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## NSF AT WORK

### Air Shield Keeps Bacteria Out of Open Wounds

Last spring, Nimbic Systems, based near Houston, Texas, received Food and Drug Administration clearance for the company's Air Barrier System (ABS), a unique medical device for reducing surgical-incision site contamination by infection-causing microorganisms.

During surgery, bacteria are continuously shed by operating room personnel into the air and can subsequently settle in and around an incision site. The organisms, such as *Staphylococcus aureus*, are a major cause of infections in prosthesis implant surgeries such as hip and knee replacements.

The portable ABS device prevents contamination without disrupting the surgical procedure or impeding access to the incision area, making the device relatively easy to use. In 2009, Nimbic Systems received funding from NSF to conduct ABS pilot trials. Read more about this NSF-supported medical device by visiting the **NSF Discovery**.



A 3-D rendering of the Air Barrier System area of protection. Credit: Nimbic Systems, Inc.

### New Computational Approach Will Reduce Planning Time for Cancer Treatment



Credit: julianlimjl, **Creative Commons Attribution License**

Researchers have devised a novel, automated method to drastically reduce the time medical specialists need to produce a radiation plan for cancer patients. The advance could benefit millions of cancer patients around the globe.

Investigators at the **Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems**, an NSF-funded **Engineering Research Center** (ERC) at Northeastern University are collaborating with clinical researchers at the Memorial Sloan-Kettering Cancer Center to implement the new technique, which is expected to reduce the time doctors spend developing clinical radiation treatment plans from several hours to a few minutes.

During the past decade, cancer treatments have been revolutionized by a method called intensity-modulated radiotherapy, which tightly controls the radiation dose to a tumor while simultaneously protecting nearby healthy tissues. However, developing an acceptable radiation plan for a difficult site in the body, such as the prostate, is a slow process, requiring many hours of an expert's time in a manual, trial-and-error series of adjustments.

Now, researchers affiliated with the **Bernard M. Gordon Center** have an automated method to drastically reduce the amount of preparation time. The new approach, called ROCO (reduced-order constrained optimization), translates concepts from optimization and machine-learning theory. Researchers first demonstrated the speed and ease of the computational techniques for the prostate site, producing in less than 5 minutes treatment plans that met clinical criteria. In collaboration with Sloan-Kettering, ERC researchers at Rensselaer Polytechnic Institute, led by Rich Radke, are extending these techniques to non-small-cell lung cancers and nasopharynx cancers.

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## NSF at the White House: Promoting Career-Life Balance in Science and Engineering

On September 26, First Lady Michelle Obama hosted an event to announce new "Workplace Flexibility Policies to Support America's Scientists and Their Families," according to the White House invitation to the East Room gathering. The event unveiled NSF's new Career-Life Balance initiative (CLB).



First Lady Michelle Obama applauds NSF's new Career-Life Balance initiative. Credit: Lee Herring

Before a capacity audience of nearly 200, which included students; science, engineering, and higher-education stakeholders; science policymakers; and others, NSF Director Subra Suresh announced the launch of NSF's CLB. The aim of the agency-wide initiative is to support graduate students, postdocs and early-career researchers in science, technology, engineering and mathematics (STEM), and to facilitate their retention in STEM fields in the face of conflicting demands of career and family responsibilities.



NSF Director Subra Suresh announces the agency's new Career-Life Balance initiative. Credit: Lee Herring

The initiative is expected to help advance the nation's ability to stay competitive in STEM fields in the global economic market. Dr. Suresh emphasized that "these strategies ... are essential to our future innovation, economic prosperity and global leadership." This initiative demonstrates what's different from business as usual. As well as seeking to be innovative, the initiative will offer a coherent and consistent set of family-friendly policies and practices to help eliminate some of the barriers to women's advancement and retention in STEM careers.

Dr. Suresh said that while the initiative applies to men and women alike, it is more often women who are forced to make difficult choices between their careers and their families--for example, marriage, birth or adoption of a child, raising a child, or caring for an elderly or dependent family member. As a result, women's professional development and career

advancement are often interrupted.

Even as the proportion of women earning doctoral degrees has continued to rise, their representation in tenured faculty positions has not kept pace. Currently, women account for approximately 41 percent of all new doctorates in science and engineering fields but only 28 percent of full-time tenured or tenure-track positions.

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## NSF's New Innovation Corps Awards

NSF has selected 21 teams for the inaugural class of NSF Innovation Corps (I-Corps) awards. Spanning a broad range of target products, geographic locales, and research fields, the teams will receive guidance from private- and public-sector experts, participate in a specially designed training curriculum, and receive \$50,000 to begin assessing the commercial readiness. Visit the **NSF press release** for more details.



Credit: NSF

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## DID YOU KNOW?

### Five 2011 Nobel Laureates Conducted Research Supported Directly or Indirectly by NSF

Saul Perlmutter, Brian Schmidt, and Adam Riess received the Nobel Prize in Physics. Thomas Sargent and Christopher Sims received the Nobel Prize in Economics.

Over the years, more than 195 Nobel Prizes have been awarded to scientists whose

fundamental research has been supported by NSF at some point in their careers. See the **NSF press release** for more details.

## FACES OF NSF RESEARCH

### NSF STEM Smart Conference



NSF Director Subra Suresh and Rep. Chaka Fattah interact with a robotic exhibit during this STEM Smart research showcase. Credit: NSF/Steve McNally.

Increasingly, future jobs at all levels will require knowledge of science, technology, engineering and mathematics (STEM), according to a study funded by the NSF and conducted by the National Research Council (NRC). The resulting NRC report, "**Successful K-12 STEM Education**," provides best practices for STEM teaching and learning in a wide range of environments and recommendations for school districts and policymakers.

