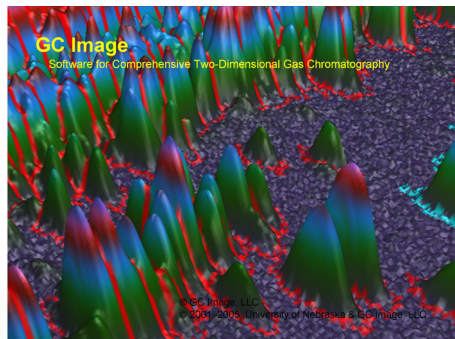


EPSCoR

NEBRASKA

Experimental Program to Stimulate Competitive Research

Annual Report
August 2007



Greetings from the Director

Nebraska EPSCoR completed its fifteenth year at the end of June 2007. At the end of 2006, I completed a third satisfying year as director. The past year has been eventful and productive. Spring 2007 brought news of a \$9M three-year NSF EPSCoR Research Infrastructure Improvement (RII) award, the third such award received by Nebraska since 2001, and two Department of Defense EPSCoR (DEPSCoR) awards (see story, pp. 4-5). Nebraska researchers have obtained over \$168 million in grant funds through EPSCoR programs since 1991. These funds continue to support research, infrastructure and economic development, and science education and outreach. Sponsored by Nebraska EPSCoR, the University of Nebraska, and Bio Nebraska, the third annual Nebraska Research and Innovation Conference was held at the Qwest Center in Omaha on March 21, 2007. We were happy to welcome nearly 380 attendees to a successful conference (see story, p. 5). The next conference will be held in Lincoln in fall 2008. It is my pleasure to welcome five new members to the Nebraska EPSCoR/IDeA Committee. They are Drs. Cam Enarson, Finnie Murray, Plamen Petrov, Linda Pratt, and Raymond Ward. I wish to thank those members whose terms ended in 2006 for their service: Drs. Lee Jones, Richard Murphy, and Jay Noren (see story, p. 3).



F. Fred Choobineh

Middendorf Champions Public-Private Partnerships

Lyle Middendorf served as a Nebraska EPSCoR/IDeA Committee member for twelve years before being appointed committee chair by Governor Heineman in late 2005. Mr. Middendorf brought a commitment to fighting for the interests of Nebraska and invaluable working knowledge of public-private sector partnerships to this position. Additionally, he serves on the board of Bio Nebraska Life



Sciences Association. "Lyle is an excellent engineer, scientist, and business person, who truly gives

unselfishly to Nebraska," said Nebraska EPSCoR/IDeA director Fred Choobineh. "His contributions to our planning and implementing of the 2007 Nebraska Research and Innovation Conference were tremendous." Mr. Middendorf is chief technical officer and senior vice president of Advanced Research & Development of LI-COR Biosciences, a Lincoln-based manufac-

turer of instrumentation systems for environmental and biological research. A graduate of the University of Nebraska-Lincoln, he joined LI-COR as an electrical engineer in 1972, shortly after it was founded.

"LI-COR Biosciences collaborates with numerous academic research groups," said Mr. Middendorf. Examples of public-private collaborations at LI-COR include funding for academic collaborators as subcontractors of Small Business Innovation Research (SBIR) grants awarded to LI-COR. Mr. Middendorf noted, "Since 1994 LI-COR has received almost \$9 million in federal government research grants. Out of this funding LI-COR has developed and commercialized significant products for its environmental and biotechnology market thrusts, resulting in several new jobs in Lincoln." Dr. Choobineh spoke highly of "the wealth of industry experience that Lyle brings to our committee." The committee, which establishes policies and strategies, has set forth objectives that include strengthening state bioscience research and education, enhancing the "pipeline" of future scientists and engineers, and enhancing economic development and technology transfer. These objectives,

supported by Nebraska's most recent merit-based NSF RII award (see story, p. 4), are completely consistent with Mr. Middendorf's outlook. "It's not only institutions like UNL, UNMC, Creighton, and others that benefit from this award. Industrial research benefits also," he said. "Academic and private-sector researchers are natural partners."

