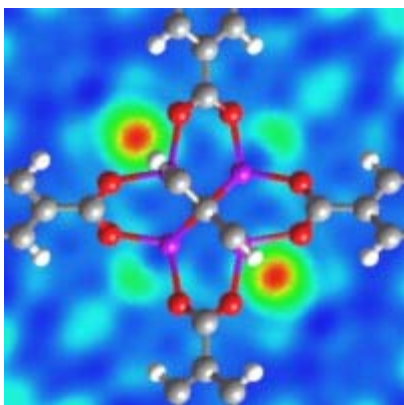


NSF AT WORK

**Chemists Improve Hydrogen Storage**



*This neutron-scattering image reveals where hydrogen molecules (red-green circles) attach in "crystal sponge," a custom-made compound being developed for hydrogen storage applications. Credit: Taner Yildirim, NIST.*

Chemists at UCLA and the University of Michigan have taken another step toward making cars that can run on hydrogen rather than gasoline by developing a new "crystal sponge" material that stores nearly three times more hydrogen than any known substance.

This is the first material with the storage capacity required to make hydrogen fuel practical--a development that could lead to transportable power sources for cars, laptop computers, cellular phones, digital cameras and other electronic devices. Currently, the high-storage densities are possible only at very low temperatures (-321 degrees Fahrenheit), but researchers are optimistic the limitation is temporary.

The microscopic structure of crystal sponge resembles a scaffold made of linked rods with a multitude of nanoscale pores. The result is an enormous internal surface area where hydrogen molecules can attach--a pinch of crystal sponge has a surface area roughly equivalent to that of a football field.

NSF, the U.S. Department of Energy, and chemical company BASF funded this research. For more on this technology, see "[New 'Crystal Sponge' Triples Hydrogen Storage.](#)"

**New Tool Hunts Through Online Catalogs Using Only a Sketch**

Working with support from NSF's Small Business Innovation Research (SBIR) program, Imaginestics, a company located in West Lafayette, Ind., has created a software application called 3D-Seek. This new kind of search engine lets users find an item in an online catalog without knowing its names or part number. A freehand sketch is all the user needs, thanks to a major advance in practical pattern recognition.

The Purdue Research Park-based company developed 3D-Seek and its associated catalog mainly for manufacturing firms, which are constantly looking for bolts, conveyor belts, motors and a host of other products. With 3D-Seek, users can find in seconds what once may have taken weeks of warehouse searching or a complete part redesign.



*Unlike other catalog search engines, 3D-Seek software rapidly locates objects with only a few quick steps. Credit: Imaginestics, LLC.*

Eventually, the search engine could prove equally beneficial for ordinary shoppers. Instead of carrying a part to the hardware store, customers could just sketch what they needed to find its replacement.

Researchers have been working for several years on software that can compare industry-standard 3-D image files to each other. This new method is faster than most and permits search "terms" that are far outside the norm. Read NSF's "[Doodle Search](#)" for more on this software.

## Lightweight, Corrosion-Resistant Composite Provides Bridge with a New Kind of Face-Lift



*Fiberglass-polymer composites form the core of a renovated bridge deck. Credit: Fabio Matta, UMR.*

Using new fiberglass-polymer materials, contractors in Springfield, Mo. performed a quick and dramatic makeover of a badly worn 70-year-old bridge deck. The workers used pre-fabricated plates and cages developed by an NSF-supported university-industry partnership to finish the job in a mere five days.

The NSF's Repair of Buildings and Bridges with Composites Industry-University Cooperative Research Center is based at the University of Missouri at Rolla and North Carolina State University. The Missouri researchers joined with colleagues at the University of Wisconsin and industry partners to develop the new construction solution.

The fiberglass-polymer composites are strong enough to endure several decades of traffic, salt and other corrosive de-icers. Moreover, workers can put the lightweight, prefabricated structures in place quickly-- saving time and preventing commuter headaches. For more on this lightweight, corrosion-resistant composite, see NSF's "[Easy Up, Not-So-Easy Down.](#)"

## Arctic Life Affected by Climate Change

Using data from long-term observations of physical properties and biological communities, a team of U.S. and Canadian researchers supported in part by NSF has concluded that previously documented physical changes in the Arctic are profoundly affecting Arctic life.

