

# Nebraska

# EPSCoR

## ANNUAL REPORT

*For the period ended  
June 30, 1998*



*Experimental  
Program to  
Stimulate  
Competitive  
Research*



## A Note from the Chair

The Nebraska EPSCoR program continues to provide assistance to state researchers. By the end of June, 1998 — our 5th full year of operation — over \$23 million in research funding have been obtained through the EPSCoR mechanism in Nebraska. Significant new funding this year includes a new Cooperative Agreement with the National Science Foundation and new grants from the U.S. Department of Defense's DEPSCoR program. It is noteworthy that our program for beginning investigators (see p. 7) has had major success. 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.

## Nebraska EPSCoR Newsmakers

**Supriyo Bandyopadhyay** (DEPSCoR scientist) was honored by ARO through selection of his atomic force micrograph of an electropolished thin aluminum film as one of the four most notable achievements in nanoscience. His micrograph was included on an ARO nanoscience poster along with three others from Caltech, UCLA, and University of Rochester.



*Dr. Bandyopadhyay  
with ARO poster*

**Joseph Dulka** (behavioral biology cluster scientist) was invited to organize the prestigious J.B. Johnston's Tenth Annual Workshop on Steroid Action on Brain and Behavior at the Nov. 1998 meeting of the Society for Neuroscience in Los Angeles.

**Gustavo Larsen** (materials scientist) received a prestigious Career Award from NSF for studies on Molecular Imprinting of Metal Oxides.

**Ram Narayanan** (DEPSCoR scientist) has been appointed to a National Research Council committee to help coordinate national and international activities relating to the allocation and assignment of radio frequencies everywhere from outer space to the ocean floor.

**Reuben Rieke** (materials cluster scientist) won the 53rd Midwest Award from the St. Louis section of the American Chemical Society for his contributions to the field.

**Pill-Soon Song** (DEPSCoR scientist) received the European Society of Photobiology medal for 1997, recognizing Song's seminal research contributions toward understanding the molecular basis of the structure and function of phytochrome, a molecular light switch in higher plants. The substance plays a significant role in initiating floral and developmental processes.

**John Woollam** (materials cluster scientist) and his team, in collaboration with NASA space scientists, came up with the cure for a contamination problem that was accelerating the aging process of the Russian space station Mir. They have begun diagnosing a problem that potentially threatens the vision of the Hubble Space Telescope. The J.A. Woollam Co. Inc. was awarded the U.S. Small Business Administration's annual Tibbetts Award for Technology Achievement.

### *Relationship to Citations on U.S. Patents*

EPSCoR programs across the country add value to their states through enhanced research competitiveness, strengthened science and engineering education programs, and increased industrial-university collaborations. A recent article in the AAAS (American Association for the Advancement of Science) 1998 yearbook on science and technology policy examined the linkage between U.S. technology development (patent applications) and science supported by government research grants. Francis Narin, Kimberly Hamilton, and Dominic Olivastro of CHI Research Inc. analyzed the sources of science and technology discoveries cited in almost 400 thousand U.S. patents issued during the six-year period FY1988-FY1994. The “references cited” section of U.S. patent applications is a critical requirement of patent law to demonstrate that the patent content is useful, novel, and not obvious. Of the papers cited by U.S. industry patents, 73% were authored by academic, governmental, or other public institutions supported heavily by NSF (National Science Foundation), NIH (National Institutes of Health), or other public agencies. The cited papers were from the mainstream of modern science, were quite basic, and were published in influential academic journals according to Narin, et al. Furthermore, inventors from different countries tended to cite research papers from their own country, indicating that they preferentially built on their own domestic science. Likewise, locations of authors tended to be at universities, including Harvard, MIT, Stanford, and UC-Berkeley, with high levels of federal grant support. Grant support is an important measure of research competitiveness. A challenging goal of EPSCoR is to enhance research competitiveness through increased research funding, which also leads to increased patents.