Collaborative academic-industry programs sponsored by Nebraska EPSCoR/IDeA with RII funds include the Nebraska Engineering, Science and Technology Internship Program (NESTIP) and the University-Industry R&D Partnership Program (see story, p. 6). The R&D Partnership Program is a cost-share program fostering partnerships between faculty of Nebraska research universities and state industries. NESTIP, also a cost-share program, supports placement of student interns in businesses like LI-COR to facilitate applied research benefiting industry and technology transfer between higher education and business in Nebraska. According to Mr. Middendorf, "These programs, building academic-industrial partnerships, are moving our state forward. I'm glad to be part of these efforts on behalf of Nebraska."

State Committee News

Terms ended for three Nebraska EPSCoR/IDeA Committee members in 2006: **Drs. Lee Jones, Richard “Barry” Murphy, and Jay Noren.** Drs. Jones and Murphy had been committee members since 1991, and Dr. Jones was vice chair. He served the University of Nebraska as executive vice president and provost from 1985 until his retirement in 2002. Dr. Murphy continues as chair of the Department of Biomedical Sciences at Creighton University. Dr. Noren joined the committee in 2002, the same year he joined the University of Nebraska as executive vice president and provost, a position he left in 2006 when he became the founding dean of the University of Nebraska Medical Center’s new College of Public Health. With thanks to Drs. Jones, Murphy, and Noren for their commitment and service, Nebraska EPSCoR/IDeA takes this opportunity to welcome five new members, appointed to the committee by Governor Heineman.

Dr. Cam E. Enarson is the vice president for health sciences and dean of the School of Medicine at Creighton University. He earned his medical degree from the University of Alberta Medical School in Canada. He holds



and he chairs the Governing Council of the Section of Medical Schools of the American Medical Association.

an M.B.A from Wharton School at the University of Pennsylvania. His work has been published widely in leading medical journals,

Dr. Finnie A. Murray is senior vice chancellor for academic affairs and student life and professor of biological sciences at the University of Nebraska at Kearney. He has been director of the interdisciplinary doctoral program in molecular and cellular biology and chair of the Department of Biological Sciences at Ohio University and dean



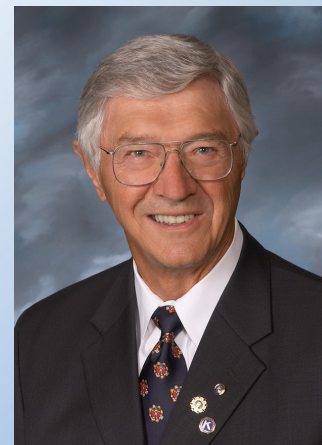
of the College of Arts and Sciences at Henderson State University. His research interests include the biochemistry of hormonally regulated secretions of the uterus and the immunological relationship between mother and conceptus. His research has been funded by USDA, HEW, NSF, and industry. He earned his Ph.D. at the University of Florida.

Dr. Plamen V. Petrov is executive vice president and chief technology officer at 21st Century Systems, Inc. in Omaha. He has been with the company since its inception and leads a department of over a hundred scientists, software developers, and engineers. He focuses on the areas of software agents, agent-based decision support, command and control applications, intelligent systems, and on obtaining DoD Small Business Innovative Research (SBIR) awards. Dr. Petrov has published widely. A pioneer researcher, he applies computational theory and real-time systems research to the field of intelligent software agents for decisions support applications.

Dr. Linda Ray Pratt was elected vice chair shortly after her appointment to the Committee. The executive vice president and provost of the University of Nebraska, she is former interim dean of the College of Arts and Sciences and former chair of the Department of English at the University of Nebraska-Lincoln. Dr. Pratt received her Ph.D. from Emory University, has published on issues in education and Victorian and Modern poetry, served as president and vice president of the American Association of University Professors, and chaired the Association of Departments of English.



