Nebraska EPSCoR

Annual Report

For the period ended June 30, 2001

Experimental Program to Stimulate Competitive Research

A Note from the Chair

The end of June, 2001 marked Nebraska EPSCoR's eighth full year of operation by which time over $58 million had been obtained by Nebraska researchers from seven federal agencies with EPSCoR programs. Selected activities and progress are highlighted in this report. New awards this year included $12.8 M from the National Science Foundation (NSF) $10.7 M (5 yrs) from the National Institutes of Health (NIH) and $975 thousand (3 yrs) from the Department of Energy (DOE), and eight DEPSCoR grants ($2.3 M) from the Department of Defense (DoD). Perhaps more significantly, several large grant proposals were developed in response to new opportunities including NASA ($2.1 M), NIH ($6 M), DoD ($5 M), DOE Lab Partnerships ($591,422) and Environmental Protection Agency ($410,000) which if funded will greatly increase funding from EPSCoR sources next year.

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

Nebraska EPSCoR Newsmakers

Ruma Banerjee (metallobiochemistry cluster scientist) has been awarded the Pfizer Award in Enzyme Chemistry in recognition of her outstanding work in this field. She was also appointed chair of the Department of Biochemistry at UNL.

Fred Choobineh (NSF Co-Project Director) was elected Fellow of the Institute of Industrial Engineers. This is the highest classification of membership they award.

Samy Elias (former DOE project director) received the first Henry Gantt Medallion Award from the Institute of Industrial Engineers recognizing individuals who have made a notable impact on the industrial engineering profession.

Shelton Hendricks (behavioral biology cluster) was appointed Dean of the College of Arts and Sciences at UNO.

Alan Kamil (behavioral biology cluster) was named to a George Holmes endowed professorship at UNL.

Ram Narayanan (DEPSCoR grantee) was elected Fellow in the Institute of Electrical and Electronics Engineers. He was recognized for his contributions to the development of coherent ultra-wideband random noise radar systems for high resolution imaging applications.

Prem Paul has accepted the position of Vice Chancellor for Research at UNL. He also serves on the state EPSCoR Committee as part of his new position.

Byrav Ramamurthy (co-PI of SDI group) published a book titled "Design of Optical WDM Networks—LAN, MAN and WAN Architectures."

Suzanne Rohde (materials cluster) was appointed Assistant Dean, College of Engineering & Technology, UNL.

Awards received in FY 2000-01

NSF EPSCoR
$12.8M
DEPSCoR
$2.3M
DOE
$975,000
NIH IDeA/COBRE
$10.7M

State EPSCoR Conference

Nebraska's 8th Annual State Conference "Developing Nebraska's Workforce for the Information Age: Informatics and Information Assurance" was held November 16, 2000 at the Scott Conference Center on the UNO campus. With the advent of the digital age come significant opportunities and challenges. The conference considered how these opportunities and challenges are being identified and addressed by academia, government, and the private sector. It included presentations from representatives from a variety of national agencies as well as participation from representatives of Nebraska's universities and corporations. Jeffrey Hunker, Senior Director for Critical Infrastructure at the White House National Security Council (NSC); Rick Holmes, Senior Director of Security and Quality Assurance for Union Pacific Railroad; and David Ladd, Program Manager for Microsoft Research, Microsoft Corporation, were just some of the participants who spoke during the conference.

New NSF Infrastructure Improvement Grant

NSF PI Advisory Group meeting

Nebraska EPSCoR in cooperation and collaboration with research universities across the state has received funding from the National Science Foundation ($9 million) to support its proposal to build infrastructures designed to support development of the new discipline of informatics. Four areas of emphasis include: 1) Secure Distributed Information (SDI) Infrastructure at the University of Nebraska (Lincoln and Omaha) with group leaders Byrav Ramamurthy, Hong Jiang and David Swanson; 2) Next Generation Enterprise Resource Planning Systems (ERP) at UNL with group leaders Scott Henninger and Fred Choobineh; 3) Informatics Center for the Life Sciences (ICLS) (campus collaborations at UNMC, UNL, UNO and Creighton Universities) with group leaders Simon Sherman, Ruben Donis, Hesham Ali, and Sandor Lovas; and 4) UNL Bioinformatics Research Laboratory (BRL) with group leaders Jitender Deogun and Sally Mackenzie. The grant supports continuing efforts with outreach, education and attraction of under-represented groups and support of beginning investigators. An additional program to support industry internships has been added (see story below).

