

PROGRAM DESCRIPTION

The Major Research Instrumentation Program (MRI) strengthens the U.S. scientific enterprise by investing in state-of-the-art research instrumentation at our Nation's institutions of higher education, research museums, and non-profit research organizations. The MRI program provides researchers and students access to state-of-the-art scientific and engineering equipment when pursuing new knowledge and discoveries in environments that integrate research with education. MRI-funded instrumentation fosters tangible outcomes including: facilitating the recruitment of researchers and students (particularly underrepresented groups and women pursuing advanced degrees in science and engineering); improving the quality of student research training; and enabling organizations to reach their research and student development goals. The program promotes the development and acquisition of research instrumentation for shared use among different entities and in concert with private sector partners.

Proposals for instrumentation are considered for all NSF-supported fields of science, mathematics, and engineering. Researchers using this instrumentation need not be supported by NSF or the Federal government.

The maximum request for instrument development is \$2 million. Proposals may also request up to \$2 million for a single instrument, a large system of instruments, or multiple instruments that share a common or specific research focus. The MRI program will consider larger, "mid-range" (greater than \$2 million and up to \$4 million) proposals for the acquisition of single instruments only.

OFFICE OF INTEGRATIVE ACTIVITIES

The Office of Integrative Activities (OIA) catalyzes excellence in research and education across the National Science Foundation. It funds emerging, cross-disciplinary research, education centers, and programs that enhance scientific discovery, invest in research infrastructure and strengthen the nation's technically trained workforce. OIA manages EPSCoR (Experimental Program to Stimulate Competitive Research), MRI (Major Research Instrumentation), and the agency's Science and Technology Centers throughout the United States, as well as prestigious honorary award programs—such as the National Medal of Science and the Alan T. Waterman award—and professional internships. OIA provides policy support to the director and deputy director of the National Science Foundation and plays a leadership role in working across organizational boundaries to promote agency-wide policy, programmatic and operational unity and alignment.

MRI GOALS

- Catalyzing new knowledge and discoveries
- Empowering the Nation's scientists and engineers
- Providing state-of-the-art research instrumentation
- Enabling research-intensive learning environments
- Building capacity for a diverse workforce
- Developing next generation instrumentation
- Promoting academic/private sector partnerships

MRI@NSF.GOV

www.nsf.gov/od/oia/programs/mri

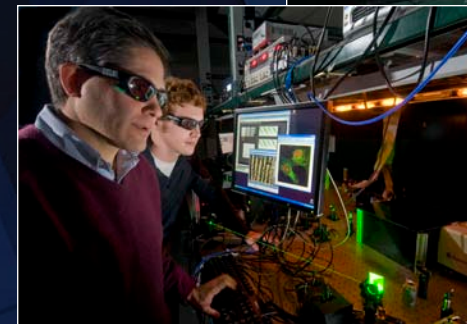
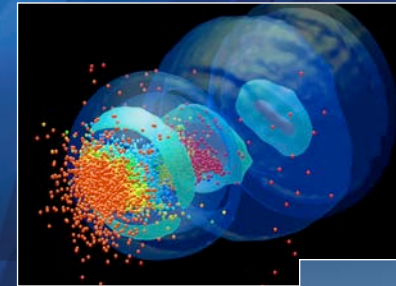
NSF-2009-5



**NATIONAL
SCIENCE
FOUNDATION**

Major Research Instrumentation

OFFICE OF INTEGRATIVE ACTIVITIES



MRI - Strengthening the Nation's Research Infrastructure



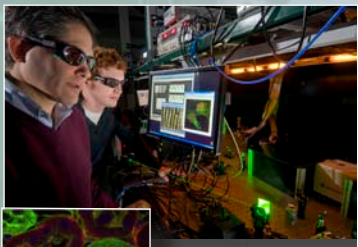
Archaeologists at the University of Arkansas use the High Accuracy Resolution Landscape and Structure Characterization System, to provide extremely detailed information about targeted surfaces. The system supports high density surveys of famous archaeology sites -



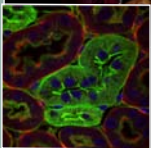
Picchu. These NSF funded instruments have also been used to scan artifacts retrieved from archaeological sites and to provide extremely detailed data on the anatomy of skeletons for anthropological research.



