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NSF Makes Cyberinfrastructure-TEAM Awards

New program prepares a cyber-savvy workforce



NSF's new CI-TEAM program supports research and education for a cyber-savvy workforce.

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October 18, 2005

The National Science Foundation (NSF) has awarded 11 projects for a total of over \$2.6 million in the inaugural year of its Cyberinfrastructure (CI)-TEAM program. CI-TEAM signals NSF's commitment to join the national science and engineering community in preparing a cyber-savvy workforce that possesses the knowledge and skills to create, advance and exploit cyberinfrastructure.

Broadly defined, the term "cyberinfrastructure" encompasses the technology and network systems that have infiltrated every aspect of today's modern world. From the farmer who uses a global positioning system to pinpoint fertilization needs in fields to the consumer who pays their monthly bills online with a few keystrokes, cyberinfrastructure is everywhere.

Information technology systems, tools and services have also integrated into an international cyberinfrastructure resource that has revolutionized science and engineering research. To harness the full power of cyberinfrastructure and its promise for discovery, learning and innovation, a sustained investment to train current and future generations of scientists and engineers is paramount.

"CI-TEAM represents the investment in people needed to complement our investment in cyberinfrastructure technology to ensure it is used, useful and usable," explained Miriam Heller, a program manager in NSF's Office of Cyberinfrastructure.

This first CI-TEAM solicitation sought promising "demonstration projects" effectively engaged in national and global research and education activities involving cyberinfrastructure. Each project will last 1-2 years and be supported with approximately \$250,000.

The successful proposals cover a wide variety of cyberinfrastructure resources, research areas and educational mechanisms. Examples follow.

- More than 50 percent of the world's population lives less than 100 miles from a coastline, geographic areas regularly challenged with environmental degradation and extreme events. The availability of cyberinfrastructure to support data-intensive modeling and simulation of coastal processes would transform the ability of scientists and engineers to improve water quality and resource management, emergency preparedness and response, and planned development impact studies.

The University of Florida's Renato Figueiredo trains members of coastal science and engineering communities to develop and use a cyberinfrastructure that incorporates grid computing systems, middleware and web-based portals for access to interactive hydrodynamic modeling software. The University of Florida, a national estuarine research reserve, and a Fla. water management district serve as the project's leaders.

Through "science gateways" operating on standard web browsers, users learn to run hydrodynamic simulations on powerful computing resources connected via grid. The associated middleware, functioning in the background to ensure interoperability of the entire system, allows users to work with a range of simulators, coded in a variety of computer languages with diverse user interfaces.

- Scientists can detect rarely occurring ultra-high energy cosmic rays (UHECRs), but their origin is unknown. Because UHECRs have energies 10 million times stronger than the highest energy man-made particles, learning more about them has been identified as a national priority.

Helio Takai, at Brookhaven National Laboratory, devised an unconventional technique to search for the source of UHECRs by simultaneously acquiring and analyzing real-time detection and GPS data over multiple sites. For the CI-TEAM project, Takai engaged high-school and community college teachers and students at 13 detector sites in the New York region to search for UHECRs while they learn about leading-edge energy physics and cyberinfrastructure. The networked detector sites allow a distributed set of students to work first-hand in cosmic physics while utilizing advanced computing tools and infrastructure.

- Engineers, including those building "snake-inspired robots," now routinely design and analyze complex prototypes on computers, rather than building and testing actual physical models. Their small diameter, locomotion characteristics and maneuverability make snake-inspired robots well suited for applications in homeland security and defense, urban search and rescue, and minimally-invasive surgeries. However, a multitude of challenges must be dealt with before realizing a functional, finished machine. Expertise in chemistry, computer science, electronics, materials science and physics come into play.

If the contribution of each discipline is thought of as an individual "model," the finished robot represents the comprehensive model, built using knowledge and data from unrelated sources. Correctly interpreting and combining the disparate models challenges even the best engineers and calls for more holistic, interdisciplinary training and collaborative design.

To address such engineering complexities, Drexel University's William Regli, together with his collaborators at three other universities, envision a new discipline termed "engineering informatics," which trains engineers to use the tools of cyberinfrastructure to efficiently merge informational models.

Regli's demonstration project uses a multi-course curriculum focused on employing cyberinfrastructure for collaborative model building, allowing virtual teams of student engineers advance the state-of-the-art in snake-inspired robotic systems while training to exploit cyberinfrastructure for other applications.

Complete list of 2005 CI-TEAM awards:

Adler Planetarium / L. Fortson **\$249,344**

Introducing High School Science Teachers to 21st Century Research Techniques by Cyberinfrastructure

Drexel University / W. Regli **\$250,000**

Exploiting Cyber-Infrastructure for Creation and Use of Multi-Disciplinary Engineering Models

Florida International University / H. Alvarez **\$224,700**

CyberBridges

Institute for Higher Education Policy / G. Fox **\$250,000**

Bringing Minority Serving Institution Faculty into the Cyberinfrastructure and e-Science Communities

Ohio State University Research Foundation / S. Gordon **\$250,000**

Leveraging Cyberinfrastructure to Scale-Up a Computational Science Undergraduate Curriculum

Pennsylvania State University / T. Simpson (lead) **\$61,390**

University of Missouri-Rolla / R. Stone **\$66,647**

SUNY at Buffalo / K. Lewis **\$62,662**

Drexel University / W. Regli **\$54,308**

Collaborative Research: Cyber-Infrastructure-Based Engineering Repositories for Undergraduates (CIBER-U)

Shodor Education Foundation Inc / R. Panoff **\$250,000**

Pathways to CyberInfrastructure

SRI International / C. DiGiano **\$249,880**

Preparing for Cybercollaboration Between Scientists and Software Developers

SUNY at Stony Brook / H. Takai **\$203,988**

Cyberinfrastructure via MARIACHI

University of Florida / R. Figueiredo **\$250,000**

Coastal and Estuarine Science Cyberinfrastructure: Training and Deployment

Virginia Tech / O. Crasta **\$250,000**

Cyberinfrastructure Through Project-Centric Bioinformatics

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Media Contacts

Richard (Randy) Vines, NSF (703) 292-7963 rvines@nsf.gov

Program Contacts

Miriam Heller, NSF (703) 292-7025 mheller@nsf.gov

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The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

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