The northern Bering Sea provides critical habitat for large populations of sea ducks, gray whales, bearded seals and walrus, all of which depend on small bottom-dwelling creatures for sustenance. These bottom-dwellers are accustomed to colder water temperatures and long periods of extensive sea ice cover.

As a result of the changing environment, animal inhabitants that subsist on these bottom-dwelling creatures can be expected to follow their food source northward--leaving behind the small, isolated Native communities of people on the Bering Sea coast who subsist on them.

To learn more about the physical changes in the Arctic, see NSF's press release, "[Bering Sea Ecosystem Responding to Changes in Arctic Climate.](#)"



*Arctic ice conditions have major impacts on creatures living on the sea bottom and predators subsisting on them. Credit: Peter West, NSF.*

## DID YOU KNOW?



*NSF spelled in American Sign Language. Credit: Photodisc.*

In the 1960s, NSF supported William C. Stokoe, Jr.'s research demonstrating that American Sign Language (ASL) contained the fundamental properties of a true language. Further NSF support enabled Stokoe and two of his Gallaudet University colleagues to publish *A Dictionary of American Sign Language on Linguistic Principles*, the first dictionary of ASL.

Prior to Stokoe's studies, strictly "oralist" methods were used for educating deaf children, an approach that prevented them from reaching their full cognitive ability. Stokoe's groundbreaking work inspired other ASL research--culminating in a revolutionized method to educate the deaf.

## MEET NSF'S NEW DEPUTY DIRECTOR



### Kathie Olsen Brings Her “A-Game” to NSF

*While the Pittsburgh Steelers pushed toward the Super Bowl, no one was more enthusiastic than NSF Deputy Director Kathie Olsen. An Oregonian and Alumna of Pennsylvania's Chatham College, a professed extrovert and an ardent sports enthusiast, Olsen uses her zeal for teamwork to great effect at the Foundation. Six months into her tenure, she is emerging as both a coach and a champion of the agency. She pushes for internal cooperation and partnership in the best traditions of Vince Lombardi. Her messages about the Foundation's contributions to national goals, the importance of science and engineering education, and the connection between science and engineering and national prosperity are delivered with the gusto of a half-time marching band. In a rare moment of quiet, we sat down with Olsen to discuss her ideas for continuing NSF's winning ways.*

#### When did you figure out that science was your calling?

As a child, I was often buried face-down in Nancy Drew novels. They stirred the mystery of discovery and a drive to solve the case based on the clues.

It was actually in college, however, before the 'science bug' bit me. I had to take a fundamental biology course in order to fit my beloved tennis class in my schedule. To my surprise, my biology professor was fantastic, and the labs were hands-on. I was hooked!

While earning my Ph.D. in neuroscience, I really understood that the world of science connected to all the things I valued – solving compelling mysteries and finding solutions to societal problems.

#### You once conducted neuroscience research at a university; why did you leave the laboratory?

I got my first taste of science policy while working as a visiting scientist at NSF. After returning for a short while to a traditional career, I began to feel that I could make broader contributions by facilitating the science and engineering enterprise via science management and science policy, as opposed to continuing to conduct independent research.

I take great pride in my science policy work – contributing to science and engineering programs and activities that lead to profound outcomes for the country is compelling work.

Science and engineering improve our nation's ability to innovate; enable discoveries; develop technologies; strengthen the economy; and improve our overall well-being.

#### Did you feel any reservation when approached about serving as NSF's 11<sup>th</sup> Deputy Director?

Absolutely not! My values are in harmony with those of NSF's. Life is too short to waste time in a job that you're not passionate and enthusiastic about!

NSF is at the forefront of identifying and catalyzing transformational research. The Foundation's culture is so unique -- a government agency closely coupled with academe and driven by merit review. It's no wonder the Foundation serves as a model to be emulated around the world.

#### In the last six months, what about NSF has surprised you the most?

The commitment of the staff is extraordinary! It is thrilling to work with people I admire so much. I'm glad to be part of the NSF team again.

#### What do you consider success in terms of an NSF-supported research and education project?

Success comes in many forms and fashions. It may be a publication that advances a field or a new insight. It might be an undergraduate student excited about a science career, a new engineer stepping into the workplace, or a teacher improving mathematics proficiency scores. Sometimes new data contradicting a long-standing hypothesis can be a success. The list goes on and on. Each of these benchmarks nurtures the larger enterprise to keep us moving forward.

