

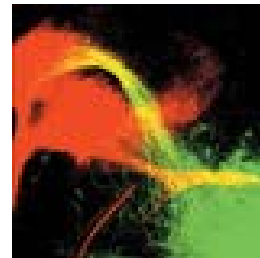
EPSCoR

NEBRASKA

Experimental Program to Stimulate Competitive Research

Annual Report

August 2005



Greetings from the Director



F. Fred Choobineh

Nebraska EPSCoR completed its thirteenth year at the end of June 2005, and I completed an eventful first year as director at the end of 2004. April 2005 brought the first annual Nebraska Research Expo at the Qwest Center in Omaha (see story on p. 4). The next Research Expo will be held at the Cornhusker Marriott Hotel in Lincoln on March 29, 2006. Nebraska researchers have obtained \$139 million in grants through EPSCoR programs since 1991. These funds have supported research, infrastructure and economic development, outreach to members of groups that are underrepresented in the sciences, and educational programs. It is my pleasure to pay tribute to State Committee chair, Dr. Robert Allington in this report. I appreciate his efforts on behalf of Nebraska EPSCoR over the past thirteen years. Likewise, I thank Dr. Dennis Alexander and Dr. David Sellmyer (whose terms ended at the end of 2004) for their committee membership since 1991 while I welcome new members Dr. Gregg Rothermel and Dr. Anthony Starace to the State Committee (see story on p. 6).

A Tribute to EPSCoR's State Committee Chair

His thirteen years of service to Nebraska EPSCoR as State Committee chair are among Dr. Robert W. Allington's many achievements. To say his record of civic service, entrepreneurship, and innovation is impressive is an understatement. Perhaps most legendary is his founding of Isco in his garage in 1958. Isco has since become a multi-million dollar manufacturer of instruments for water-pollution monitoring, research and analysis. Dr. Allington was CEO of Isco until the company merged with Teledyne Tech-

nologies in 2004; he is now senior vice president and chief scientific officer of Teledyne Isco, Inc. A UNL alumnus, Dr. Allington has served on the Chemistry Industrial Advisory Board of UNL as well as many other boards including the Nebraska Polio Survivors, League of Human Dignity, and Nebraska Research and Development Authority. *R&D Magazine* named him the 1991 Research and Development Executive of the Year. In February 2005, Dr. Allington received the fourth annual Pittcon

Heritage Award, given to recognize his achievements in analytical chemistry and instrumentation. The award is given by the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon) and the Chemical Heritage Foundation to recognize outstanding entrepreneurs whose careers have inspired achievement, promoted public understanding of instrumentation sciences, and highlighted the economic role of analytical chemistry.

NCV Fights Worldwide Health Threats

Nebraska's first center established under a NIH Centers of Biomedical Research Excellence (COBRE) grant is now in its fifth year, and NIH is renewing the original grant. The Nebraska Center for Virology (NCV) was established in 2000 under a \$10.7 million NIH Institutional Development Award (IDeA) COBRE grant. NCV investigators have since received over \$34 million in Public Health Service (largely NIH) funding and nearly \$5 million in other external grants (from NSF, USDA, and industry). The investigators have also received three patents, published nine books, chapters and reviews, 130 peer-reviewed

articles, and 112 abstracts. In fall 2004, NCV hosted its fourth annual virology symposium. Housed in the Beadle Center at UNL, NCV has started to outgrow its current space, and plans are in progress for a new center, anticipated to be constructed on the UNL East Campus.

NCV researchers from UNL, UNMC, and Creighton University (CU) study viral pathogenesis under the leadership of director Charles Wood. Dr. Wood observes that this research helps to address questions pertaining "to some of the most devastating viral and neuroimmune disorders fac-



A mother and baby visit the new clinic

ing the global community, including AIDS, Alzheimer's, multiple sclerosis and virus-induced cancers." His career as a molecular virologist and HIV

researcher includes commitment to addressing the problem of HIV transmission in Africa with particular focus on Zambia where about 20 percent of the population is infected and where he leads an international research team.

After growing up and attending high school in Hong Kong, Dr. Wood came to the U.S. as a college student. "I was always interested in biomedical research, hands-on in the lab. My undergraduate research developed that interest. Despite the long hours, I have a job I love coming to every day." He elaborates on some favorite aspects of his work. "To be able to ask a question and then find the answer, especially if it's what you expected; to be able to develop and test a hypothesis; to see your work quoted and studied by others, who recognize what you do; to see a research center start from the bottom and to shape it to maturity, into a reputable program; to bring people together to do good work for the center, for the university; to have an impact—that's very satisfying." He hopes the NCV will "continue to grow in size and reputation with university and research support, to maintain and sustain."

Working with NCV colleagues to meet the international AIDS crisis, Dr.



