CURRENT
NATIONAL SCIENCE FOUNDATION

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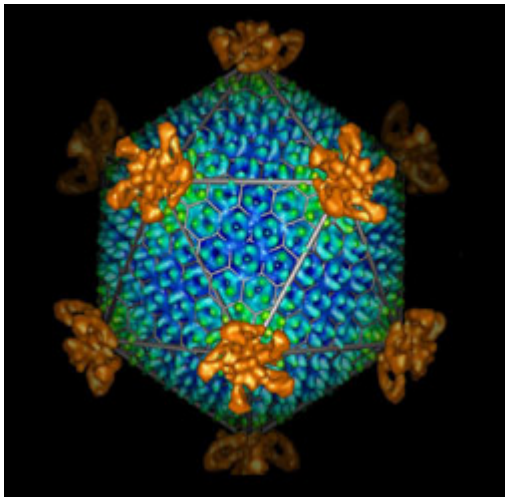
NSF AT WORK

From a Boiling Acid to a Nanotechnology Building Block

Newly discovered viruses isolated from microorganisms living in boiling acid pools in Yellowstone National Park are serving as raw materials for amazingly diverse new products, from nanoelectronics to drug delivery systems for cancer treatment.

With NSF support, researchers at Montana State University isolated these viruses and studied their practically indestructible protein shells, or "cages." They have now artificially replicated the cages for new applications in nanotechnology. The cages have been used as bases for new platinum catalysts to efficiently produce hydrogen and have made advanced magnetic materials for use in memory devices now in development with Panasonic.

The researchers also established SpeciGen, a biotech company, which has exclusive rights to the patented protein-cage technology developed through years of basic research. SpeciGen has over $11 million in government funding. For more on the company's "molecular lego sets," visit SpeciGen Inc.



The structure of a virus from a boiling acid pool in Yellowstone Park. Its protein coat is practically indestructible and is finding many uses. Credit: Mark Young, Montana State University.

Taking Science to School

A recent report from the National Research Councils says the commonly held view that young children are simplistic thinkers is outmoded. Instead, studies show that children think in surprisingly sophisticated ways. All children, the report says, have basic reasoning skills, personal knowledge of the natural world and curiosity that teachers can build on to achieve proficiency in science. Credit: Barry Meyers.

Improving science education in kindergarten through eighth grade will require major changes in how science is taught in America's classrooms, as well as shifts in commonly held views of what young children know and how they learn, says a new report from the National Research Council (NRC), part of the private, non-profit U.S. National Academies.

According to the report, compiled by a 14-member committee of experts in education and learning, today's standards are too broad and result in superficial coverage of science that fails to link concepts or develop them over successive grades. It also says teachers need more opportunities to learn how to teach science as an integrated whole and to diverse student populations. Teacher preparation and professional development should focus on boosting teachers' knowledge of science, how students learn the subject, and methods and technologies that aid in science learning for all, the report says.

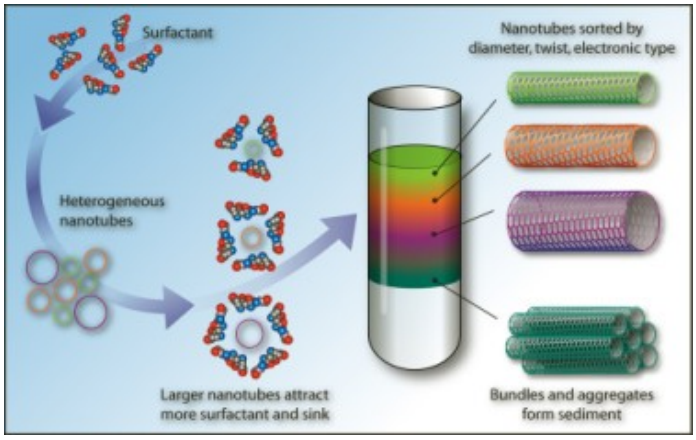
The study was sponsored NSF, the National Institute of Child Health and Human Development, and the Merck Institute for Science Education. See NSF's press release for more information.

Improved Sorting of Carbon Nanotubes May Lead to Widespread Commercial Use

Carbon nanotubes are intriguing new materials that have been touted for their exceptional mechanical, thermal, optical and electrical properties. They sport a long list of powerful properties, from superior strength to finely tuned electrical conductivity.

