francisco
San Francisco, CA, $4,800,000, 4 yrs.
To support the research activities of the 2008 class of the Pew Scholars in the Biomedical Sciences.
Contact: Edward H. O'Neil, Ph.D.
415.476.9486
www.futurehealth.ucsf.edu/pewscholar.html

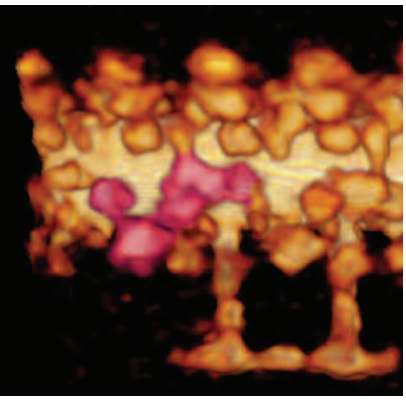
National Program

Center for Responsible Lending
Durham, NC, $1,000,000, 2 yrs.
Contact: Martin Eakes
919.313.8500
www.responsiblelending.org

Through nonpartisan research and outreach, the Center for Responsible Lending will champion practical policy solutions to curb abusive subprime home loans and strengthen underwriting and disclosure standards. Such policies will include verifying a borrower's income and ability to repay at the fully-indexed interest rate, requiring the escrow of taxes and insurance



Daniela Nicastro, 2007 Pew Biomedical Scholar, of Brandeis University studies the three-dimensional structure of macromolecular machines, organelles and cells using cryo-electron tomography. She aims to better understand the functional organization of cells. *Top of next page:* from a green alga called chlamydomonas [Nicastro et al. (2006) *Science* 313:944-8]. *Above:* from sea urchin sperm [Nicastro, et al. (2005) PNAS, 102:15889-94]. For more, consult www.bio.brandeis.edu/faculty01/nicastro.



payments and documenting the value of the property being financed.

The center will organize a diverse coalition of civil-rights, consumer-advocacy, faith-based and other groups to support the adoption of the federal guidance through letter-writing as well as public statements and comments. It will encourage members of Congress to call on regulators to adopt the guidance. And it will keep the spotlight on the problems caused by subprime loans and on the need for common-sense solutions that protect home ownership and families' financial well-being.

Georgetown University
Washington, DC, $450,000, 6 mos.
For the Center on Alcohol Marketing and Youth to reduce underage youth exposure to alcohol advertising.
Contact: David Jernigan, Ph.D.
202.687.1019
www.camy.org

Other Projects

College of Physicians of Philadelphia
Philadelphia, PA, $600,000, 3 yrs.
For support of Philly Health Info, an online portal to enable the region's residents to make more informed medical decisions.
Contact: George M. Wohlreich, M.D. 215.563.3737 x205
www.collphyphil.org

Ralston House
Philadelphia, PA, $150,000, 3 yrs.
To improve accessibility to its main building.
Contact: Barbara Phillips
215.386.2984
www.ralstoncenter.org

Center on the States

Campaign Finance Reform

William J. Brennan Jr. Center for Justice
New York, NY, $530,000, 2 yrs.
To support original research and related activities designed to inform the constitutional jurisprudence that affects the Bipartisan Campaign Reform Act of 2002.
Contact: Deborah Goldberg, Ph.D.
212.998.6748
www.brennancenter.org

Early Education

Education Law Center
Newark, NJ, $580,000, 2 yrs.
For the Starting at Three initiative to collect and disseminate information on including preschool in state education-adequacy litigation.
Contact: Ellen Boylan
973.624.1815 x42
www.edlawcenter.org

Education Writers Association
Washington, DC, $260,000, 3 yrs.
To help print and broadcast journalists cover prekindergarten as an important educational issue.
Contact: Lisa J. Walker
202.452.9830
www.ewa.org

Generations United
Washington, DC, $225,000, 1 yr.
For the Seniors4Kids initiative to engage senior citizens as champions for quality prekindergarten for all 3- and 4-year-olds.
Contact: R. Brent Elrod
202.289.1556
www.seniors4kids.org

The Pew Charitable Trusts for the Partnership for America's Economic Success
Philadelphia, PA, up to $395,000, 18 mos.
To disseminate research on the economic benefits of effective investments in children prenatal to age five.
Contact: Sara Watson 202.552.2134
www.partnershipforsuccess.org

Make Voting Work

The Pew Charitable Trusts for electionline.org
Philadelphia, PA, up to $3,000,000, 3 yrs.
Contact: Doug Chapin
202.552.2027
www.electionline.org

In response to the prolonged, contentious aftermath of the 2000 election, Pew established electionline.org to guide federal, state and local policy makers and election officials on trends, important issues and best practices in election administration. The project has become the preeminent source of comprehensive news and analysis in its field.

As part of the Center on the States' broader Make Voting Work strategy, electionline.org will continue to inform the field about technologies, policies and practices that make voting convenient for eligible voters without compromising accuracy.

The project will help set the agenda in the field of election administration through its issue alerts, weekly newsletters, 50-state comparative reports and trend analyses. It will significantly expand its public role by providing testimony, holding forums and hosting training sessions that update policy makers and election officials about new trends and research findings.

