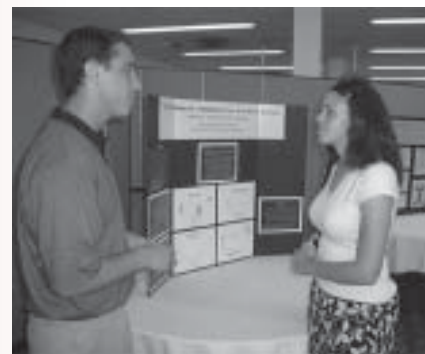


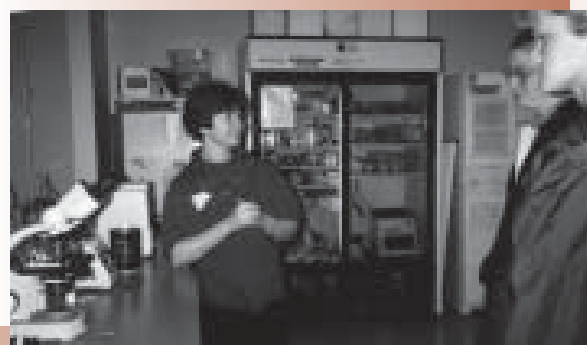
Nebraska EPSCoR

ANNUAL REPORT

*For the period ended
June 30, 1999*



*Experimental
Program to
Stimulate
Competitive
Research*



A Note from the Chair



I am pleased to report that the Nebraska EPSCoR program continues to provide assistance to state researchers. By the end of June, 1999—our 6th full year of operation—\$25.9 million in research funding have been obtained through the EPSCoR mechanism in Nebraska. This year six new grants were obtained from the Department of Defense's DEPSCoR program and supplemental funding was added to the NASA EPSCoR project. We completed the first cooperative agreement with the National Science Foundation, and NSF's co-funding mechanism produced over \$1 million. Highlights of some of this year's activities are detailed in this report.

Dr. Robert W. Allington
Chair, Nebraska EPSCoR Committee
CEO and Chairman, ISCO, Inc.

Newsmakers & National News

Robert Allington (EPSCoR Committee Chair) was honored with Nebraska's Entrepreneur of the Year Award by the Nebraska Center for Entrepreneurship.

Prabir Bhattacharyya (DEPSCoR grantee) received a Faculty Research Award from the College of Engineering and Technology, UNL.

Bernard Doudin (materials cluster) received a NSF CAREER Development award for his work in "Single Spin Electronics".

Priscilla Grew (Co-PD NSF) returned to teaching and research in Geosciences from her Vice Chancellor for Research position at UNL.

Larry Harshman (metallobiochemistry and bioremediation clusters) received a Distinguished Teaching Award from the College of Arts and Sciences, UNL.

Alan Kamil and **Alan Bond** (behavioral biology cluster) received national and international attention from CNN, the BBC and the Chronicle for Higher Education for their paper in *Nature* on the use of geometry by Clark's nutcracker in locating prey.

Robert Klucas (metallobiochemistry cluster) was named Director of the Center for Biological Chemistry and Head of the Dept. of Biochemistry at UNL.

Diandra Leslie-Pelecky (materials cluster) received a NSF CAREER Development award for her project entitled "Cluster-Assembled Magnetic Nanostructures".

James Merchant (ESS/GPN) received the first "outstanding contributions" award by the Nebraska GIS/LIS Association.

Gergely Toth, (Creighton bio-organic grad. student) received an award for best poster presentation at the American Peptide Symposium in Minneapolis.

Tian Zhang (bioremediation cluster) received a Faculty Research Award from the College of Engineering and Technology, UNL.

Quiming Zhu (DEPSCoR grantee) was appointed to the Kayser Professorship at UNO which honors outstanding performance in research/creative activity.