#### *Awards received in FY 1997-98*

- NSF EPSCoR Cooperative Agreement, \$1M
- NSF Co-funding awards \$450,000
- DEPSCoR, 11 awards \$2.9M
- NSF collaborative award \$312,542

#### Cooperation with NTDC

Nebraska EPSCoR in cooperation with the Nebraska Technology Development Corporation (NTDC) has endeavoured to create greater awareness of the SBIR/STTR program opportunities among

companies, chambers of commerce, local economic development groups and utility companies in Nebraska. In addition to a presentation to the Spring Conference of the Nebraska Economic Developers Association, contact and meetings have occurred in 17 communities across the state. Comprehensive SBIR/STTR workshops are being held and we are currently working on specific proposals with 28 firms from six communities.



Lincoln  
Technology  
Development  
Park

## Nebraska EPSCoR Receives NSF Funding

A new three-year cooperative agreement with the National Science Foundation began in February. The agreement centers around the new NSF-EPSCoR emphasis on developing infrastructure rather than supporting specific research clusters as in the previous agreement. The statewide EPSCoR Committee selected three targeted areas for infrastructure development including: 1) computational support for engineers and scientists at UNL to support general campus connectivity to the emerging Internet 2 project as well as enhancing the capacity for numerical analysis for computer scientists and engineers (group leaders are Kent



*Platte River State  
Park PI meeting*



Hendrickson, Sharad Seth and Dale Finkelson), 2) development of a complex systems simulations laboratory at UNO focusing on enhancing graphics and simulation research (group leaders are John Flocken and Michael Mulder), and 3) developing infrastructure for peptide-based

bioorganic chemistry at Creighton University focusing on analytical equipment (group leaders are Richard Murphy and J. Michael Conlon). The UNL and UNO computational efforts will collaborate with the Great Plains Network project (also supported by NSF-EPSCoR) to make these computer capabilities available to faculty on both campuses. The cooperative agreement also supports continuing efforts to increase research competitiveness through S&T planning, outreach and education, technology transfer, and faculty development.

## NSF Outreach Visits Benefit Nebraska Researchers

NSF-EPSCoR began a new program in 1998 intended to increase interactions of NSF program officers with the EPSCoR states. Due to limited travel funds, most program officers



*Dr. Judith  
Plesset at  
the state  
conference*

at NSF are able to travel only to larger states or national meetings. The new EPSCoR outreach initiative provides funding for program officers to visit the EPSCoR states. Knowledge gained from the visits will benefit Nebraska researchers because enhanced understanding of procedures and funding priorities of the different NSF programs can increase funding success. The local research strengths demonstrated to NSF program officers during their visits is an added benefit. Recent outreach NSF visitors include Dr. Gary Strong (Director, Human Computer Interaction Program and Deputy Director, Intelligent Systems), Dr. Judith Plesset (Director, Integrative Biology and Neuroscience), Dr. Hollis Wickman (Director, Condensed Matter

Physics, Division of Materials Research), Dr. Gary Poehlein (Director, Chemical and Transport Systems Engineering) and Beth Strausser (Office of Budget Finance and Award Management). Planned visits include Dr. Priscilla Nelson (Director, Civil and Mechanical Systems Engineering) and Beverly Sherman (Office of Information and Resource Management).

The NASA EPSCoR Cooperative Agreement in its second year of the three year award continued to fund the initial research clusters concerning “remote sensing and earth data systems” and “space environmental protection.” In addition, two mini-clusters were selected to begin preliminary work. These included “Evaporation of fuel droplets within a high pressure combustion chamber” (George Gogos, UNL) to study fuel droplet evaporation at elevated pressures and “Unmasking temperature data: a reliable tool for studies of circadian rhythmicity in astronauts and airline pilots” (Lynne Farr, UNMC and Terry Foster, UNL) to test a new method of recording and demodulating continuous temperature measurements for use in pilot performance and airline safety studies.

The Department of Defense’s “DEPSCoR” program over the past 4 years has awarded 24 grants to Nebraska researchers totaling over \$6.6 million. In the most recent competition, 11 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.

