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NSF AT WORK

Robotic Surgery Systems Shipped to Medical Research Centers

A set of seven identical advanced robotic-surgery systems produced with NSF support were shipped last month to major U.S. medical research laboratories, creating a network of systems using a common platform. The network is designed to make it easy for researchers to share software, replicate experiments and collaborate in other ways.

Robotic surgery has the potential to enable new surgical procedures that are less invasive than existing techniques. The developers of the *Raven II* system made the decision to share it as the best way to move the field forward--though it meant giving competing laboratories tools that had taken them years to develop.

"We decided to follow an open-source model, because if all of these labs have a common research platform for doing robotic surgery, the whole field will be able to advance more quickly," said **Jacob Rosen**, associate professor of computer engineering at the University of California-Santa Cruz. Rosen and **Blake Hannaford**, director of the University of Washington Biorobotics Laboratory, led the team that built the *Raven* system, initially with a U.S. Army grant. NSF funded development of a new generation of the system and the production of the seven identical sets.

The equipment is at Harvard University, Johns Hopkins University, University of Nebraska, University of California-Berkeley, and University of California-Los Angeles, in addition to the developers' own universities. Once installed, the systems will be networked over the Internet for collaborative experiments. This work was supported by NSF grants **0957082** and **0958441**. Read [more](#).



Students with components of the *Raven II* surgical robotics systems. Credit: Carolyn Lagattuta

Sun's "Spit" Predicted, Recorded by Solar Observatory

On January 23, 2012, the sun spit out a huge ball of flame--the largest solar flare recorded since October 2003. The timing and strength of the solar storm were accurately forecast by the nation's Space Weather Prediction Center, using computer models that rely on continuous observations made by the NSF-funded **National Solar Observatory** (NSO).

Solar activity requires vigilance because solar flares and geomagnetic storms have the potential for disabling electronic technologies, such as GPS and telecommunications systems, here on Earth. The January solar flare--or coronal mass ejection, a large, fast-moving clump of electrically charged particles traveling through space--required the rerouting of several airplane

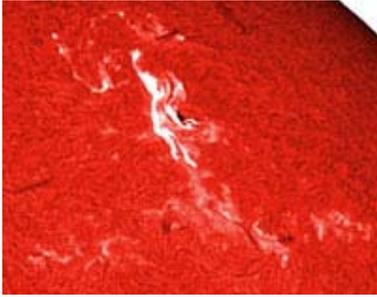


Image of the January 23 solar flare. Credit: NSO/GONG

flights near Earth's northern polar region to avoid increased radiation levels.

Read **more** and watch a **movie** of the solar flare in action, captured by the NSO's Global Oscillation Network Group at a station in Udaipur, India. NSO instruments have been monitoring and providing images of the sun's activity since the 1950s.

Even in Winter, Life Persists in Arctic Seas



Deploying sampling nets from the stern of the *Healy*. Credit: Chantelle Rose/NSF

Despite brutal cold and lingering darkness, life is surprisingly active in the frigid waters off Alaska, even in winter. Scientists aboard an NSF-funded research cruise discovered, contrary to expectations, that microscopic creatures at the base of the Arctic food chain are not dormant.

Working aboard the U.S. Coast Guard icebreaker *Healy* for six weeks, the researchers were surprised to find zooplankton--microscopic organisms that drift in the ocean and bodies of fresh water--actively feeding at low rates. The organism were detected in an area of the globe seldom visited in winter and poorly understood by scientists.

The researchers, from Woods Hole Oceanographic Institution, the University of Rhode Island, and the University of Alaska-Fairbanks, were joined by Ohio high-school teacher **Chantelle Rose**, who sent journal reports home to her school, detailing the wind, waves and wind chills that reached -40 degrees Fahrenheit. Read more in this **NSF press release**.



The *USCGC Healy* in the Bering Sea. Credit: Chantelle Rose/NSF

DID YOU KNOW?

NSF Budget Positions U.S. To Maintain Competitive Edge

On February 13, NSF Director Subra Suresh revealed a \$7.373-billion budget request for the agency for fiscal year (FY) 2013, which represents a 5-percent increase over the FY 2012 enacted budget level. The budget plan emphasizes that new knowledge resulting from federal investments in science and technology is needed to ensure the nation's continued prosperity and competitiveness.

The request includes investments for fundamental research, advanced manufacturing, cybersecurity, sustainability and education initiatives. The budget request and supporting documents are **here**.



Credit: Eliza Grinnell/Harvard SEAS

FACES OF NSF RESEARCH

Opinion Polls: What's Behind the Numbers?

With the presidential campaign in full swing, it seems like new poll numbers flash on our television screens every day. **Vincent Hutchings**--a political scientist at the University of Michigan--knows better than most people what goes into the public opinion polls that help measure who's up and who's down among the candidates and where the public stands on important societal issues.

Hutchings is part of the NSF-funded **American National Election Studies** project, which



Credit: NSF/NBC Learn

conducts its own surveys of citizen views, collecting data that help explain why Americans vote the way they do on Election Day. The studies have helped researchers examine voter behavior and attitudes from more than six decades of presidential elections.

Hutchings says it's possible for campaign pollsters to draw a surprisingly accurate picture of the opinions of a large group of people, using "random sampling"--the statistical

method of surveying a small, randomly assembled segment of that group. He points out that, when reading poll results, it's important to be aware of the "fine print," including how the poll was conducted, the size of the sample, and the margin of error. Despite the small level of uncertainty, Hutchings says, polls are a vital part of the electoral process.