Awards received in FY 1998-99

NSF EPSCoR
\$2.15M
DEPSCoR
\$1.57M
NASA
\$225,000

First NSF Cooperative Agreement: 1993-1998

The first cooperative agreement (1993-1998) with the National Science Foundation had a major impact on the development of five participating research clusters in Nebraska.



Enhanced research competitiveness in these groups is evidenced by the external grants received by faculty in these groups (approximately \$40 million in the past five years), an increased proportion of funded faculty (from 43% to 82% in one cluster), extensive collaborations with the private sector (49 companies and foundations), and the on-going activities of research and graduate training as well as hundreds of technical publications, presented papers and patents. Clearly, the NSF EPSCoR investment

in Nebraska increased the research competitiveness in the areas of (1) materials research on nanostructured and complex systems, (2) behavioral biology: the adaptation/mechanism interface, (3) the function of metals in natural processes, (4) accelerated bioremediation of xenobiotics in soil and water, and (5) gene expression in plants. Previous annual reports provided details of these and other benefits associated with S&T planning, research initiation by new investigators, tech transfer, and minority student education.

State EPSCoR Conference

A state conference focusing on research applications of new high-speed networks such as GPN and I2 was held on November 17, 1998. The conference entitled “Internet 2: The Future of University Research” was held with the assistance of UNL's Information Services. The conference was well attended with over 125 participants and was also broadcasted live over the Great Plains Network. Some highlights of the program included: Terry Rogers and Ted Hanss from UCAID talked about the Abilene Project and Research Applications over Internet 2. Rick Summerhill of the Great Plains Network focused on the role of the Great Plains Network in support of research.

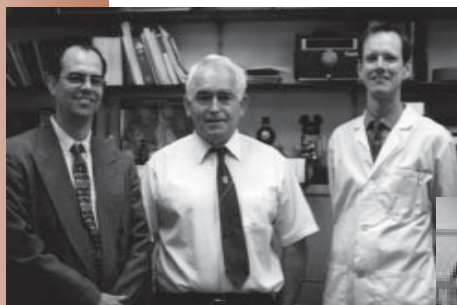
Other highlights included demonstrations of various I2 Applications having to do with “hard” science—a biodiversity project at the Univ. of Kansas Natural History Museum, a 3-D climate visualization project from the National Center for Atmospheric Research, and a satellite data and visualization demonstration from the Earth Resources Observation Systems Data Center in Sioux Falls, SD. The fourth had to do with the “arts”—a digital library project at the Indiana University of Music Library where composers and composition students can log on, select a work and listen to the music while they study the score.



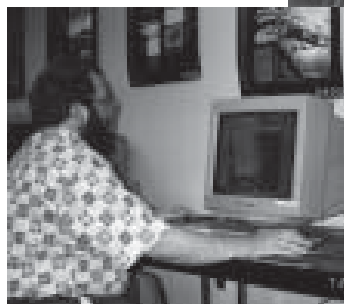
Internet 2 demonstrations

NSF Project News

Our current cooperative agreement with the National Science Foundation involves infrastructure development in three specific areas on three campuses. The **complex simulations lab** facility established at the University of Nebraska at Omaha has included research on chemical modelling of large structures (Drs. Stack and Wood) and modelling the theory of phase transitions in solid materials and developing improved interatomic



Creighton,
UNL, and
UNO
project
participants



potentials to extend computations to polar materials (Drs. Mei, Duan, Ossowski, and Liu). Several other projects in early developmental stages involve using satellite data to study glaciers and cloud formations in central Asia (Drs. Bishop and Shroder) and developing a range of virtual environment prototypes for visual imaging studies. The **bio-organic** group at Creighton University has established advanced technologies for molecular dynamics studies of peptides and proteins including conformational studies of certain growth hormones (Dr. Lovas) and peptide based antibiotics from skins of frogs (Dr. Conlon). As noted on page 2, Gergely Toth recently won a best poster presentation award. The **computational research**

facility at the University of Nebraska-Lincoln is now up and running with some 31 users from 7 departments. Examples of research currently underway include weather prediction (Dr. Rowe), sub-atomic physics (Dr. Starace), vehicle crashworthiness (Dr. Reid), detonations (Drs. Hardy and Swanson), droplet combustion (Dr. Gogos), and data encryption (Dr. Magliveras).