Zambian colleagues and Dr. Wood in front of clinic

Wood notes the tremendous health and security risks posed by AIDS to industrialized as well as developing countries. Seated at the conference table in his office, he explains, "As a generation of workers is devastated by disease, productivity declines and poverty rises. That economic impact of the disease can lead to social instability and even revolution because of poverty." Dr. Wood has worked to help surmount lack of infrastructure for research and health care needs. One result is a clinic with teams of Zambian researchers and health care professionals (see above & cover photos). He continues, "We are not in Zambia just to do our research. We want to help the people build their health care delivery systems and their own research programs. Together we can make a difference, and I am hopeful for the future. I see a world where AIDS will

no longer be a terminal disease but will be a manageable lifelong infection. I see the quality of life for infected individuals being restored. I believe we can do this." Although he describes the AIDS pandemic as "a humanitarian crisis arising out of the inequities in global health care," Dr. Wood refuses to be discouraged. Despite United Nations concerns that in the next several years infant mortality could rise 25% in the hardest hit countries with

a possible mortality increase of over 100% among children under five, he explains his optimism; due to support from the World Health Organization, Global AIDS funds, and the U.S. government, an attempt to provide anti-retroviral treatment to three million people before the end of this year is ongoing. "There has been improvement in development and distribution of drugs; even though it is still on a small scale, it is already making an impact. I just returned from Zambia where the hospital ward housing HIV infected individuals used to be packed, and it's now nearly empty. The treatment program needs to be expanded to a much larger scale, and that is a humungus job. The picture in Africa was discouraging just a couple of years ago, but it is changing as these drugs are becoming available. In fact, the African continent is now filled with hope."

EPSCoR Grant Projects

NSF

NCCB: The Nebraska Center for Cell Biology (NCCB), established at CU with support from the 2004 Research Infrastructure Improvement (RII) grant, obtained a multi-photon confocal microscope with enhanced capability over the previous system (see cover photo). A remote user can control all functions of the confocal microscope and operate it with minimal intervention from the NCCB

operator. The first annual Omaha Imaging Symposium was hosted by the NCCB. Over 50 faculty and students from CU, UNMC, UNL, and Nebraska Wesleyan University attended to hear speakers from the University of Iowa, Washington University School of Medicine, Harvard



The Mobile Computing & Wireless Communication team with Fred Choobineh at the Expo (see related stories p. 4)

Department of Radiology, and MIT as well as local speakers. Coherent and Zeiss helped sponsor the symposium. Zeiss, Boyce Instruments, and Hirschfeld Instruments provided exhibits. The second symposium will be held September 24, 2005. NCCB also participated in outreach activities and in the Nebraska Research Expo (see stories below and on p. 6). First-year activities led to congratulations from an external reviewer “on an exceptionally productive start.” NCCB information is available at <http://www.biomedsci.creighton.edu/facilities/nccb.html>.

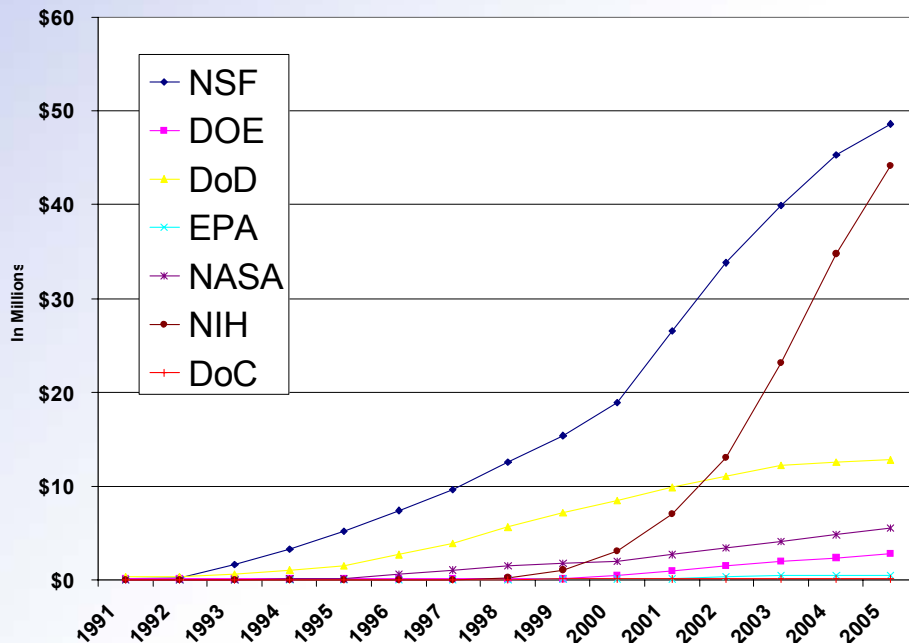
Mobile Computing and Wireless Networks: With 76,868 square miles (primarily rural) in Nebraska, landline high-speed communications data links are an expensive proposition while need increases for high-speed connections to access a new generation of Internet-based applications. Scientists from UNO and UNL are working to solve the problem. Researchers have built several wireless network test beds (major components of a proposed wireless research infrastructure) and identified real-world applications for wireless networks, particularly in medical and transportation domains. Mobile computing is a growth industry in Nebraska. Find more information at <http://nwind.ist.unomaha.edu>.