Dr. Raymond Ward earned his Ph.D. in soil fertility from South Dakota State University following undergraduate work at the University of Nebraska. He is president of Ward Laboratories, Inc., which he founded in Kearney, Nebraska in 1983 and developed into one of the largest and most respected laboratory testing facilities in the Great Plains. He has also managed laboratories in Oklahoma, Kansas, and South Dakota. His expertise has been sought regionally, nationally, and internationally. Dr. Ward has published widely.



EPSCoR/IDeA Grant Projects

NSF

A new three-year (2007-2010) \$9M **NSF EPSCoR Research Infrastructure Improvement (RII)** award will support research at the University of Nebraska-Lincoln, University of Nebraska Medical Center, and Creighton University. Researchers from the three universities will build a collaborative team connecting chromatin biology and engineering to establish an interdisciplinary research center focused on epigenetics. According to chromatin area coordinator, Dr. Sally Mackenzie, research will improve understanding of “the cellular context in which genes are expressed. We understand how individual genes might influence particular features, such as eye color or predisposition to disease, but we don’t fully understand how suites of genes are coordinated to influence processes of development or an organism’s response to its environment. Understanding these complex genetic processes could help us, for example, to enhance a plant’s ability to adapt to environmental changes or to influence an animal’s aging process.”

Bioengineering area coordinator, Dr. Joseph A. Turner said, “The project’s engineering aspects are focused on understanding the force-displacement behavior of plant cell walls to design a nanodevice that can insert short strings of RNA into a plant cell in a reliable manner. We need a clear understanding of the penetration process, the development of new methods of insertion via nanofiber manufacturing, and integration of the two for building functioning nanodevices. It’s exciting applying an engineering approach to a biological system in a new and unique way.”

The new RII award provides continued support to the **First Award, University-Industry R&D Partnership**, and the **Nebraska Engineering,**

Science and Technology Internship programs as well as outreach and education in the sciences (see stories, pp. 5, 6-7).

Building on Prior NSF Support: The **PrairieFire** supercomputer at UNL, initially funded with a 2001-2004 RII award, will move to a new home in the **Paul and June Schorr Center for Computer Science and Engineering**, which will house the computer science department. PrairieFire is available to Nebraska researchers (see “Newsmakers,” p. 7).

NIH

The new **Ken Morrison Life Sciences Research Center** will house the **Nebraska Center for Virology (NCV)**. The NCV was established in 2000 with a five-year \$10.7M **Centers for Biomedical Research Excellence (COBRE)** award through the IDeA program. NCV received a second five-year award for \$10.6M in 2005. Groundbreaking research and training in such areas as HIV/AIDS continue at NCV. Current COBRE grants also support the **Molecular Biology of Neurosensory Sys-**