Public Safety Performance Project

The Pew Charitable Trusts for the Public Safety Performance Project
Philadelphia, PA, up to $3,000,000, 3 yrs.
To educate state governors, legislators, budget officials and court leaders about evidence-based approaches that states are taking to reduce recidivism among offenders and control corrections costs.
Contact: Adam Gelb 404.848.0186
www.pewpublicsafety.org

Other Projects

Editorial Projects in Education
Bethesda, MD, $2,226,000, 3 yrs.
For Quality Counts to develop and disseminate high-quality reports on the status of education in all 50 states.
Contact: Virginia B. Edwards
301.280.3100
www.edweek.org

National Center for State Courts
Williamsburg, VA, $220,000, 1 yr.
To support a national judicial leadership summit in Philadelphia.
Contact: John R. Meeks
757.259.1802
www.ncsconline.org

Other Policy Projects

Johns Hopkins University
Baltimore, MD, $800,000, 1 yr.
To provide supplemental assistance to the National Commission on Industrial Farm Animal Production to conduct an assessment of the impact of the concentrated animal feeding operations on public health, the environment, animal welfare and rural communities, and produce a series of thoughtful recommendations on ways to mitigate the negative impacts of industrialized livestock production.
Contact: Shelley Hearne, Ph.D.
410.502.7578
www.ncifap.org

INFORMING THE PUBLIC

The Pew Research Center

The Pew Forum on Religion & Public Life
Washington, DC, $5,400,000, 1 yr.
To promote a deeper understanding and a more informed discussion among the American public, policy leaders and the media of issues at the intersection of religion and public affairs.
Contact: Luis Lugo 202.419.4550
www.pewforum.org

The Pew Global Attitudes Project
Washington, DC, $4,618,000, 2 yrs.
In support of multination opinion surveys of attitudes toward America's role in the world, globalization, democratization, terrorism and other issues of abiding global importance.
Contact: Andrew Kohut
202.419.4361
www.pewglobal.org

The Pew Hispanic Center
Washington, DC, $3,100,000, 2 yrs.
To study the economic, social and political realities of America's fast-growing Hispanic population, as well as the impact Hispanics are having on American civic, political and economic life.
Contact: Paul Taylor 202.419.3610
www.pewhispanic.org

The Pew Research Center
Washington, DC, $3,400,000, 2 yrs.
Contact: Paul Taylor 202.419.4361
www.pewresearch.org

The new Pew Research Center Project on Social and Demographic Trends will illuminate a range of important changes in America through a combination

of survey research and data analysis.

Its principal goal will be to conduct in-depth, nonpartisan studies on major trends that are reshaping the nation, beginning with a comprehensive portrait of the American middle class. The goal will be to complete this study in time to inform the public debate in the final stages of the 2008 presidential election.

In addition, the project will continue the Pew Social Trends surveys, which have explored people's attitudes and behaviors toward such matters as home ownership, retirement, spending and savings habits, work and leisure, and components of a good marriage.

The Pew Research Center
Washington, DC
I. To support discrete research and publishing activities of the Pew Research Center to enhance its mission to inform citizens, journalists and policy makers about contemporary issues and trends, $1,024,000, 1 yr.
II. To support the administrative infrastructure of the Pew Research Center, $5,444,000, 1 yr.
Contact: Andrew Kohut
202.419.4361
www.pewresearch.org

The Pew Research Center for the People and the Press
Washington, DC, $4,100,000, 2 yrs.
To conduct research and opinion surveys on political, social, economic and journalistic matters and to disseminate the results to policy makers, the media and the public.
Contact: Andrew Kohut
202.419.4361
www.people-press.org

Other Projects

Missourian Publishing Association
Columbia, MO, $105,000, 18 mos.
To study the field of alternative community news, analyzing both the scope and content of these emerging, largely online operations.
Contact: Esther Thorson
573.882.9590
www.columbiamissourian.com

National Public Radio, Inc.
Washington, DC, $600,000, 2 yrs.
In support of National Public Radio's continuing coverage on religion and the ways religion and religious discourse help shape American public life.
Contact: Melissa Thompson
202.513.3261
www.npr.org

STIMULATING CIVIC LIFE

Culture

The University of the Arts
Philadelphia, PA, $2,700,000, 2 yrs.
In support of the Philadelphia Cultural Management Initiative
Contact: Martin Cohen
267.350.4911
www.artshelp.org

Since 2001, the Philadelphia Cultural Management Initiative has helped arts institutions in Southeastern Pennsylvania strengthen their organizational and financial management practices.

It provides project support, typically for addressing managerial needs such as strategic planning and the development of new marketing and fund-raising efforts; professional development support to help staff hone management skills in finance and research; educational programs, workshops and seminars in marketing, accounting and related topics; and professionally-administered assessments of organizational capacity to help diagnose and address operational challenges.

With this new investment, the initiative will expand the number of applicant organizations it can serve. It will bolster its well-regarded series of special programs to address community-wide concerns on such topics as leadership succession. And it will expand education on current marketing trends and practices in the nonprofit culture sector, helping the organizations be more creative and effective in the use of new resources.