Credit: NSF/NBC Learn

"The reason that opinion polls are important, particularly in the United States, is because we are a democracy," Hutchings says. "Public opinion polls provide us with a way, absent an actual election, to discern where the public stands on various issues."

Learn more in this video.

University of Michigan's Vincent Hutchings explains the science of random sampling, which makes it possible to query a small subset of a population and use that data to accurately determine the opinions of the larger group. Credit: NSF/NBC Learn

NSF IN THE NEWS

Machine Can Tell if Plants' Genes are Modified by Watching Them Grow (*Popular Science*) To explore how gene expressions affect plants, Wisconsin plant physiologist Edgar Spalding creates time-lapse movies of plant root growth with an NSF-funded, 6-foot-high robotic camera.

Growth Spurt at Bolivian Volcano is Fertile Ground for Study (*The New York Times*) The Andean volcano Uturuncu--dormant for 300,000 years--is steadily inflating and could potentially become a "supervolcano." An NSF-funded team is taking radio-wave measurements.

It Adds Up (*Philadelphia Inquirer*) Design Zone, an exhibition funded by NSF, illustrates the relationship between math and the fields of art, music and engineering.

Sound Investment: Temple Team Advances Use of Noise to Purify Water (*National Public Radio*) Researchers at the NSF-supported Water and Environmental Technology Center are using

sound to purify water. Their aim is to make it easier to clean up chemicals in industrial waste and runoff.

THE RIPPLE EFFECT

Science Visualization Helps Earn "The Tree of Life" an Oscar Nod for Cinematography



Cosmic image from "The Tree of Life." Credit: Fox Searchlight

"The Tree of Life," starring Brad Pitt and Sean Penn, earned an Academy Award nomination for best cinematography--thanks partly to the science behind the big screen. At the heart of the film are sequences of the early universe, based on real data. The **Advanced Visualization Laboratory** at the NSF-supported National Center for Supercomputing Applications, University of Illinois, teamed up with the film crew and an astronomer to generate two of the film's spectacular visual sequences--the appearance of the first stars in the cold, dark universe and a flight through a galaxy.

The team employed state-of-the-art computational science to help "create an experience beyond what any other film could provide," says lab director Donna Cox. Using a cluster of computers with about 200 processors and a 9,600-processor supercomputer named **Abe**, Cox's team generated animated visualizations of data from their lab and from the lab of astronomy professor **Volker Bromm**, an NSF grantee working at the Texas Advanced Computing Center. The animations are on-screen for about a minute in the cinematic release.

Calling All Citizens: Measure Light Pollution in Your Night Sky

Light pollution threatens not only our ability to see starlight, but can affect energy consumption, wildlife and health, according to scientists. The NSF-supported **GLOBE at Night** program is an international citizen-science campaign to raise public awareness of the impact of light pollution. During two upcoming periods, March 13-22 and April 11-20, citizens are invited to measure the night-sky brightness and report their observations via the program's **web app**, using their computer or smart phone.

The campaign has run for two weeks each winter or spring for the past six years. People in 115 countries have contributed more than 70,000 measurements, making GLOBE at Night one of the most successful light-pollution awareness campaigns. Learn more from audio podcasts posted on January 1, February 1 and March 1, available on iTunes at **365 Days of Astronomy**.



Citizen scientists measure light in the Arizona night using a hand-held Sky Quality Meter. Credit: GLOBE at Night/NOAO

NSF Takes Active Role in Establishing Worldwide Radio Spectrum Policies

The radio spectrum is an increasingly valuable and scarce resource, needed for applications that include cell phones, mobile broadband, aviation, GPS and defense, as well as scientific research. The **International Telecommunication Union**, an agency of the United Nations, held a **World Radiocommunication Conference** early this year to update the global regulations for use of the radio spectrum. NSF program officers Tomas Gergely and Andrew Clegg joined the accredited U.S. delegation to represent the radio-spectrum interests of NSF-funded science and engineering activities, helping to obtain:



An artist's conception of the

- Improved protections for the use of spectrum from 275 GHz to 3 THz, a frequency range used, for example, by the new NSF-supported **ALMA** radio astronomy facility in Chile.
- New global frequency bands for ocean radars, which can remotely monitor ocean currents out to 100 miles or more, and which may eventually be used for tsunami warning and predicting the path of vessels or persons lost at sea.
- Future consideration of the spectrum needs of small satellites, such as the innovative, NSF-funded Cubesat projects now being used to monitor and understand the Earth-space environment.
- Consideration of the needs of radio astronomy in the 76-81 GHz band, which the automotive industry would also like to use to accommodate vehicular radars for

ALMA antennas. Credit:
NRAO/AUI and ESO

collision avoidance, self-parking and other purposes. Such radars, when operating near radio observatories, could interfere with astronomical observations.



*The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. Its Fiscal Year 2012 budget is \$7.0 billion. NSF funds reach all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives more than 50,000 competitive requests for funding and makes about 11,000 new funding awards. NSF also awards nearly \$420 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: Amber Jones. Editor: Amber Jones. Contributors: Josh Chamot, Leslie Fink, Lee Herring, Neysa Call.*



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