New Awards

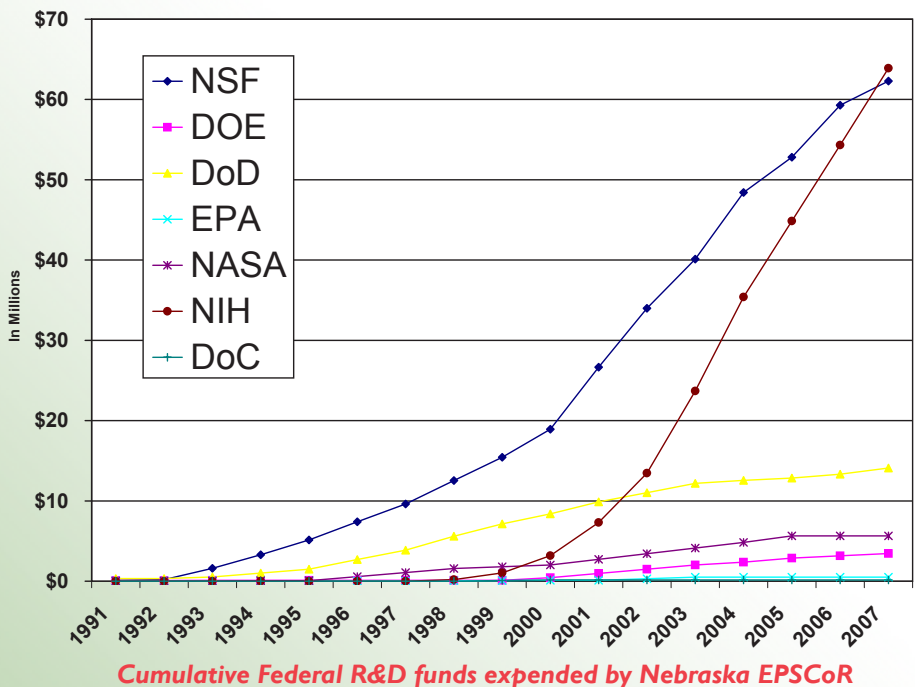
DOD \$812,163

NSF \$9M

tems and the **Nebraska Center for Cellular Signaling** at UNMC and the **Nebraska Redox Biology Center** at UNL. A current **IDeA Networks of Biomedical Research Excellence (INBRE)** grant at UNMC promotes biomedical research in Nebraska by encouraging students to pursue careers in this area. Additional information on current grants is included in 2003-2006 annual reports, available in print and online.

DoD

In 2007 Nebraska received two DEPS-CoR awards, one from the **Air Force Office of Scientific Research (AFOSR)** and one from the **Army Research Office (ARO)**. Out of 103 submitted projects, 25 were selected to be funded. Rodney J. Soukup, electrical engineering professor at UNL received the AFOSR award for “A



Novel Variable Wide Bandgap Material for High Power, High Frequency Devices.” Lawrence Harshman, biological sciences professor at UNL, received the ARO grant for “Genome Biology of Innate Immunity: Genetic Dissection of *Drosophila Melanogaster* Responses to *Bacillus* Infection.”

DOE

Current National Lab Partnership awards continue to support “Magnetic Cluster States in Nanostructured

Materials” and “A Study of Ultra-Peripheral Colliders at RHIC.” More information is available at <http://epscor.unl.edu/projects/current/doe.shtml>.

NASA

NASA Nebraska EPSCoR submitted two research proposals for consideration in July 2007, “Robotic Harvesting of Ice from Lunar Craters” and “Satellite Contaminant Materials Program.” The proposals seek seed funding for Nebraska to develop an academic

research enterprise directed toward long-term, self-sustaining, nationally-competitive capabilities in aerospace and related research. Both projects offer significant contributions to the strategic research and technology priorities of the NASA Exploration Systems Mission Directorate and NASA field centers. The projects would contribute to Nebraska’s research infrastructure, science and technology capabilities, higher education, and economic development.

Nebraska EPSCoR First Award Program

The new RII grant continues support for the **First Award** program, which assists Nebraska faculty members’ research early in their careers. Awardees are required to submit an NSF CAREER proposal within the one-year award period. 2006 and 2007 awardees were: Greg Bashford, Biological Systems Engineering, UNL; Myra Cohen, Computer Science and Engineering, UNL; Eileen Hebets, Biological Sciences, UNL; Lisong Su, Computer Science and Engineering, UNL; Li Tan, Engineering Mechanics, UNL; Mark Wilson, Biochemistry, UNL; Lin Wu, Mechanical Engineering, UNL; Kirill Belashchenko, Physics and



Dr. Andrea Holmes and her research team work together in their lab (see cover photo of group also).

Astronomy, UNL; Chunsheng Liu, Computer & Electronics Engineering, UNL; and Andrea Holmes, Chemistry, Doane College. Dr. Holmes’s research

on flunitrazepam, the “date rape” drug, has attracted national attention. While still a grad student, she read about use of the drug against women and chose it as a research area. Prior to a First Award, Dr. Holmes received an **Undergraduate Research Experience** award, which supported her successful efforts to engage a student research team in creating a sensor for the “date rape” drug. Having succeeded in the lab, she and her team are applying their formula to developing a paper strip that could be used to screen drinks. Additional information on programs is available at <http://epscor.unl.edu/programs>.