Philadelphia Cultural Leadership Program (in support of general operations)

Brandywine Conservancy, Inc.
Chadds Ford, PA, $276,000, 3 yrs.
In support of general operations of the Brandywine Museum.
Contact: James H. Duff
610.388.8334
www.brandywinemuseum.org

The Center for Emerging Visual Artists
Philadelphia, PA, $45,000, 3 yrs.
Contact: Maida R. Milone
215.546.7775 x16
www.cfeva.org

The Clay Studio
Philadelphia, PA, $144,000, 3 yrs.
Contact: Amy Sarner Williams
215.925.3453 x12
www.theclaystudio.org

The Franklin Institute
Philadelphia, PA, $720,000, 3 yrs.
Contact: Dennis M. Wint, Ph.D.
215.448.1146
www.fi.edu

Greater Philadelphia Chamber of Commerce Regional Foundation
Philadelphia, PA, $45,000, 3 yrs.
In support of general operations for the Arts and Business Council of Greater Philadelphia.
Contact: Karen B. Davis
215.790.3622
www.artsandbusiness-phila.org

Pennsylvania Ballet Association
Philadelphia, PA, $300,000, 2 yrs.
Contact: Michael Scolamiero
215.551.7000
www.paballet.org

The Franklin Institute features the exhibition "Identity: Everything About You" until April 20.

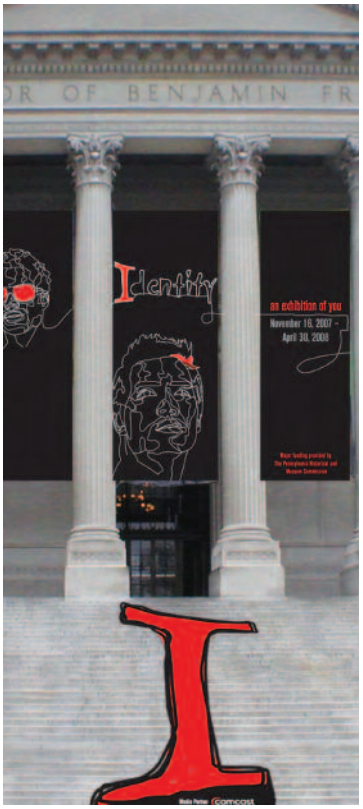
Philadelphia Museum of Art
Philadelphia, PA, $1,920,000, 3 yrs.
Contact: Anne d'Harnoncourt
215.684.7701
www.philamuseum.org

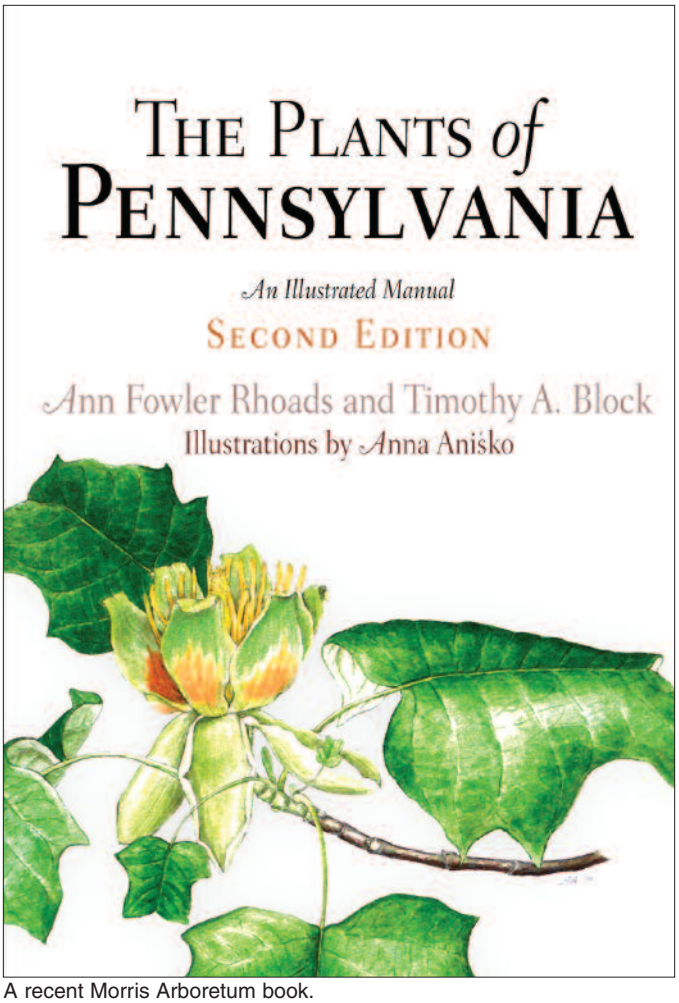
The Philadelphia Orchestra Association
Philadelphia, PA, $640,000, 2 yrs.
Contact: James Undercofler
215.893.1900
www.philorch.org

Trustees of the University of Pennsylvania
Philadelphia, PA, $252,000, 3 yrs.
In support of general operations of the Morris Arboretum.
Contact: Paul W. Meyer
215.247.5777 x106
www.morrisarboretum.org

Support for Regional Culture

Greater Philadelphia Cultural Alliance
Philadelphia, PA, $50,000, 1 yr.
In support of funding for the Americans for the Arts convention in Philadelphia in June 2008.
Contact: Julie Hawkins
215.557.7811 x12
www.philaculture.org





A recent Morris Arboretum book.