Industry Internship Program

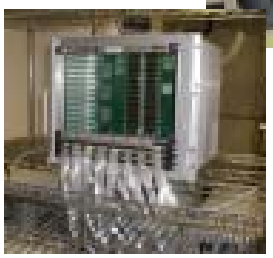
With the funding of the new NSF implementation grant, a new program was developed entitled the Nebraska Engineering, Science and Technology Internship Program or NESTIP for short. Dr. Fred Choobineh, UNL Professor of Industrial and Management Systems Engineering, will oversee the program. The goal of NESTIP is to provide science and technology assistance to private industry, to facilitate technology transfer between Nebraska and higher education and businesses, and to encourage applied science and engineering research beneficial to state industries. NESTIP will promote technology transfer by subsidizing short-term employment of upper division undergraduate and graduate students who could make contributions to the business enterprise's performance, products, or processes using science and technology. There are currently ten students and businesses paired.

NSF Infrastructure Project Progress

The Nebraska EPSCoR infrastructure project (1998-2001) provided support greatly enhancing research efforts in computational sciences, intercampus connectivity and computational chemistry. The project involved scientists at UNL, UNO and Creighton University as summarized below.

UNL — The Research Computing Facility (RCF) has made an agreement with the Chemistry Department to remodel a former Mass Spectrometry lab to house a larger Beowulf cluster including high bandwidth (2 Gigabit/sec) Myrinet networking. Several research groups are currently in the process of porting programs to this cluster. Dr. Rich Sincovec has recently been hired as Hansen Professor and chair of Computer Science and Engineering as part of RCF's effort to recruit faculty and staff with research that is computationally intensive. Research conducted utilizing RCF has recently amounted to over $3.1 million in awarded grants. In addition, two new courses in CSE were offered using the new facility and students and professors from other departments on campus used the facility for their courses as well. The RCF has made a web site available (http://rcf.unl.edu) and the SGI 2400 is the server for two other sites benefiting other groups on campus. Dr. David Swanson, RCF Coordinator, represented the group nationally at the meeting SC2000 in Dallas, TX, along with two graduate students.

Dr. Swanson teaching "Beowulf Computing" course



Myrinet network technology utilized in RCF cluster

UNO — Drs. Mei and Boyer (Naval Research Lab) worked on a new Self-Consistent Atomic Deformation (SCAD) computational method. Drs. Mei and Boyer along with Drs. Durcharme, Takacs, Ianno and Adenwalla (UNL) worked to improve piezoelectric devices made from polyvinylidene fluoride (PVDF) and its copolymers. Dr. Duan is applying the Linearized Augment Plane Wave method (LAPW) to compute the nonlinear optical coefficients of KNb03. This is the first time that Second Harmonic Generation coefficients have been accurately calculated for this compound. Drs. Smith, Hardy and Mei received funding from the Nebraska Research Initiative for their project entitled, "Computer Design and Synthesis of Novel Ferroelectrics." Geoscientists at UNO are studying alpine glaciations in the western Himalayas. This work is part of the international GLIMS project, which is a global consortium of universities and research institutes coordinated by the United State Geological Survey in Flagstaff, Arizona, to assess and monitor the Earth's glaciers. UNO is the regional center for south Western Asia as scientists from the Departments of Geography and Geology conduct field work to support modeling efforts designed to determine glacier mass-balance trends, alpine glacier impact on sea level changes, water resource potential, and the influence of surface processes in landscape evolution in this area. The Complex Systems Simulation Lab (CSSL) allowed Dr. Stack's group (Chemistry) to run large models to investigate the correlation between the formation of certain types of estrogen metabolites and the initiation of cancer. The College of Education also has used the CSSL with outreach efforts to area high school teachers, educational activities associated with the GLIMS project and the NASA Jet Propulsion Lab.

Durham Science Center, UNO

Creighton — The MS instrument was used by Drs. Conlon, Lovas, Smith, Mackin, and Murphy (Biomedical Sciences) for over 2000 analyses of peptides including microbial antibiotics, EGF, gastrin gene products, glucogen gene products and synthetic analogues and partial structures. The mass spectrometer and automated protein sequenator have been used in the laboratories of Dr. J.M. Conlon to carry out a program of proteomic analysis that has focused upon the characterization of novel insulin-releasing peptides that are synthesized in the endocrine pancreas of a range of non-mammalian species and novel antimicrobial peptides that are present in the skin secretions of amphibians. The program has led to the filing of two U.S. patents and has attracted support from a Nebraska-based biotechnology company. This work entailed collaboration with Dr. Knoop (Medical Microbiology). The facilities were also used to support research on malondialdehyde-midified adducts of proteins by Dr. Kearley (Chemistry) and on chemotaxis receptor domains for Dr. Narin (Medical Microbiology). Vibrational CD equipment was purchased and installed. This equipment incorporates FT-IR capabilities.