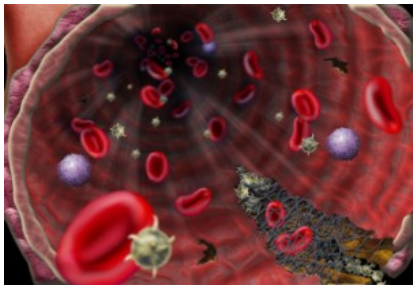
Researchers worldwide are striving to apply these nanostructures in electronics, high-resolution displays, high-strength composites and biosensors. Previous methods for synthesizing them, however, yielded diverse, unusable mixtures of the tiny tubes, limiting their use in commercial technology.

NSF-supported researchers at Northwestern University developed a method to sort carbon nanotubes so the resulting tubes vary from each other by no more than 0.02 nanometers. To read more about these tiny tubes, see the Northwestern University news release.



Single-walled carbon nanotubes are coated in soap-like molecules called surfactants, then spun at tens of thousands of rotations per minute in an ultracentrifuge. The resulting density gradient sorts the nanotubes according to diameter, twist and electronic structure. Credit: Zina Deretsky (adapted from Arnold et al.), NSF.

Model Reveals Clues to Blood Clotting



Scientists have developed a microfluidic system that successfully models blood clotting. The approach should reveal mechanisms behind a variety of reactions within the body. And in medicine, the technique could become a way to perform rapid and detailed diagnostic tests. Credit: Nicolle Rager Fuller, NSF.

Researchers at the University of Chicago have crafted a simple model for predicting when and where blood clotting, or hemostasis, will occur.

Their microfluidic system focuses on the interactions between blood and surfaces patterned to trigger blood clotting. It allows the researchers to separately monitor clotting in both blood plasma and a chemical model.

The researchers, led by an NSF CAREER awardee, believe the methodology may prove useful in a range of studies, adding a powerful tool for predicting the dynamics of other complex biochemical networks.

The system successfully modeled the workings of a complex biochemical network by showing how the start of clotting depends upon localization of clotting stimuli. The researchers used the model to predict behavior that they later confirmed with human blood plasma. They found that blood can be exposed to significant amounts of clotting stimuli without initiating clotting.

Did You Know?

NSF's Advanced Technology Education (ATE) Program focuses on the education of technicians for the high-technology fields that drive our nation's economy. Two-year colleges receive most ATE program support from NSF.

- An average of 60,000 students, at approximately 800 locations, were enrolled in ATE-supported programs each year from 2000-2005.
- ATE programs reached a total of 48,000 secondary school students, 320,000 two-year college students, and 6,000 students at baccalaureate institutions during the same six-year period.
- More than 100 "on-the-job" technician education programs have been started by ATE programs.
- In 2005 alone, external collaborators with the ATE programs -- mostly business and industry -- provided $34 million of additional support in the form of monetary donations or in-kind support.

See the just-released "ATE Centers Impact 2006-2007" report for more on the contributions of the ATE program.

Read about the ATE Center near you!

Faces of NSF Research

Cora Marrett Named Assistant Director for Education and Human Resources at NSF

Cora Marrett, the University of Wisconsin's senior vice president for academic affairs, has been appointed assistant director for the Directorate for Education and Human Resources (EHR) at NSF. She assumes the post Feb. 1, 2007.

Marrett, who was assistant director for NSF's Directorate for Social, Behavioral and Economic Sciences (SBE) in the 1990s, will lead the NSF's mission to achieve excellence in U.S. science, technology, engineering and mathematics (STEM) education at all levels and in both formal and informal settings.

EHR's mission is to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry that has access to the ideas and tools of science and engineering. The purpose of these activities is to enhance the quality of life of all citizens and the health, prosperity, welfare and security of the nation.

"We're thrilled to have Dr. Marrett join us at NSF again at this critical time in our agency's mission," said NSF Director Arden Bement. "Leadership in STEM education at NSF is immensely important, and the agency is fortunate to have a professional such as Dr. Marrett leading EHR."

Marrett served as UW's senior vice president for academic affairs for six years. Her NSF position in Arlington, Va., will be in conjunction with the UW-Madison Department of Sociology, where she will remain a tenured faculty member.