Civic Initiatives

Civic Engagment

George Washington University
Washington, DC, $750,000, 2 yrs.
For Young Voter Strategies to increase young voter turnout by providing key constituencies with nonpartisan information and tools to effectively mobilize young people.
Contact: F. Christopher Arterton, Ph.D. 202.994.5843
www.youngvoterstrategies.org

Other Projects

Indiana University Foundation
Bloomington, IN, $500,000, 3 yrs.
To develope an online "Virtual Congress" game.
Contact: Wayne Vance
812.856.4708
www.centeroncongress.org

Virtual Congress will be an online game to teach young people about representative democracy in an innovative way and help them understand their role as citizens.

In conventional computer simulations, the main moves are basically programmed at the outset. The latest role-play games, however, have enormous flexibility and allow players to develop their own identities, devise their own strategies and make their own decisions about what happens in their virtual world.

In this game, the world will be Congress, and the ultimate goal, passing a bill.

Students from across the country will fill the 535 seats in Congress, and others will participate as constituents, journalists, lobbyists and staffers. Players will engage in the many activities that lead up to a bill becoming a law. Senators and representatives will hear from constituents, committees will discuss bills, journalists will report on legislative activity, and interest groups will seek to affect the outcome.

Students will learn the nuts and bolts of the legislative process and also learn some of the skills needed to be a successful legislator, such as working out compromises among multiple viewpoints and various versions of bills.

Planned Parenthood Southeastern Pennsylvania
Philadelphia, PA, $250,000, 1 yr.
For a new health care facility to provide a range of medical services to residents of Northeast Philadelphia.
Contact: Dayle Steinberg
215.351.5538
www.ppsp.org

Smithsonian Institution
Washington, DC, $1,000,000, 1 yr.
To complete construction of a new permanent viewing gallery for the Star-Spangled Banner, the war-torn flag that inspired the national anthem, as well as the installation of interpretive exhibits that educate the public about this American icon and symbol of the nation's hard-fought struggle for freedom.
Contact: James Gardner, Ph.D.
202.633.3497
www.americanhistory.si.edu/ssb

Religion

The Research Foundation of State University of New York
Albany, NY, $766,000, 15 mos.
For the Roundtable on Religion and Social Welfare Policy to inform policy makers, government officials and journalists about policy and legal developments regarding faith-based organizations in America's social welfare system.
Contact: Richard P. Nathan, Ph.D.
518.443.5831
www.religionandsocialpolicy.org

Bettman/CORBIS

A G.I. in a foxhole in Italy exercises his right to vote on November 3, 1944. Another waits his turn.

More than six million Americans—members of the military and civilians—live overseas, and many of them find it arduous, through no fault of their own, to vote in U.S. elections. A recent government report revealed that between two-thirds and one-half of the ballots mailed to overseas voters were not returned in time to be counted for the 2006 election.

According to new research from the Pew-supported electionline.org, these potential voters face a perfect storm of challenges: inconsistent processes and requirements specified by the states, outmoded systems used by election offices, and sluggish domestic and international mail delivery.

In October, Pew and the Overseas Vote Foundation announced novel Web-based voter services to help this constituency. A new Web site and integrated voter-services applications, available at **www.overseasvotefoundation.org**, offer a user-friendly online system to automate the complex process facing military and civilian overseas voters attempting to register to vote and request absentee ballots. The site's Election Official Directory provides the most comprehensive and up-to-date listing of local U.S. election-office contact information.

Here is how it works: The Web site prompts the voter for information necessary to register to vote in his/her home state in accordance with each state's unique regulations. Error-checks occur during the process to ensure that the voter does not forget any required information. The site then generates an official form in PDF format and provides the voter with the correct county election-office address for mailing. The program eliminates the need to individually research and navigate unique state regulations and mailing instructions, thus doing away with the necessity of culling through pages of information. Furthermore, the Overseas Vote Foundation permits states to license and customize the new software for their individual use.

Pew's partnership with the foundation is part of a larger effort by Make Voting Work, which is a project of Pew's Center on the States (www.pewcenteronthestates.org) that supports policies, practices and technologies to enhance the accuracy, convenience, efficiency and security of U.S. elections.

"I wake up every morning happy and go to bed happy because of the work I do," says W. Wilson Goode, describing his work on behalf of **Amachi**, a mentoring program for children with incarcerated parents that he founded in 2000. He is not the only one pleased with the results. The former Philadelphia mayor was named one of five inaugural winners of the Purpose Prize, awarded by Civic Ventures, which aims to get older Americans busy confronting social problems.

Amachi, which was launched partly with Pew support, pairs children of prisoners with volunteers from local churches (see summer 2005 *Trust*). Currently, there are 271 programs in 48 states that use the model or were inspired by it, and they have partnered with more than 6,000 churches and served more than 60,000 children. (*Amachi* is a West African word that means "who knows but what God has brought us through this child.")

Goode said his own father went to prison in 1954 and served three years for assaulting Goode's mother. Goode, who was 15 at the time, says, "I think I owe something to other children who are similarly situated in life."