- D. Alexander, M. Algrain, and D. Poulain (Electrical Engineering, and Center for Electro-Optics, UNL) ARO. *“Development of High Speed Quartz Resonators by Femtosecond Machining”*
- P. Bhattacharya (Computer Science & Engineering, UNL) BMDO. *“Automatic Target Recognition, Wavelet Transforms and Stereo Matching”*
- C. Eckhardt and X.C. Zeng (Chemistry, UNL) ONR. *“Novel Experimental, Theoretical, and Computational Approaches to Understanding Detonation of Explosives”*
- M. Langell, P. Dowben, B. Robertson, and N. Ianno (Chemistry, Physics, Mechanical Engineering, and Electrical Engineering, UNL) AFOSR. *“High Temperature/High Speed Junction Devices and Contacts”*
- W. Mei and R. Smith (Physics, UNO) ARO. *“Experimental and Theoretical Study of Microwave-Active Materials”*
- P. Williams, N. Ianno, L. Lauderback, (Electrical and Chemical Engineering, UNL) AFOSR. *“Advanced Diagnostics for Closed-Loop Process Control in Semiconductors Manufacturing”*
- S. Liou (Physics and Astronomy, UNL) ARO. *“High Temperature Stability of Magnetic Clusters”*
- R. Narayanan (Electrical Engineering/Center for Electro-Optics, UNL) ONR. *“Covert High Resolution Radar Imaging of Targets and Terrain”*
- D. Sellmyer (Center for Materials Research and Analysis, UNL) AFOSR. *“Advanced High-Temperature Magnetic Materials”*
- S. Bandyopadhyay (Electrical Engineering, UNL) ARO. *“Self-Assembled Nanostructures: Physics and Applications”*
- S. Ducharme (Physics and Astronomy, UNL) ONR. *“Structure of Ferroelectric Polymers”*

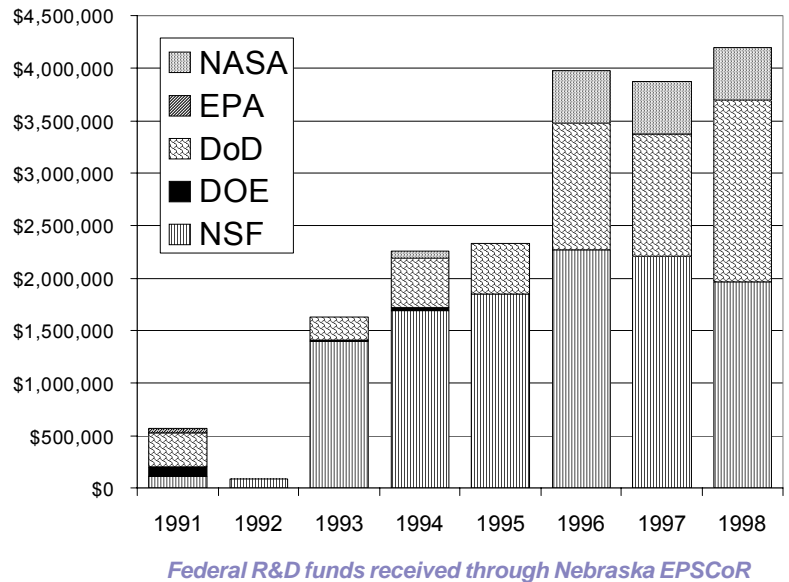
## Activities Supported in FY 1997-98

- Statewide conference held in conjunction with the plant sciences initiative sponsored by the EPSCoR research cluster “Gene Expression in Plants” entitled Nebraska Plant Science Retreat, May 15-16, 1998.
- Educational activities: Science Works Research/Outreach Project for graduate assistantships (UNL); Pollution Prevention Partners Internship Minority Program; Earn and Learn Engineering Internships for High School Students and Teachers; Support for a national conference focusing on PhD Research in Physics Education; Support to host a national summer meeting of the American Association of Physics Teachers; Creighton University faculty support; Continued Publication of “Writing from the Winner’s Circle: A Guide to Preparing Competitive Grant Proposals;” NSF GEM Program and support of undergraduate GEM scholars.

