



Expanding Student & Teacher Horizons

A computer boot camp...a tri-university science research partnership for undergraduates...nanoscale research experiences for teachers. These are the foci of some of the summer education and outreach programs for college and high school students and teachers offered under the auspices of LA EPSCoR's CyberTools faculty.

They are also manifestations of National Science Foundation (NSF) strategies to integrate research and education in its funded programs and provide researchers, educators and students with opportunities to engage in joint efforts that infuse education with the excitement of discovery and enrich research through a diversity of learning perspectives.

Highlights of just some of the summer education and outreach programs affiliated with the NSF-funded CyberTools project include:

A collaborative program of LA Tech University's Institute for Micromanufacturing (IfM), Tulane University's Center for Computational Science and its Biochemistry department, and the University of New Orleans' (UNO) Chemistry



Dr. Steven W. Rick, University of New Orleans Associate Professor of Physical and Biochemistry, third from left, and his team, from l to r, undergraduates Tucker Adams and David Brooks; graduate students Alexis Lee and Hongtao Yu; and undergraduate James Crouch.

department is open to undergraduates of those institutions and Xavier University.

Its goal is to introduce students to computational techniques in applications that may include molecular dynamics, computational fluid flow, enzyme kinetics, and antibody-antigen interactions. The six-week program places teams of students at one of the universities accord-

ing to their academic background and preference.

At UNO, for example, the focus is research that could lead to the development of small, hand-held sensors. Explaining, Dr. Steve Rick, the UNO Associate Professor of Physical and Biochemistry who leads his institution's team, says participants use computer simulations to predict the structures of antibodies in contact with metal complexes.

"Understanding these structures can help in the design of better sensors, which would ultimately lead to the development of small, hand-held sensors that could check the purity of environmental samples out in the field.

"The program is a great educational experience that brings together students with a variety of backgrounds, including biology, chemistry and computer science, a perfect combination for this project. They enjoy having the ability to contribute in their own way and to see how their knowledge could be applied towards a technological goal," explains Dr. Rick.

The Beowulf Boot Camp for High School Students and Teachers is hosted by the LSU Center for Computation and Technology (CCT). It offers participants the opportunity to work hands-on with the Center's researchers, including Professor

CyberTools Project Leader Recipient of Prestigious Award



Dr. Tevfik Kosar, Assistant Professor, Computer Science, Louisiana State University (Photo by Eduardo M. Perez, LSU)

The National Science Foundation's "most prestigious award" reserved for junior faculty deemed most likely to become the 21st century's academic leaders has been received by Dr. Tevfik Kosar, a leader of LA EPSCoR's current CyberTools project. A five-year \$400,000 grant accompanied the award.

The NSF CAREER award brings with it the recognition that Dr. Kosar, an LSU Assistant Professor in Computer Science and Center for Computation & Technology (CCT), exemplifies "the role of teacher-scholar through outstanding research, excellent education and the integration of education and research activities within the context of their institutions."

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Thomas Sterling, a former NASA scientist who invented the Beowulf supercomputing cluster.

They learn how to use supercomputers for research, develop and run basic applications, and experiment with computer science techniques for video games. Hands-on activities include building a computer from its parts, installing a Linux operating system in the computer, and learning how to program a mini-supercomputer.

CCT also offers a **Parallel Programming and Cluster Computing Workshop** for undergraduate faculty from a variety of disciplines who are interested in adding parallel computing to their teaching and research. The hands-on program includes exercises in both programming and curriculum development. Undergraduate and graduate students are also invited to attend alongside a sponsoring faculty member.

LA Tech's Nanoscience and Education Outreach program concentrates on the disciplines of molecular science and nanotechnology, a combination of biology and engineering at the nanoscale. It links engineers, scientists and graduate students in IfM and the Colleges of Applied and Natural Science and Engineering and Science with students and teachers from rural and urban school systems in northern Louisiana.

Teachers learn about engineering and science through interactions with university researchers and conducting bionanotechnology research using state-of-the-art equipment under the mentorship of university faculty and students.

"The interdisciplinary outreaches of our NSF-funded Infrastructure Improvement Project, also known as CyberTools, are



Louisiana Tech University nanoscholars working on a lesson that explores the nanoscale.

of particular interest to researchers in materials science, nanotechnology, environmental and biological science," notes LA EPSCoR Project Director Michael Khonsari. "It thus expands the horizons and possibilities for participating students and teachers."

"Students enjoy having the ability to contribute in their own way and to see how their knowledge could be applied towards a technological goal."
(UNO Associate Professor of Physical & Biochemistry Steve Rick)

Kosar Continued

Dr. Kosar leads the team that performs the Data Management and Scheduling Services supporting CyberTools' science projects. His CAREER grant was awarded for a project to develop new computing

systems that manage data more effectively with automated processes, enabling scientists to spend more time focusing on their research questions and less time dealing with data management.

"This project will not only impact computer science research by changing the way computing is performed, but will also change how domain scientists perform their research by facilitating rapid analysis and sharing of raw data and results," explains Dr. Kosar.

"It will help scientists start thinking about totally new scenarios where simulations are closely coupled with large amounts of observational and experimental data, which would revolutionize science, not just in the new scenarios but in the way it will bring the computational, theoretical, and experimental scientists together."

Dr. Kosar is the prime designer and developer of the Stork Data Scheduler, which makes it easier and more efficient to access and transfer large data sets. His other major scientific contributions include his work on the Condor project, a high-throughput computing software framework that manages workload on a dedicated cluster of computers, and/or farms out work to idle desktop computers.

The Cyber Tools Project

In 2007, NSF EPSCoR awarded the Board of Regents' LA EPSCoR program a \$9 million Research Infrastructure Improvement Grant for a team of researchers from nine Louisiana universities to develop new cybertools enabling significant science and engineering advances. With matching funds of \$3 million from the Board of Regents Support Fund and \$3.2 million from participating institutions, the three-year award totaled over \$15.2 million.