"Video journalists with a capital *J*," stated the advertising supplement to *The New York Times*, featuring the *Times* "V.J.s," who report, write, shoot and edit their own videos. One of the V.J.s was Shayla Harris, a 2003 fellow in the **Pew International Reporting Project** at Johns Hopkins University.

At that time, Harris was employed by NBC, where she subsequently earned a George Foster Peabody Award for "The Education of Ms. Groves," a documentary on a first-year teacher that she shot and produced for *Dateline NBC*. From 2000 to 2005, Harris worked on a number of award-winning documentaries for *Dateline*, including "Pattern of Suspicion," an investigation of racial profiling in Cincinnati,

and "Children of War," on Ugandan child soldiers.

Her Pew fellowship allowed Harris to travel to Sweden for six weeks to shoot a short documentary on race and immigration. Her videos "have captured sensitive subjects ranging from a series on aging to a portrait of a Koranic school in Queens to a Berlin travelogue," the *Times* said.

The September issue of *GQ* listed "The 50 Most Powerful People in D.C." According to the magazine, "In Washington, you are either a person with power or a person who acts like he has power. How do you tell the contenders from the pretenders? We canvassed the city's top think-tankers, congressional aides and political journalists to find out."

One who made the list was **Andrew Kohut**, president of the Pew Research Center. Here's what *GQ* said about him: "Pew polls have the most widely cited stats out there: In the past 12 months, Kohut has shown up in the press 700 times. 'Most polls tend to be superficial,' says former Clinton adviser Paul Begala, 'but Kohut has a reputation as a guy who asks why.'"

Stateline.org fared better than any other news organization in the Capitolbeat Awards, which honors the nation's best statehouse journalism. The nationwide association of reporters and editors who cover state government presented the awards at its annual convention in Philadelphia earlier this year.

Stateline captured seven honors across four categories in online journalism: first and second place for a single report; second place in commentary; second and third place for in-depth reporting; and second and third place for beat reporting.

Part of the Pew Research Center, Stateline has published online since 1999 and is staffed entirely by professional journalists.

What factors are driving the growth of prisons in this country, and what options for reform are possible to increase public safety, manage corrections spending and hold offenders accountable?

The **Public Safety Performance Project** seeks answers to those questions, with the aim of helping states advance fiscally sound, data-driven corrections policies and practices. The initiative is supported by the Council of State Governments, the Vera Institute of Justice and Pew, which also administers it.

In February, the project issued *Public Safety, Public Spending: Forecasting America's Prison Population 2007-2011*, the first known attempt to determine the future growth of the nation's state and federal prison systems as a whole (see its Web site, www.pewpublicsafety.org).

Shortly afterward, *Maclean's* magazine caught up with Sue Urahn, managing director of Pew's Center on the States, where the project is based; the following is an excerpt of an interview in *Maclean's* (figures updated since its March 19 publication), reprinted with permission.

Maclean's: Since 1970, there's been a 700 percent increase in the prison population in the U.S. Your report explains that if current trends continue, within five years one in every 178 U.S. residents will live in prison. And that number doesn't even include people in local jails.

How much is it going to cost to have that many people behind bars?
Urahn: We're currently spending about $61 billion a year on incarceration, and to accommodate the additional 192,000 prisoners we're projecting by 2011, we're estimating it will cost another $27.5 billion because new prisons will need to be constructed.

Maclean's: Aside from the crime rate, what's driving the incarceration rate?
Urahn: Sentencing policies have a significant impact. Truth in sentencing, for instance, which means that when a person is convicted of a particular type of crime and is sentenced to a term of X length, he will in fact serve some guaranteed percentage of that time.

Previously, sentences were plea-bargained or otherwise reduced, so there was not much connection between what the sentence was and the time actually served.

Maclean's: But if these are dangerous people, they should be locked up, right?
Urahn: If you look at crime from a national perspective, about half of the crimes that are committed are violent, and the other half tend to be drug- and property-related.

The explosion in incarceration is not necessarily one that can be tacked directly to an explosion in violent crime. Today, a lot of prison admissions are people who are having their parole or probation revoked, in many cases because of technical violations, like not turning up for an appointment with a parole officer.

In some states, though, graduated sanctions are being put in place, so a technical violation doesn't automatically result in being sent back to prison, but some kind of consequence occurs and further violations result in harsher sanctions, culminating in a return to prison.

This is a more nuanced approach to criminal justice, identifying which people on parole and probation really do need intensive monitoring and supervision, which people are higher risk to re-offend.

Maclean's: But doesn't incarceration at least have some impact on the crime rate, because you're getting violent criminals off the street?
Urahn: Most of the research shows that incarceration tends to account for about 25 percent of the drop in

crime rates [that occurred in the 1990s], so it certainly has an effect. But what we are looking at now is the law of diminishing returns. The more people you put in prison, you get gradually less and less impact on the crime rate.

What states need to do is figure out who needs to be in prison to protect public safety—which is job one—how to hold offenders accountable and how to pay attention to the fiscal bottom line and to be responsible stewards of taxpayers' funds.