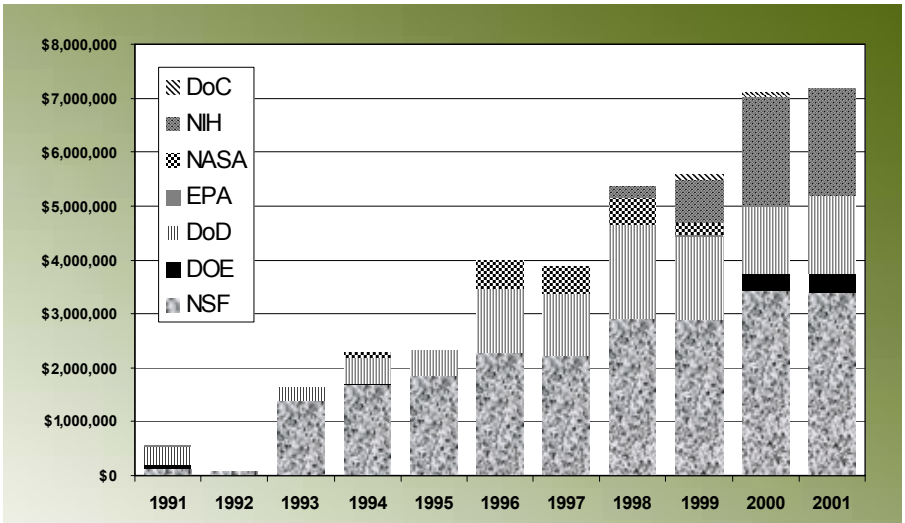
Activities Supported in FY 2000-01

- Eighth Annual Statewide conference held on November 16, 2000 focused on "Developing Nebraska's Workforce for the Information Age: Informatics and Information Assurance" (p. 3).

- Conference/Workshop Support: Research on Learning Conference, Lincoln; Women in Science Conference, Lincoln.

- Educational activities: NSF Graduate Education for Minority (GEM) Students Program and support of undergraduate GEM scholars.

- Outreach Activities: Supercomputer Workshop, San Diego, CA; NIH IDeA Workshop, Washington, D.C.; Kansas Chautauqua Conference, UNK; Supercomputer Workshop, Lawrence, KS; DOE Lawrence Berkeley Lab, Berkeley, CA; GPN meeting, Lincoln; SBIR Nat'l Conference, Oklahoma City; GPN Building a Collaborative Infrastructure, Kansas City; Nanoscale Science & Technology Conference, Tuskegee, AL; Supercomputing 2000 Conference, Dallas, TX; AAAS Planning Workshop, San Francisco, CA; DOE Brookhaven Nat'l Lab Workshop, New York; Collaboration with NE Academy of Sciences.



Federal R&D funds expended by Nebraska EPSCoR projects

- Research: Research and infrastructure development supported by NSF, NIH, NASA, DOE, DOC, DoD and EPA.

- Total expended federal funds attributed to the EPSCoR mechanism amount to $48.7 million as of June 30, 2001.

Educational Activities

GEM – The fifth year of our GEM program was very successful. Ten undergraduate students from Grambling State University, Xavier University of Louisiana, Alcorn State University, Jackson State University, Cleveland State University (2), University of North Carolina at Pembroke (2), and University of Texas at El Paso (2) participated in GEM 2001. The students conducted research projects in many different areas with faculty members from across campus. An indication of the success of the program is that three summer GEM students have gone on to pursue a graduate program, two at UNL.

Women in Science – The Third Annual "Women in Science" conference attracted 70 participants from Nebraska and Kansas to Lincoln, Nebraska, on March 23-24, 2001. The keynote speaker was Dr. Sherilyn Fritz, faculty member in the Department of Geosciences and the School of Biological Sciences, UNL. The participants had panel discussions with women scientists from a university setting as well as those from business and industry to learn about career opportunities for women in the scientific field. Panel discussions were also held with graduate and undergraduate students to learn about college life and how to prepare for majors related to science and mathematics. They were also given tours of various facilities at UNL and around Lincoln.

NSF Research on Learning Conference – A "Research on Learning" conference was held November 30, 2000, at the new Embassy Suites Hotel in Lincoln. The conference acquainted researchers and teachers with opportunities for NSF support regarding projects related to research on learning. The event featured eight NSF program officers and drew attendees from six Nebraska colleges and universities, Lincoln Public Schools, Omaha Public Schools, and faculty from seven other states and Puerto Rico.