NSF-EPSCoR Co-funding Success

In FY98, NSF-EPSCoR began a program to enhance shared funding responsibility between the EPSCoR program and the programs of regular NSF research directorates (see p. 7 Annual Report, 1997 for rationale and mechanism). This initiative, referred to as “co-funding” offered to enhance funding of proposals from EPSCoR states. Funds to support this initiative came from reducing each EPSCoR state’s NSF cooperative agreement by \$500,000 per year. All but one EPSCoR state benefitted from this new co-funding approach according to data presented by Dr. Jane Harrington, NSF-EPSCoR program officer. In co-funded awards, Nebraska researchers received over twice the amount of the reduction in the cooperative agreement. On average, co-funded awards from NSF totaled over \$1.6 million in 1998.



Jane Harrington and Jim Hoehn,
NSF EPSCoR Program Officers

NASA EPSCoR Progress

The third of three years of NASA Nebraska EPSCoR funding is culminating in exciting cluster research results. Researchers working on Remote Sensing and Earth Data Systems developed an algorithm that will be used by NASA to enhance images from NASA's LANDSAT 7 satellite, launched in 1999. The Space Environmental Protection cluster researchers have continued in their research as well. Crack free aluminum oxynitride has been successfully sputter deposited on space-grade encapsulant epoxy. Preliminary tests indicate this material serves as a hermetic seal against oxidation. The two mini-clusters are also making progress. The UNO Aviation Institute, on behalf of the NASA Nebraska EPSCoR program, submitted a proposal for a NASA EPSCoR Preparation grant designed to forge new collaborations and strengthen existing cooperative efforts between Nebraska researchers and NASA research personnel. The proposal included plans for the development of a new research cluster that will support NASA's efforts to implement a Small Aircraft Transportation System (SATS) as envisioned in its National General Aviation Roadmap. Findings from this cluster will support the efforts of NASA personnel at Langley Research Center and key stakeholders charged with planning the eventual implementation of SATS. Finally, a two-year renewal proposal is being submitted in August 1999 for an extension to the original three-year award.



UNO Aviation
Institute visit by
Astronaut Paul
Richards

Defense Research Competitiveness

The Department of Defense's "DEPSCoR" program over the past five years has awarded 32 grants to Nebraska researchers totaling over \$8.1 million. In the most recent competition, six grants were awarded to scientists in Nebraska who are doing research of special interest to the Department of Defense. The new awards are shown below.

- Ram Narayanan** (Electrical Engineering, UNL), AFOSR. *"Random Noise Polarimetry Technique for Covert Detection of Targets Obscured by Foliage"*
- Quiming Zhu** (Computer Science, UNO), AFOSR. *"Non-monotonic Extrapolation of Causal Relations for Knowledge-base Decision Support Using a Goal-driven Approach"*
- George Gogos** (Mechanical Engineering, UNL), ARO. *"Subcritical and Supercritical Evaporation/Combustion of Single Fuel Droplets within Forced Convection Environments"*
- Joseph Turner** (Engineering Mechanics, UNL), AFOSR. *"Dynamic Response of MEMS"*
- Yuris Dzenis** (Engineering Mechanics, UNL), ARO. *"Development of a New Generation of Advanced Polymer Composites with Nanoreinforced Interfaces"*
- Ruqiang Feng** (Engineering Mechanics, UNL), ARO. *"The Role of Interface Topography and Friction on Dynamic Fracture Failure of Ceramics"*