States are finding that there are ways to handle non-violent and low-risk offenders that don't involve incarceration. For example, community-based punishments such as day reporting, electronic monitoring, work release, having people work to pay fines and restitution—or in the case of drug offences, treatment. All these alternatives hold people accountable, protect public safety and also cost much less than incarceration.

Maclean's: Judging by network television, Americans are obsessed with crime and the criminal justice system. Do you think TV is glamorizing crime and thereby encouraging it?
Urahn: I have no idea. But if you look at the polling data, 10 years ago, 36 percent of Americans said that crime was one of the top two issues the government needed to address. And in 2003, the number of people who felt that way was less than one-half of one percent. So I think there's been a real shift in public perception about crime as a really serious issue.

We did a poll in 2003 that showed 72 percent of Americans think the criminal justice system should rehabilitate criminals, not just punish them. It may just be because so many people's lives are now touched by the system. So television aside, there's been a really fundamental shift in public opinion about the need for incarceration. That same poll showed that 75 percent supported reducing spending on prisons and allocating those funds to public schools and community-development programs.

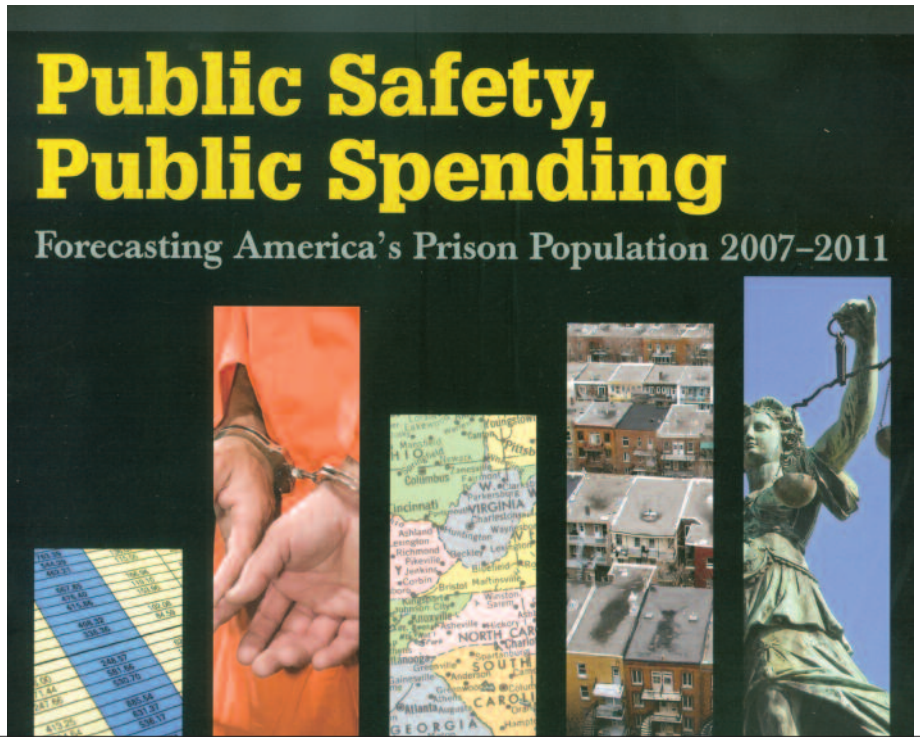
What we see overall is that Americans want really serious criminals sent to prison, but they are very supportive of options, and rehabilitation efforts, for low-level offenders. It is a case where the public is ahead of the policy makers.

On average, corrections spending is the fourth-largest item states are struggling with, so it does mean that the more they spend on incarceration, the less they have to spend on education and health care. It's also one of the things that states have pretty much complete control over in their budgets.

Maclean's: But isn't there a significant political danger of being perceived as soft on crime?
Urahn: Traditionally there's been a fear, but you can come at these problems from a very data-driven and sensible perspective, and we are seeing that more and more. Both conservatives and liberals are now talking about being smart on crime, not tough or soft on crime. Maybe the only nice thing about our projections is that they could well be wrong.

Maclean's: But you didn't pull these numbers out of a hat. Your study is based on statistics provided by the states and the federal government.
Urahn: Yes. But our projections are a combination of the external factors—demographics, socio-economic and crime trends, things we don't have a lot of control over—and the internal decisions the states themselves make on sentencing, on which offences are criminalized to which degree, how they use probation and parole, whether they have effective community-based punishment systems. So the states have a lot of control over whether these projections become reality.

But if nothing changes, then absolutely, these numbers are very realistic. It's like the ghost of Christmas Future in Dickens's A *Christmas Carol*—this is what you're looking at, but does it have to be that way? Not necessarily.



Smithsonian Magazine recently featured "37 Under 36: America's Young Innovators in the Arts and Sciences," and one of the up-and-comers was **E. John Wherry**, Ph.D., an immunologist at The Wistar Institute, an independent nonprofit biomedical research institute in Philadelphia.