Marrett holds a B.A. degree from Virginia Union University (1963), and M.A. (1965) and Ph.D. (1968) degrees from UW-Madison, all in sociology. She received an honorary doctorate from Wake Forest University in 1996, and was elected a fellow of the American Academy of Arts and Sciences in 1998 and the American Association for the Advancement of Science in 1996. She is widely published in the field of sociology, and has held a number of public and professional service positions.

NSF in the News

My, How Children's Museum Has Grown -- *Houston Chronicle (10/11/06)* -- The "Cyberchase" exhibit at the Children's Museum of Houston will emphasize real-life applications of math. The Children's Museum of Houston is experiencing a huge growth spurt. Designed by Robert Venturi, one of the United States' best-known architects, the museum's current home opened in 1992 and was designed to accommodate 350,000 visitors a year. Annual attendance runs at about 600,000. Its development is being funded by NSF.

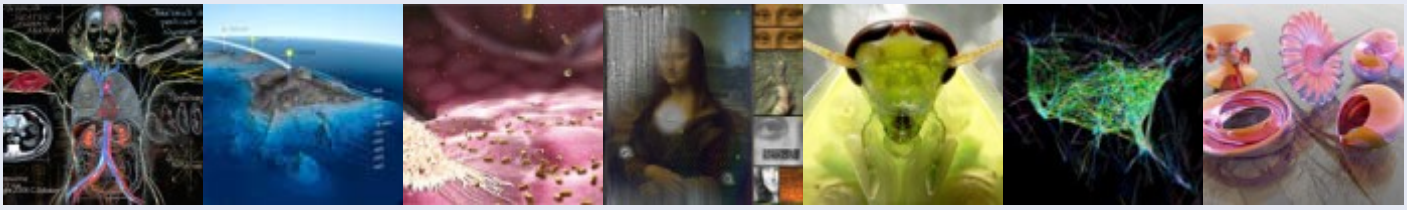
Schools Find Cyber Security a Hot Study Area -- *Daily Oklahoman (10/08/06)* -- With cybercrime among the nation's top threats, cyber-sleuthing has become a hot study area at some Oklahoma colleges and universities. Rose State College in Midwest City, Okla., has received a $499,364 NSF grant that will provide full scholarships for students participating in its cybersecurity program.

Perspective: Neither Safe nor Secure on the Internet -- *CNET (10/04/06)* -- The National Academies recently completed a report sponsored by the U.S. Department of Commerce and NSF that urged ICANN [Internet Corporation for Assigned Names and Numbers] to strengthen its agreements with TLD [top-level domain] operators and improve security of the DNS [Domain Name System].

Science and Engineering Visualization Challenge 2006

NSF and the journal *Science* recently announced the winners of the 2006 Science and Engineering Visualization Challenge. Currently in its fourth year, the annual contest recognizes outstanding achievement in the use of visual media to promote understanding of research results and scientific phenomena. The judges' criteria for evaluating the entries included visual impact, innovation and accuracy.

Winning entries communicate information about complex mathematical concepts, the intricacies of the human body, air-flight patterns, the latest scientific imaging technologies to analyze Leonardo da Vinci's art, and more. Some of the winning entries are pictured below. See all of them in the NSF Special Report.



Nomination Deadline for Prestigious Science Awards Quickly Approaching...

Medal of Science Award

Deadline: December 29, 2006

NSF is now accepting nominations for the National Medal of Science. Please see the Nomination Information page for details. The deadline is Dec. 29, 2006, at 11:59 p.m.

The National Medal of Science is the nation's highest scientific honor. Established by Congress in 1959, it was intended to be bestowed annually by the President of the United States on a select group of individuals deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences. Congress expanded this definition in 1980 to recognize outstanding work in the social and behavioral sciences.

For more information, see the NSF Fact Sheet or the Call for Nominations.

Waterman Award

Deadline: December 31, 2006

NSF is now accepting nominations for the Alan T. Waterman Award. The deadline for nominations is Dec. 31, 2006, at 11:59 p.m.

Congress established the Waterman Award in August 1975 to mark the 25th Anniversary of NSF and to honor its first Director. The annual award recognizes an outstanding young researcher in any field of science or engineering supported by NSF. In addition to a medal, the awardee receives a grant of $500,000 over a three-year period for scientific research or advanced study in the mathematical, physical, medical, biological, engineering, social, or other sciences at the institution of the recipient's choice.

For detailed information, please see the Call for Nomination.