Other Program News

Department of Defense (DEPSCoR)

The Department of Defense's "DEPSCoR" program over the past seven years has awarded 42 grants to Nebraska researchers totaling over $10.98 million. In 2001, eight grants were awarded to scientists in Nebraska who are doing research of special interest to the Department of Defense. Following is the list of current awards. You Qiang (Physics & Astronomy, UNL) "*Control and Dynamics of Interacting Spins in Nanoscale Metamaterials*"; Ralph Skomski (Materials Research & Analysis, UNL) "*Advanced Nanostructured Magnetic Materials*"; Peter Dowben (Physics & Astronomy, UNL) "*Spin-Polarization at Ferromagnetic-Insulator Interfaces*"; Hesham El-Rewini (Computer Science, UNO) "*On the Design and Operation of Mobile Computing and Communication Systems with Hybrid Backbones*"; Robert Palmer (Electrical Engineering, UNL) "*Atmospheric Boundary Layer Structure and Dynamics Revealed Through Adaptive Imaging Techniques*"; Ram Narayanan (Electrical Engineering, UNL) "*Random Noise Monopulse Radar Technique for Covert Tracking of Missiles in Flight*"; Diandra Leslie-Pelecky (Physics & Astronomy, UNL) "*Cluster-Assembled Soft Magnets for Power Electronics Applications*"; Jiashi Yang (Engineering Mechanics, UNL) "*Effects of Biasing Fields*".

DOE EPSCoR

DOE field demonstrations

Nebraska EPSCoR has received a Department of Energy Research Implementation grant in the amount of $975,000 to support the Carbon Sequestration and Global Climate Change research cluster. This is a three-year grant which began in July 2000 led by Dr. Shashi Verma involving faculty from UNL and UNOmaha. This project will investigate the biophysical constraints on increasing carbon storage in dryland and irrigated agricultural ecosystems in the Great Plains. Two DOE lab partnership grants to Drs. Adenwalla and Turner were received totaling $591,000.

NIH COBRE Award

With the support of a $10.7 million COBRE award from the National Institutes of Health IDeA Program (NIH's EPSCoR program), the Nebraska Center for Virology (NCV) was formed. Dr. Charles Wood (UNL) is Director of the center and Drs. James Van Etten (UNL) and Howard Gendelman (UNMC) serve as Co-Directors. The NCV combines the expertise and facilities of UNL, UNMC, and Creighton University, Nebraska's leading biomedical research institutions, to create a nationally recognized center of biomedical research. The Center's purpose is to produce a new generation of broad knowledge researchers, develop partnerships between basic and clinical researchers working in all areas of virology, and conduct innovative research addressing fundamental questions about infectious agents and the host responses. The Center's research programs will address pathogenic and therapeutic questions of some of the most devastating viral and neuroimmune disorders facing the global community such as AIDS, HIV-1, Alzheimer's and chronic infections caused by the herpes viruses.

Postdoctoral fellow Hong Zhang conducts experiment

NASA EPSCoR

The National Aeronautics and Space Administration (NASA) has given notice of its plans to support a $7 million project to the NASA EPSCoR group. It is a five-year grant that provides $3.5 million from NASA with a $3.5 million match from the University of Nebraska. The Principal Investigator is Dr. Brent Bowen, Director of the UNOmaha Aviation Institute. The three different research areas that were funded are: "*Research in Airborne Remote Sensing*" led by Ram Narayanan (UNL), "*the Implementation of the Small Aircraft Transportation System*" led by Russell Smith (UNO), and "*Fuel Droplet Combustion for Aircraft propulsion*" led by George Gogos (UNL). The University of Nebraska had all three research proposals selected. NASA stated in their notification letter that ". . . is quite an impressive achievement." Dr. Bowen attributes the success to the aeronautics focus and collaborative research team approach.

NSF EPSCoR

One researcher from UNO and one researcher from UNL received National Science Foundation grants. Hamid Sharif (Computer & Electronics Engineering, UNO) received a two- year grant for "*EPSCoR Creation of a Multimedia Hub to Broadcast Real-time SCOLA TV Channels Over Internet2*" and Dennis Schulte (Biological Systems Engineering, UNL) received a two-year grant for "*Environmental Air Quality*" that he is working on in cooperation with faculty from Kansas, Kansas State, and Wichita State Universities.

State EPSCoR Committee Members

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

Mr. Bradley Edwards, *General Partner, Heartland Capital Management, Inc., Lincoln*

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, Creighton University*

Dr. Prem Paul, *Vice Chancellor for Research, UNL*

Mr. Herman Person, *Director, Corporate Product Development, Bishay Dale, retired, Columbus*

Senator Ron Raikes, *State Senator, State of Nebraska*

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

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

Dr. Roy Wilson, *Vice President for Health Sciences,Creighton University*

Dr. John Woollam, *President, J.A. Woollam Co., Lincoln*

EPSCoR: An Investment in Science and Engineering Research Competitiveness

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Ms. Nancy Simnitt, *Administrative Technician, Nebraska EPSCoR Office*