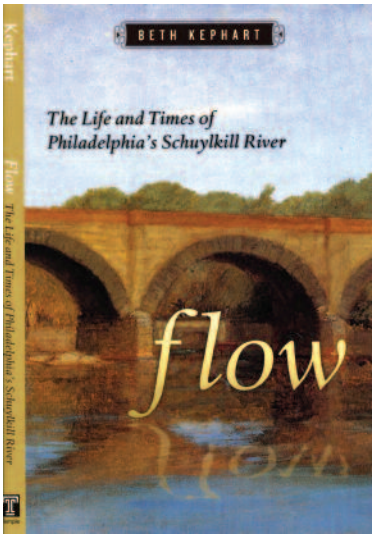
The profile highlights Wherry's contributions to an effort to develop a universal vaccine against influenza that would provide long-lasting protection against all strains of the virus, including those yet to emerge and the avian flu. The vaccine would reduce the need for annual vaccination programs and defend against pandemics. As conceived, the vaccine will also be more effective in protecting the at-risk elderly than current vaccines.

Existing flu vaccines target two prominent protein molecules on the surface of the influenza virus. Because these proteins mutate constantly, the vaccines must be redesigned and readministered regularly to remain effective—thus the need for an annual flu shot. By contrast, a universal flu vaccine would induce broad protection, lasting year after year.

To achieve this goal, the Wistar team aims to design a vaccine directed against internal viral proteins that are less prone to mutation than the surface proteins. Based on the same research, they will also develop a "cocktail" of antibodies against the flu virus to be given as an early treatment for flu infection.

Wherry is examining the normal decline of the immune system with age, and his insights into this problem will be reflected in the design of the Wistar universal flu vaccine. The elderly are less able to fight off infections of all kinds, and they respond poorly to vaccines compared to younger individuals. Early findings from Wherry's laboratory indicate that specific immune-system genes become inactivated in the elderly. A universal vaccine would incorporate tactics for reactivating these genes.

Wherry arrived at Wistar in 2004 under a Pew-supported program enabling the institute to recruit outstanding biomedical investigators.



A river runs through Philadelphia, and Beth Kephart, an award-winning local author, was inspired to write about it. Not its history, however, but its auto*biography—"a strange enough idea, by some standards," she says.*

She credits a Pew Fellowship in the Arts in 2005 with giving her time to research and write. "It seemed imperative to me to use the funds to give something back to Philadelphia," she told The Philadelphia Inquirer. *"There would have been no other project I would have done with the money."*

Below is the "Prelude" as it appears in Flow: The Life and Times of Philadelphia's Schuylkill River *by Beth Kephart. Copyright © 2007 by Beth Kephart. Used by permission of Temple University Press.*

It was the color of the sky, and it ran clean. It was the color of shad and of the trees—sycamores, willows, oaks—that clustered near. It bent the reflection of the moon, then held it still. A man looked in, a woman did, and, startled, found themselves.

The Schuylkill River at its start is stone-coal country; there are hills in most directions. Blue Mountain. Second Mountain. Locust Mountain. Sharp Mountain. In Tuscarora there are covert springs, and this is where the east branch of the river begins—a trickle, not even a stream. It will wend its way between hills and across valleys before it joins with the west branch near Schuylkill Haven. It will course many miles more and take a turn through Philadelphia before it yields to the Delaware River, which will empty into a long-nosed bay before yielding to the sea.

The river is cumulative. It harbors the floating oddments of towns like Auburn, Reading, Birdsboro, and Valley Forge. It widens and rises at the intersection of creeks that turn toward it. There is dust in its waters, the churn of bones. There are the remains of islands and animals, perch and catfish, broken branches and water-logged seeds. You might find the cross-frame of a kite in its silt, or the last page of a diary, or the buckles of a soldier's shoe, or the chunky afterthought of anthracite. You might find the flint tip of a spear. That's the thing about this river: You have to imagine it to see.

William Penn took a canoe up the Schuylkill during his second trip to Pennsylvania—a pale man with a square face cutting the current with a paddle, his eyes on a rabble of low-flying pigeons, or on a beaver's well-built dam, or on the smoke rising from a Lenni Lenape fire. There would have been no sound of machines, no insistent hum of industry, but corn was being torn from its husk, no doubt, and a mother was calling for her child. Penn heard whatever a man could hear, afloat on that river, in a boat carved from a tree.

One might have hoped for a more spellable name, or for something more suggestive of a poem. But *Schuylkill*, once spelled *Skokihl*, means nothing more than Hidden Creek, and it was a Dutch navigator, Arendt Corssen, who did the christening. This was the middle of the seventeenth century, and it was bulrush season. The place

where the Schuylkill meets the Delaware River was obscured and inauspicious the day that Corssen happened on it. In the spring, shad had to fly, not swim, to get upstream: The water at this junction was that shallow. Hidden Creek, Corssen thought to himself, and that's how the river got its name.

The Lenni Lenapes had better names for their river: *Ganshowahanna* they called it, which means "falling waters." *Manayunk*, they also called it, which translates into "where we drink." The Indian names suggest a sound and a taste, but Schuylkill River is a navigator's label, a name for those who are headed somewhere. Be on the lookout, the name suggests. Turn your craft this way.

The river, all those years ago, took you somewhere. It took you (if you were entering it from its southern tip, if you were in a canoe, or on a boat, or on a makeshift raft) north and also west. You were moving against its current, but you were following its line. You were Dutch or you were Swedish or you were a Quaker exile from England, and you went the way the river went, between its crags, against its falls, through its shoals of determined shad, above its beds of mussels.