Nebraska Research and Innovation Conference

The third annual **Nebraska Research and Innovation Conference** was held at the Qwest Center in Omaha on March 21, 2007. Nebraska EPSCoR, the University of Nebraska, and Bio Nebraska Life Sciences Association sponsored the conference. Approximately 380 academic and business researchers exchanged ideas and explored potential collaborations. This year’s conference included a student poster competition for the first time. Sessions included such topics as bioinformatics, cell wall penetration, industry-academic research collaborations, business plan develop-

ment, intellectual property, workforce development, and risk management. Nebraska EPSCoR/IDeA Committee chair, Mr. Lyle Middendorf, and NSF EPSCoR program director, Ms. Karen Sandberg, welcomed participants. The University of Nebraska provost, Dr. Linda Pratt, introduced the keynote speakers, Drs. Leroy Hood and William Harris. President James B. Milliken introduced the lunch speaker, Governor Dave Heineman. Details of the 2006 and 2007 conferences, including programs, presentations, speaker bios, poster abstracts, 2007 student poster competition winners, and display

exhibitions are available at <http://epscor.unl.edu/events>. Planning has begun for a fall



President Milliken

Governor Heineman

2008 conference at the Cornhusker Marriott in Lincoln.

Economic Development and Outreach/Educational Activities

Economic Development

The successful **Nebraska Engineering, Science, and Technology Internship Program (NESTIP)** encourages highly qualified graduate and undergraduate students from Nebraska colleges and universities to intern with Nebraska science and technology companies. Through this cost-share program, students interned at Bedient Pipe Organ, Building Solutions, Exmark Manufacturing, i2rd,

Interaction Arts and Technologies, Olsson Associates, and Transcrypt International in 2006. **University-Industry R&D Partnership Program** award recipients in 2006 were Michael Meagher (UNL) and Graham Cox (Schering Plough Animal Health) for “Process Development for a Recombinant Cattle Vaccine against *Cryptosporidium parvum*” and Vyacheslav Rykov (UNO) and Al-

exander Kasiyanov (GR Exypnos, Inc.) for “Innovation of Screening System for Highly Pathogenic Avian Influenza H5N1 Virus.” This cost-share program fosters partnerships between Nebraska research faculty and state industries. For more information on these programs, see <http://epscor.unl.edu/programs>. R&D Partnership and NESTIP brochures are available online and in print.

Outreach/Education

Nebraska EPSCoR is committed to recruiting students who are members of groups that are underrepresented in the sciences and supports the following activities/programs. **EPSCoR Summer Saturday** brought together summer research students from Creighton University (CU), the University of Nebraska-Lincoln (UNL), the University of Nebraska Medical Center (UNMC), and the University of Nebraska at Omaha (UNO) in 2006. Approximately 60 students heard speakers on such topics as career development, participated in peer-led seminars, socialized over lunch, and enjoyed afternoon recreation at Mahoney State Park. The **UNL Summer Research Program** had 11 participants in 2006. Five UNL former summer research students are in Ph.D. programs at UNL, and one is in an M.S. program. Students who participated in the 2006 **Summer Program Opportunities** at UNMC have pursued such opportunities as UNMC’s pharmaceutical sciences doctorate program, teaching science in an urban public school, and in the Peace Corps, and internships (one at a research university and another with a marine life conservation project in Costa Rica).