#### What advice do you most often offer principal investigators seeking first-time NSF support?

Read the solicitation guidelines, and call your program officer. I have lived in both worlds—as a researcher and a program officer. I know that the process of applying for research support can be frustrating. Keep your eyes on the goal, and maintain your sense of humor.

#### Do you envision any grand challenges for NSF during your tenure as Deputy Director?

As part of the Administration's American Competitiveness Initiative, which includes doubling our budget over the next ten years, we are tasked to help maintain the nation's global science and engineering leadership. Continuing to identify and support the most promising research is one such grand challenge. We are also responsible for helping to prepare the next generation of scientists and engineers, and the nation's skilled technology workforce. Educating the general public about science and engineering generally, and showing them the linkages between basic research and technological innovation will also be paramount.

Our nation is at a crossroads in terms of globalization and economic innovation. The results of fundamental research permeate society. NSF's role has never been more critical. Our contributions underpin the nation's ability to innovate and accelerate transformation in this new era.

#### And, how about for yourself?

I'm constantly striving to become a better person, a more effective leader, and a more capable manager. And, there are always my ski moguls, golf swings, and the Steelers!

***“In a world increasingly driven by technological change, it's more important than ever to get the message across that science is for everyone -- not only the quiet types.”***

### [A Growing Need for Hybrid Mechanics](#)--Detroit Free Press (03/23/06)

Michigan's Macomb County Community College has received a three-year, \$200,000 National Science Foundation grant to develop a curriculum addressing the need for auto technicians skilled in hybrid technology.

### [Cornell's Leopold Sews Seeds of Breakthrough](#)--Ithaca Journal (03/22/06)

Cornell University scientist Carl Leopold had no idea his studies of dry seeds would eventually produce a new insulin inhaler that utilizes dried insulin, making treatment of diabetes simpler. Instead, with funding from the National Science Foundation, Leopold says he was concentrating on the survival of dry seeds like soybeans and corn. "This is a very nice example of how an interesting problem led to a technique that is useful," Leopold said. "But this is not why you do the experiments."

### [State Keeps Eyes on Dams](#)--Honolulu Star-Bulletin (03/19/06)

University of California at Irvine associate professor of civil engineering Brett Sanders has developed a computer model that predicts where floodwater will go in the event of a dam failure. The project was funded by the National Science Foundation.

## NSF PERSPECTIVES

### **An Interview with NSF Director Arden L. Bement Jr.**



***"Right from its very founding over 50 years ago, the tradition of the foundation has been to integrate education and research."***

*In a recent Chemical and Engineering News interview, Bement stressed the importance of recognizing the societal benefit of a diversified integration of education and research.*

*Below are excerpts from the interview; see [CEN online](#) for the interview in its entirety.*

"Education is an area where you just can't have enough funding. The role of NSF is really to carry on research in education and to inform us how to optimize teaching and learning. Those are areas where we are going to continue to try and grow as rapidly as we can, especially with our future budget increases."

"Even in graduate research, we educate the graduate students in the course of doing research. That integration pays huge benefits for society, because that knowledge and technology go with the graduate students when they leave graduate school to go into the private sector or into academics."

"We need to take into account that a lot of education of minorities takes place in two-year community colleges...more and more, a lot of teachers are also getting their education at two-year schools."

"Just as there are pathways into science and engineering, there are also pathways out. Those are all a benefit to society, and we shouldn't feel that we are only interested in the B.S. graduates who are going to stay in science and engineering. We should be interested also in providing science- and engineering-trained students into the other professions such as law, business, and medicine, because that's all in the interest of having a technologically informed public."

"Scientists are very quick to advocate for their own science field at the expense of others. As the fields converge, however, it's important to advocate for science in general, because a field will not progress if it does so narrowly and in isolation."



The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science with an annual budget of nearly \$5.58 billion. NSF funding reaches all 50 states through grants to roughly 1,700 universities and institutions. Each year, NSF receives about 40,000 competitive requests for funding and makes about 10,000 new funding awards. The NSF also awards over \$400 million in professional and service contracts yearly. Contact [NSF's Office of Legislative and Public Affairs](#) for more information, to unsubscribe, or for permission to reuse newsletter images.