As a young man, Benjamin Franklin wandered beside the river beneath the big trees on its east shore. He'd come up from town, through fields of swine and cattle, past fruit trees and the bark of wild turkeys. He'd meet his friends by the banks, or else walk or sit alone. In winter, the trees would be barren; river ice would crunch up against the shore. In summer, it would be cool beneath the oak trees and thick with the smell of wildflowers and herbs, the drone of bees and flies. At the river's intersection with Spruce Street, where Franklin would meander, Pastor Morgan Edwards and his parishioners could be found getting ready for a dunk in the holy Schuylkill waters.

Bears once prowled near the banks of the Schuylkill, as did the occasional panther. Wolves were feared and greedy, and there were snakes, minks, hazel hens, cranes, woodchucks, squirrels, foxes, rabbits, not so many deer as one might think, and beavers that fishermen somehow trained to hunt and retrieve for them.

America's most active botanists lived and worked beside the Schuylkill. The gardens planted there were written of in postcards, in books, in letters travelers sent back home. There was John Bartram and his studies and his seed house, his sprouting things. There was William Hamilton and his Woodlands, Lemon Hill and Gray's Ferry. There was Meriwether Lewis coming partway across the country to be mentored in the art of flora hunting by the ambitious Benjamin Smith Barton. There was the river, always, and what grew there, and its wayward springs.

War would come to the Schuylkill, and so, of course, would fever. Ships heavy with anthracite, cattle, timber, and more would jam in both directions; wharves would overtake the banks; fishermen would complain. By the turn of the nineteenth century, the river was being diverted to local homes through bored spruce and yellow pine logs and the clever machinations of the Water Works. A few years later it was being dammed with hickory logs to satisfy the city's emphatic thirst.

It was only a matter of time before the Schuylkill below the dam became a liquid trash heap—something to cross, not something to see. Detritus would be wheeled to the river's bank and dumped—a steaming mess. Slaughterhouse remains would be dumped as well, not to mention whale oil, dead people, old furniture, broken plates, hair ribbons, clipped fingernails, the bones from a previous night's fowl, the pages of a book no one could finish. The river had turned the color of mud, the color of the noise on city streets.

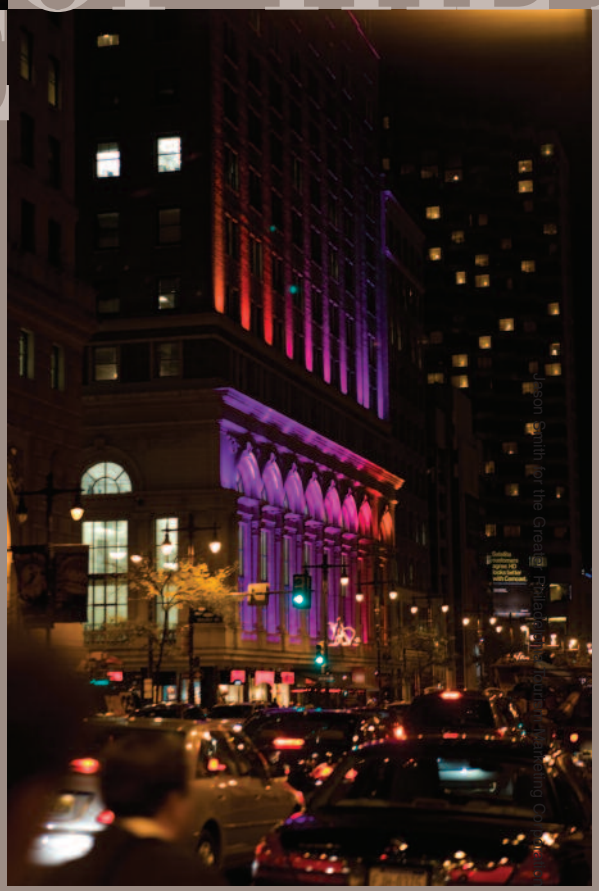
But a river stands for something even after the silence is gone. Even after the wolves and the panthers and the hazel hens are gone, there are other stories, big as myths. A river still begins at covert springs, and it still flows out to sea. It still floats the moon on its back at night, still stares out at the faces staring in, still dreams. T

Flow's front cover *(page 39)* shows the *Schuykill River Bridge* (1989) by Patrick Connors, reprinted with the permission of the artist. Collection of Peter Joly.

The back cover *(above)* shows *View of Philadelphia* from the Schuykill River (1859) by Edmund Darch Lewis. Private collection.

Jason Smith for the Greater Philadelphia Tourism Marketing Corporation

AVENUE OF THE ARTS



Jason Smith for the Greater Philadelphia Tourism Marketing Corporation

Part of Philadelphia's Broad Street—a central city artery—has been designated the Avenue of the Arts, and now some special lighting underlines the point. In November, officials threw the switch to *son et lumiere* at the Terra Building (*son* by Beethoven), located at Broad and Walnut streets. It was the first of more than a dozen façades permanently illuminated by programmable, color-changing, projected LED fixtures. Pew supported the lighting design and installation for the Terra and two other nonprofit buildings.

Muslim Americans: highly diverse, decidedly American in outlook, values and attitudes.

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