UNO offered summer **information technology (IT) camps** for high-school students with special emphasis on ethnic-minority and female students interested in IT. CU’s **Discovery Research Institute** introduced laboratory research careers to high-school students who



Bright Lights students making gummy worms



UNMC summer research students and Dr. Mary McNamee take a break from research to enjoy a picnic.

got first-hand experience in scientific research. Fifteen students participated in the two-week research program at King Science and Technology Center in Omaha. Three select students from UNMC and CU summer programs presented posters at the Nebraska Research and Innovation Conference on March 21, 2007 (see story, p. 5).

EPSCoR scholarships brought opportunity to low-income elementary- and

middle-school STEM students in the **Bright Lights Summer Learning Adventures** program and helped expand the program’s outreach activities, especially to ethnic-minority students. The interdisciplinary program serves about 1900 students, with a middle-school week-long engineering camp as one example of its many offerings. Using water, alginate powder, red food coloring, and depositing this substance into a calcium chloride solution, teams of students enthusiastically produced “gummy worms,” then checked to see whose was longest. In a “tower of power” contest, teams constructed towers of toothpicks, straws, and shaving cream. A “clear water” contest in soil erosion prevention determined the combination of sand and clay that produced the least runoff. The camp offered hands-on activities in biosys-

tems, mechanical, civil, computer, electrical, and construction management engineering.

Nebraska EPSCoR sponsored the 2006 **Good Medicine Camp**, a math and science day camp for 30 5th-8th grade Native American students at the Lincoln Indian Center. The camp provided employment opportunities as counselors to college and high-school students. Tribes represented at the camp included Omaha, Ogalala & Rosebud Lakota, Ponca, Santee Dakota, and Winnebago. In summer 2007, EPSCoR joined UNL and the Nebraska Children and Families Foundation in cosponsoring the **Circle of Nations Youth Council** conference. Approximately 160 high-school students from the Omaha, Ponca, Santee, and Winnebago tribes gathered at UNL. The conference added a middle-



NASA Goddard researchers from Little Priest Tribal College

school contingency this year. EPSCoR supported science activities at the conference, which encourages Native Americans to pursue postsecondary education. Those welcoming students and leading interactive workshops included tribal leaders and educators.

Spring 2006 brought a geospatial training seminar at **Little Priest Tribal College** for teachers and tribal gov-

ernment members, conducted by Native IMAGE Director Jan Bingen, NASA Nebraska EPSCoR Geospatial Extension Specialist Karisa Vlasek, and former UNO faculty Hank Lehrer. Participants learned basics of geographic information systems (GIS) and remote sensing. The seminar utilized the upgraded computer lab funded by NSF Nebraska EPSCoR. In summer 2007, Ms. Bingen and four students participated in research

at NASA Goddard in Greenbelt, MD, through a partnership between NASA and the American Indian Higher Education Consortium. This is the second year Ms. Bingen and students have done research at NASA Goddard (see cover photos). Students worked with a NASA scientist on research projects including water quality, GIS, and botany; they will continue those projects on the Winnebago Reservation.

Nebraska EPSCoR Newsmakers

Stephanie Adams (past EPSCoR minority coordinator) has been named the associate dean for undergraduate education in the College of Engineering at UNL.

Hesham Ali (past NSF EPSCoR area leader) was named dean of the College of Information and Science Technology at the University of Nebraska at Omaha.

Ken Cassman (past DOE EPSCoR co-PI) was named director of the new Nebraska Center for Energy Sciences Research, a partnership between UNL and the Nebraska Public Power District. He spoke on "The Science of Sustainability in U.S. Agriculture" at the 2007 American Association for the Advancement of Science conference.

Yuris Dzenis (NSF EPSCoR nanomaterials researcher) was awarded a \$317,127 grant from Hexcel Corporation for "Next Generation Super Carbon Fiber."

Vadim Gladyshev (NSF EPSCoR bioengineering researcher) led a research team that used the PrairieFire supercomputer to develop rapid identification of amino acids in proteins that have redox functions, which are basic to all organisms. This work was published in *Science*.

Clague Hodgson (Nebraska EPSCoR/IDeA Committee member) is president of Nature Technology Corp., which received an NIH Phase II SBIR grant of \$993,000

to improve the manufacture of large quantities of purified DNA.