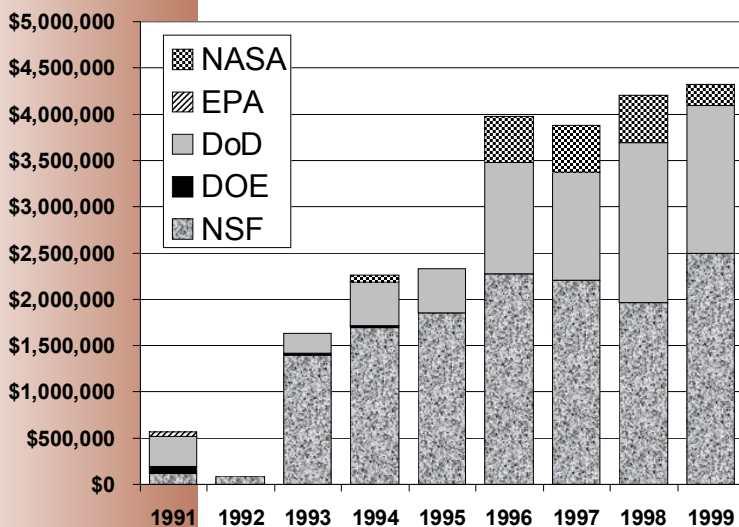
NSF EPSCoR National Conference

Ten representatives from Nebraska attended the 14th Annual NSF EPSCoR National Conference held in Myrtle Beach in November. The conference, “Engaging Industry,” was organized by the state EPSCoR program in South Carolina. The conference featured national speakers and discussions highlighting successful programs and important issues faced by EPSCoR. Topics ranged from development of competitiveness in basic research and science education to strategies for technology transfer.



Activities Supported in FY 1998-99

- Statewide conference held in conjunction with UNL's Information Services focused on “Internet 2: The Future of University Research,” Nov. 17, 1998.
- **Conference/Workshop Support:** Science Workshop for Minority High School Students, Lawrence, KS; Women in Science Conference, Lincoln; Regional Materials Conference, Tulsa; NCURA's Satellite Video Conference on Award Administration at UNO.



Federal R&D funds received through Nebraska EPSCoR

by NSF staff from Social, Behavioral and Economic Sciences, materials research, FASTLANE, and grants administration.

- **Educational activities:** NSF Graduate Education for Minority (GEM) Students Program and support of undergraduate GEM scholars; Educational Talent Search Summer Program; Seminar on “Bioinformatics”; Created “Writing from the Winner's Circle: A Guide to Preparing Competitive Grant Proposals” web publication.
- **Outreach Activities:** Participation in AAAS Leadership Development discussions and conferences in Washington D.C. (Ehler’s Report Symposium); San Francisco and San Diego, CA; Lawrence, KS; Stillwater, OK; Lincoln, NE; Biloxi, MS as well as conferences in Chapel Hill, NC; Tulsa, OK (materials and engineering) and Reno, NV (biological sciences). Outreach visits
- **Research:** Research and infrastructure development supported by NSF, NASA, and DoD; grant proposal development trips to Davis, CA; Louisville, KY; Fayetteville, AR; Washington, D.C.; and recruitment of staff for research coordination in the Computational Research Center; SBIR grant proposal development in cooperation with NTDC.
- Total federal funds attributed to the EPSCoR mechanism amount to \$25.9 million since Nebraska was identified as an eligible state.

EPSCoR Regional Initiatives

The EPSCoR programs in the Great Plains have increased their interactions and cooperation since the Great Plains Network grant, and future collaborations are planned. Two areas of interactions include collaborative grants and cooperative conferences. The AAAS earth systems science conference in South Dakota led to a conference in Kansas. Nebraska scientists and students participated in two additional conferences described below.

Top photo courtesy of Lawrence Journal-World

Science Workshop for Minority High School Students.