- Special Equipment Grant Awards; 3 projects from UNL, UNO, and UNMC totaling \$40,000.

- Research: Research projects supported by NSF, NASA and DoD.

- Total federal funds attributed to the EPSCoR mechanism amount to \$23.5 million since Nebraska was identified as an eligible state.



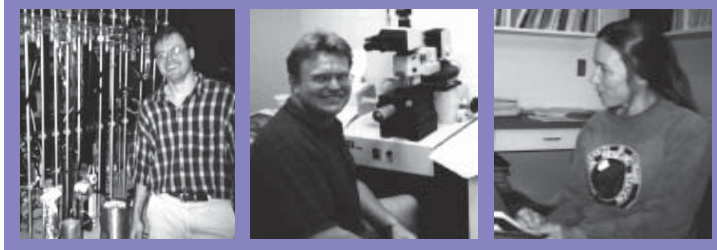
## NSF EPSCoR National Conference



Thirteen representatives from Nebraska attended the National EPSCoR conference held in New Orleans in December. The conference, “Strong Sciences and EPSCoR Alliances,” was organized by the state EPSCoR program in Louisiana. 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.

## New Investigator Program Reaps Benefits

The “Type II” grant program of Nebraska EPSCoR provides small grants to beginning investigators to initiate projects supporting grant applications. All three of the researchers in the first round of Type II projects have now received nationally competitive grants—totaling



over \$1.5 M. These investigators pictured here from left to right include Drs. Steve DiMagno, UNL Chemistry; Yuris Dzenis, UNL Engineering Mechanics; and Diana Pilson, UNL Biological Sciences. Five new projects were

approved recently to Drs. A. Atkin, H. Cerutti and G. Orti (UNL, Biological Sciences), B. Doudin (UNL, Physics) and J. Miner (UNL, Animal Sciences).

## Other Program Updates

**Private Sector Collaborations** — Our 1996 and 1997 Annual Reports highlighted interactions with the private sector. EPSCoR researchers continue a wide spectrum of collaborations with companies including recent interactions with Addax, American Cyanamid, Analog Devices, Arnold Engineering, BioNebraska, Boeing, Brenco, Cook Family Foods, Dale Electronics, Disney's Animal Kingdom™ Theme Park, Eli Lilly, Glaxo-Wellcome, HDR Engineering, H&H Ecosystems, HMT Technology, HybriTech, IBM, Lincoln Composites, Micogen, Monsanto, NEXT Nutrition, Omaha Public Power, Paramount Seeds, Pioneer HiBred, Planet Biotechnology, Seagate, SmithKline Beecham, and Western Digital.

**GPN** — The Great Plains Network developed in collaboration with other EPSCoR states in the region will be operational in August, 1998. Connection between GPN and Internet 2 is expected by October.

**GEM** — Eight undergraduates from six universities worked in labs during the summer of 1998 as part of a program to increase minority participation in graduate education in S&T. Three GEM graduate students were supported during AY 97-98.

**Co-Funding** — Over 50 proposals from Nebraska were certified eligible for co-funding during the past year.

**State Conference** — A state conference focusing on research applications of new high-speed networks such as GPN and I2 is being planned for November, 1998.

**Research Cluster Progress** — Funding of five research clusters ended in 1998 after making significant progress in enhancing research competitiveness and fostering program development. Over \$40 million of external grants were obtained by faculty in these clusters over the past five years.



*GEM Students,  
Summer of  
1998*



## EPSCoR State 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, *Vice Chancellor for Academic Affairs, and Dean, Graduate Studies & Research, UNMC*

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

Dr. F. Joseph Daugherty, *Management Consultant, Omaha*

Dr. Priscilla Grew, *Vice Chancellor for Research, UNL*

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

Ms. Maxine Moul, *Director, Nebraska Department of Economic Development*

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

Dr. Ernest Peck, *Vice Chancellor for Academic Affairs, UNO*

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*

### STATE OFFICE

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Ms. Sandra Scofield, *Project Director & Principal Investigator, Nebraska Math & Science Initiative*

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

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