Yongfeng Lu (DEPSCoR grantee) received a \$122,500 NSF award for "Self-Aligned Nanomanufacturing of Carbon Nanotubes in Nanoelectronics."

Prem Paul (Nebraska EPSCoR/IDeA Committee member) has been elected chair of the Coalition of EPSCoR/IDeA States.

Lance Pérez (DEPSCoR grantee) has been named the associate dean for academic affairs and graduate programs at UNL's College of Engineering.

Raymond Ward (Nebraska EPSCoR/IDeA Committee member), president and co-owner of Ward Laboratories, Inc., received a UNL Alumni Achievement Award.

Xiao Cheng Zeng (past NSF EPSCoR nanomaterials researcher) was one of the discoverers of "golden hollow cages" made of pure gold atoms, as reported in the May 5, 2006 Proceedings of the National Academy of Sciences online edition. Subsequently, with members of his research team, he discovered double helices of ice molecules, which may have major implications in studying disease-related protein structures. The PrairieFire supercomputer was used in both discoveries.

State EPSCoR Committee Members

Mr. Lyle Middendorf, *Chair, Sr. Vice President & Chief Technical Officer, Advanced Research & Development, LI-COR, Inc., Lincoln*

Dr. Linda Pratt, *Vice Chair, Executive Vice President and Provost, University of Nebraska*

Mr. Richard Baier, *Director, Nebraska Department of Economic Development*

Dr. Thomas Bragg, *Associate Vice Chancellor for Research & Dean of Graduate Studies, UNO*

Dr. Michael Cherney, *Professor of Physics, Creighton University*

Dr. Judith Christman, *Stokes-Shackleford Professor & Chair, Department of Biochemistry & Molecular Biology, UNMC*

Dr. Cam Enarson, *Vice President for Health Sciences and Dean, School of Medicine, Creighton University*

Dr. Clague Hodgson, *President, Nature Technology Corporation, Lincoln*

Dr. Marjorie Langell, *Charles Bessey Professor of Chemistry, UNL*

Dr. Finnie Murray, *Senior Vice Chancellor for Academic Affairs and Student Life, UNK*

Dr. Prem Paul, *Vice Chancellor for Research & Dean of Graduate Studies, UNL*

Dr. Plamen V. Petrov, *Executive Vice President & Chief Technology Officer, 21st Century Systems, Inc., Omaha*

Dr. Ronald Raikes, *State Senator, State of Nebraska*

Dr. Thomas Rosenquist, *Vice Chancellor for Research, UNMC*

Dr. Gregg Rothermel, *Professor and Jensen Chair of Software Engineering, Department of Computer Science and Engineering, UNL*

Dr. Anthony Starace, *George Holmes University Professor, Department of Physics and Astronomy, UNL*

Dr. Raymond Ward, *President, Ward Laboratories, Inc., Kearney*

Dr. Terri Wasmoen, *Senior Director, Biological Research, Schering-Plough Animal Health Corporation, Elkhorn*

Dr. Ilze Zigurs, *Mutual of Omaha Distinguished Chair of Information Science & Technology, UNO*



Experimental Program to
Stimulate Competitive
Research

Institutional
Development
Award Program

Nebraska EPSCoR • W192 Nebraska Hall
Lincoln, NE 68588-0557 • Ph: (402) 472-8946
Fax: (402) 472-8948 • Email: epscor@unl.edu
<http://epscor.unl.edu>

STATE EPSCoR OFFICE STAFF

Dr. F. Fred Choobineh, P.E., *Director*

Dr. Gaynell Gavin, *Grants/Communication Specialist*

Ms. Karla Roth, *Administrative Assistant*

Ms. Nancy Simnitt, *Administrative Technician*

Annual Report Editor: Gaynell Gavin

Design and Layout: Karla Roth

Copy Editor: Nancy Simnitt