University of Wisconsin-Madison's CAMECA 1280 ion microprobe enables highly precise and accurate oxygen and lithium isotope, and trace element analysis of zircons-Earth's oldest fragments-using micron scale spatial resolution. The oxygen isotopic composition of zircons suggest that the protoliths were altered at low temperature by interaction with liquid water on Earth's surface. A possible conclusion is that condensation of oceans on the Hadean Earth may have created conditions habitable to life. If so, microbial life may have evolved over 400 million years earlier than previously thought.



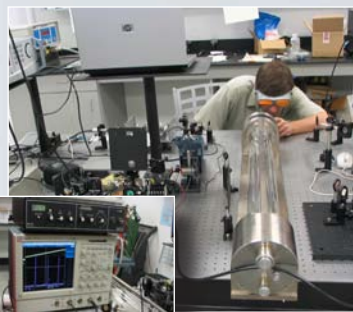
Researchers at Michigan State University have developed ultrashort pulse lasers and the technology used to improve biomedical imaging. The cells inside a mouse kidney are displayed here using 15 femtosecond pulses.



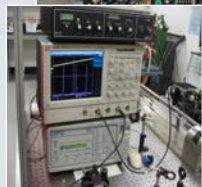
Without pulse compression, the signal would be a factor of 45 times weaker.



Researchers at North Dakota State University's High-Throughput Genotyping Center examine the stresses that affect crop production. Capillary sequencing, robotic DNA extraction and dispensing systems are some of the tools NSF funded to help researchers understand the molecular genetic basis of the stresses in order to address them in a timely manner.

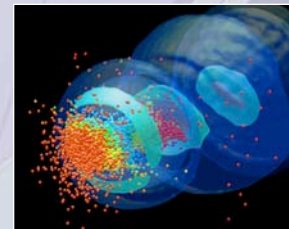


Imagine detecting oil without drilling, hidden explosives without opening containers, or early stages of cancer just by smelling a person's breath. The Optical Nose, developed by researchers at the University of Alabama at Birmingham, uses



a mid-infrared laser in conjunction with compatible sensing, signal enhancing and molecule identification techniques to simulate biological olfaction functions. It effectively mimics a magnified sense of smell and visually displays it as absorption patterns specific for each detected molecule.

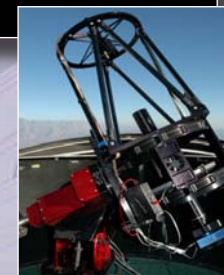
Colorado State University researchers use an Aerosol Mass Spectrometer (AMS) to measure near-roadway particulate matter. The AMS measures mass concentrations of particles smaller than 1 micron in diameter, a size class strongly linked to adverse health effects. Concentrations of particles rich in organic carbon were associated with increases in traffic during the morning rush hour, but also were observed in the late evening and early morning hours. Findings from this research will help inform policy decisions related to urban planning, including the siting of schools.



Using the MRI funded Dawson computer cluster, physicists from the University of California in Los Angeles created computer simulations to guide the development of a plasma-driven accelerator that yields much higher particle energy gains over relatively shorter distances compared to conventional particle accelerators. The ionization induced head erosion, which is responsible for the upper limit in energy gain, is shown by the orange particles in the above image.



Panchromatic Robotic Optical Monitoring and Polarimetry Telescopes is a project undertaken by the University of North Carolina at Chapel Hill at Cerro Tololo Inter-American Observatory in Chile. PROMPT enables researchers to observe rapid and simultaneous multi-wavelength gamma-ray burst afterglows, some when they are only tens of seconds old, as well as to measure in unprecedented detail redshifts by dropout and extinction curves of sufficiently bright afterglows.



Researchers at Berea College have developed a miniature robot "scout" that obtains surveillance data in areas that pose significant risk to human beings or are unreachable in any other way. The robots, which can withstand repeated impact, can be thrown into position as well as be deployed from remote-controlled unmanned aerial vehicles. The robots have been deployed in Iraq in advance of ground forces, as well as adapted for educational, research, and outreach programs—including a robotics camp for middle school students from underrepresented groups.