On Sept. 19, 2011, the report was the focus of a day-long national conference hosted by Drexel University in Philadelphia that drew about 300 leaders from government, education, and science and engineering. The conference, titled "STEM Smart: Lessons Learned from Successful Schools," launched a national effort to put the report's ideas into action and was sponsored by NSF, the Community for Advancing Discovery Research in Education, nonprofit organization EDC and the National Academies. U.S. Rep.

Chaka Fattah (D-Penn.) and NSF Director Subra Suresh helped kick off the event with remarks.

In addition to hearing the featured speakers, visitors could interact with exhibits showcasing the latest innovations supporting science teaching and learning. A complete list of panelists and exhibitors is available via the **conference agenda** and **list of exhibits**. For more information and videos of the conference, see the **NSF press release**.

## NSF IN THE NEWS

**Dinosaur Footprints Discovered in Arkansas** (*FOX News*, Oct. 6, 2011) Researchers at the University of Arkansas are studying a new field of fossilized dinosaur tracks, including one set that appears to be from a large three-toed predator, the university announced. The tracks were found on private land in southwest Arkansas and provide a window into the life forms that roamed the area as long as 120 million years ago during the Early Cretaceous period. The research effort is funded by a grant from the NSF.

**The United States is Still No. 1 in R&D Spending, But ...** (*MSNBC*, Sept. 29, 2011) The United States still leads the world in spending on research and development (R&D), but experts say the competition is fierce, and the weak economy could be a risk to the nation's competitive edge. R&D that began as early as the 1950s, at places like NSF, laid the groundwork for major discoveries that came decades later.

**Laser Detects Roadside Bombs** (*MSNBC*, Sept. 19, 2011) Scientists are pitching a new high-tech laser that is able to detect roadside bombs before they explode, potentially thwarting the deadliest weapon in Iraq and Afghanistan. Roadside bombs, known as improvised explosive devices, or IEDs, account for 60 percent of coalition soldiers' deaths, according to NATO figures. This new approach, partially funded by NSF, detects the fingerprints of individual molecules, allowing soldiers to pick out explosives in crowded urban environments.

**Mouse Genomes Aid Human Disease Studies** (*UPI*, Sept. 15, 2011) Sequencing the genomes of 17 common strains of laboratory mice will help identify genes responsible for diseases in both mice and humans, U.S. researchers say. By enabling scientists to understand the genetic differences between the 17 strains of mice, the premier model animal for studying human diseases, the new genome sequences will improve the identification of mutations and genes that contribute to disease. NSF provides funding for this project.

## THE RIPPLE EFFECT

## NSF-funded Hazards Researchers "Storm" Capitol Hill



Senate Majority Leader Harry Reid meets with NSF-supported hazards researchers and students. Credit: Senate Sergeant of Arms

Each year in the United States, natural and man-made disasters cause hundreds of deaths and cost billions of dollars by destroying homes and critical infrastructure and disrupting commerce. In light of National Preparedness month and the East Coast hurricanes and earthquake, NSF hosted an expo on Capitol Hill in September.

The expo featured research on tornados, earthquakes, tsunamis, volcanos, oil spills and hurricanes, as well as the human response to these events. More than 350 people attended the Hazards Expo, including Rep. Bill Flores, Sens. Michael Bennet, Jack Reed, and Bill Nelson, who provided remarks. Senate Majority Leader Harry Reid also met with the hazards researchers in the afternoon.

Nelson was impressed with the amount of research NSF funds on hazards, especially on hurricanes: "All of you, the National Science Foundation, and the broader scientific community, are our hope, to try to get through to the policy makers, decision-makers and the appropriators, that science does matter."

NSF-funded researchers demonstrated how their work impacts and enables policymakers and disaster responders to better predict, prepare for, mitigate and respond to significant hazards that affect life, property, societal infrastructure and natural assets. The exhibits included an earthquake simulator, tornado pods, search-and-rescue robots, a flood flume, 3-D IMAX clips from "Tornado Alley," unmanned aerial vehicles for rescue, and more.



Sen. Bill Nelson addresses a crowd interested in hazards research. Credit NSF/Steve McNally

For further information about invited speakers and exhibits, see the [NSF press release](#).

## NSF Launches Science360 Radio for Web, iPhone and Android

*Science, technology, engineering and math (STEM) programming now streams 24/7*



Credit NSF

NSF has launched **Science360 Radio**, an Internet radio stream dedicated to programming about STEM. Science360 Radio offers programming 24 hours a day, seven days a week, with more than 100 radio shows and podcasts. The programming is made available by the producers at no cost to NSF or listeners. It's available on the Web and via iPhone and Android devices. U.S. and international contributors include the NSF and other U.S. government agencies, science institutions and professional organizations, universities and

media outlets. Science360 Radio is the latest addition to NSF's **Science360 Network**, which includes a STEM video library, the daily multimedia news feed **Science360 News Service**, and an **iPad App**.



*The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year (FY) 2011, its budget is about \$6.9 billion. NSF funds reach all 50 states through grants to nearly 2,000 universities and institutions. Each year, NSF receives over 45,000 competitive requests for funding, and makes over 11,500 new funding awards. NSF also awards over \$400 million in professional and service contracts yearly. Contact **NSF's Office of Legislative and Public Affairs** for more information or for permission to reuse newsletter images. Editor: Jennifer Boehme. Contributors: Neysa Call, Jacqueline Conciatore, Craig Fisher, Christine Hamel, Lee Herring, Laurie Howell, Zeke Kossover, Steve Lonker, Cheryl Roesel.*