This workshop, held on March 25-27 in Lawrence, Kansas was sponsored by the EPSCoR programs in Kansas, Nebraska, Oklahoma and South Dakota in cooperation with the Brown Foundation and the KU Math and Science Center. High school students from the four states were provided information about college life and careers in science, math and engineering as well as treated to science demonstrations by science faculty from the four states that ranged from DNA finger printing to tornado research.



Women in Science Conference. Co-sponsored by the Center for Science, Mathematics, and Computer Education at UNL, this conference featured Dr. Ruth Howes, Distinguished Professor of Physics and Astronomy at Ball State University. Organizer Sandra Scofield (EPSCoR State Committee member and Director of the UNL center) said that high school girls from Nebraska and Oklahoma met women role models and explored future opportunities in science. Students heard from panels of successful women professionals in academe, industry, and government. A highlight of the conference was the opportunity to visit research settings and labs of UNL women scientists who described and demonstrated their research. The conference was held on April 23-24 in Lincoln.



An EPSCoR Loss



Nebraska EPSCoR regrets to report the death of Dr. Michael Mulder, Co-director of EPSCoR's complex system simulation lab project at UNO. We will miss his expertise greatly. Dr. Mulder was the founding Dean of the College of Information Science and Technology at the University of Nebraska at Omaha, Co-Dean of the Peter Kiewit Institute of Information Science, Technology and Engineering, and a registered professional engineer. He was a member of the Board of Directors of the Institute of Electrical and Electronic Engineers (IEEE), a member of the Board of Governors of the IEEE Computer Society, a commissioner of the Computing Sciences Accreditation Commission, and an advisor to the National Science Foundation (NSF). Dr. Mulder had a broad background in computing, including leadership roles in academe, industry, and government. He was an active researcher in complex information systems and educational teaching/learning pedagogy. Dr. Mulder received 10 awards and recognitions for his many contributions to the profession as well as many grants and awards from the NSF and industry. He was a senior consultant with the Boeing Company for many years and published over 100 technical and educational papers.

State EPSCoR Committee Members

EPSCoR: An Investment in Science and Engineering Research Competitiveness

Dr. Robert Allington, Chair, CEO and Chairman, ISCO, Inc., Lincoln

Dr. Lee Jones, Vice Chair, Executive Vice President and Provost, University of Nebraska

Dr. Dennis Alexander, Director, Center for Electro-Optics and Kingery College
Professor of Electrical Engineering, UNL

Dr. David Crouse, Associate Vice Chancellor for Academic Affairs, and Associate
Dean for Graduate Studies & Research, UNMC

Dr. Gary Curtis, Vice President of Clinical Operations, Harris Laboratories,
Lincoln

Dr. F. Joseph Daugherty, Management Consultant, Omaha

Dr. Derek Hodgson, Vice Chancellor for Academic Affairs, UNO

Mr. Lyle Middendorf, Vice President of Research & Development, LI-COR, Inc.,
Lincoln

Dr. Richard Murphy, Chairman, Biomedical Sciences and Associate Dean of
Research, Creighton University

Mr. Herman Person, Director, Corporate Product Development, Dale Electronics,
Columbus

Dr. Sam Rao, Vice President of Research, ConAgra Trading & Processing Cos.,
Omaha

Dr. Richard Reinhardt, Moran Professor of Periodontology and Director of
Research, College of Dentistry, University of Nebraska Medical Center, Lincoln

Ms. Sandra Scofield, Director, Center for Science, Mathematics & Computer
Education, UNL

Dr. David Sellmyer, Director, Center for Materials Research & Analysis and
George Holmes Distinguished Professor, Physics & Astronomy, UNL

Dr. Robert Sweeney, Executive Director,
Applied Information Management Institute,
Omaha

Dr. Marsha Torr, Vice Chancellor for
Research, UNL

Dr. James Van Etten, William Allington
Distinguished Professor of Plant Pathology,
UNL

Mr. Al Wenstrand, Director, Nebraska
Department of Economic Development

Mr. Cliff Williams, President, International
Sensor Systems, Aurora

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