DoD

In 2005 Nebraska received Department of Defense (DEPSCoR) support for an Air Force Office of Scientific Research project, which competed with 108 projects, requesting over \$56 million. DEPSCoR awards

Nebraska Research Expo

Nebraska EPSCoR sponsored the first annual Nebraska Research Expo at the Qwest Center in Omaha on April 20, 2005. The Expo had 218 attendees and showcased academic research



Cumulative Federal R&D funds expended by Nebraska EPSCoR

totaled \$11.4 million for 27 projects in 16 states. The funded Nebraska project is “Laser-Assisted Fabrication of Large-Scale 3-D Photonic Bandgap Structures” at UNL.

DOE

CU’s “A Study of Ultra-Peripheral Collisions at RHIC” received a Department of Energy National Lab Partnership award in fall 2004. Brookhaven’s RHIC (Relativistic Heavy Ion Collider) is one of the two flagship facilities for nuclear physics in the U.S. In the second year of its Research Implementation Award renewal, the “Carbon Sequestration and Global Climate Change” project at UNL continues research on carbon sequestration in rain-fed and irrigated agricultural ecosystems and the role of carbon sequestration in mitigating increases in atmospheric carbon dioxide concentrations.

NASA

In the fourth year of the NASA Nebraska EPSCoR grant, the three collaborative research teams, Airborne Remote Sensing (ARS), Small Aircraft Transportation Systems (SATS), and Convective Extinction of Fuel Droplets (CEFD), had peer-reviewed publications and invited presentations. NASA EPSCoR’s display at the Nebraska Research Expo covered these research areas. ARS flew missions in 16 different states, collecting data from lakes, fields, and prairies. SATS research on systems assessment and decision support analysis is a centerpiece of the SATS demonstration project. CEFD’s work includes examining ways to reduce major losses due to fire on space stations by conducting simulations.

New Awards

DOD \$417,837

DOE \$443,684

and interaction among students, faculty, and business people in technology, engineering, mathematics, and science. The five primary areas were Bioinformatics, Nutritional Genomics,

Cell Biology, Nanomaterials, and Wireless Communication; but research display and poster presenters were not required to restrict their presentations to these areas. Faculty and students from throughout Nebraska and beyond participated (see story below). After Dr. Jay Noren, University of Nebraska ex-

ecutive vice president & provost, welcomed attendees, they heard from NSF EPSCoR program director Karen Sandberg and plenary speakers on economic development. Lunch was followed by afternoon sessions in the above five areas. Information about the Expo including the program, the 74 poster presentation abstracts,

speakers' bios, and additional information about their presentations is available at <http://epscor.unl.edu>. The next Nebraska Research Expo, emphasizing research, innovation, and economic development, will be held Wednesday, March 29, 2006 at the Cornhusker Marriott Hotel in Lincoln. See updates on our website.

Economic Development and Outreach/Educational Activities

Economic Development

In addition to the Nebraska Research Expo, this year's economic development activities included the Nebraska Engineering, Science, and Technology Internship Program (NESTIP) and a new R&D grant. During its fourth year, NESTIP continued to successfully link students with private sector companies. This program now accepts applications continuously. As interns, science, engineering, math, and technology students provide technical expertise to Nebraska companies. In the summer and fall of 2004, nine students from Nebraska Wesleyan, UNL, and UNO participated in the program. In the spring and summer of 2005, 13 students from Nebraska Wesleyan, UNK, UNL, and UNO participated. Participating businesses included Cargill; Hamilton Telecom-

munications; i2rd; Kelly Industries; Megabase Research Products; Morrissey Engineering; Natura Manufacturing; Neapco; Building

Solutions; IntelliCom Computer Consulting; Interaction Arts and Technologies; Lincoln Electric System; M.I.S. Engineering; Nebraska Centers for Excellence in Electronics; Nebraska Mu-

nicipal Power Pool; Nebraska Public Power District; Olsson Associates; Springbok; and Valmont Industries. In its first year, a R&D partnership grant has been awarded to GC Image, which develops software for visualizing, processing, analyzing, and reporting on images produced in two-



Former NESTIP intern and current employee Nathan Sheets stands with Morrissey Engineering president, George Morrissey, and recent NESTIP intern Michael Muller

dimensional gas chromatography. "Technology Transfer. . .Economic Development: NESTIP" and "Applied Research. . .Economic Development: University-Industry R&D" are available in print and online at <http://epscor.unl.edu>/publications.

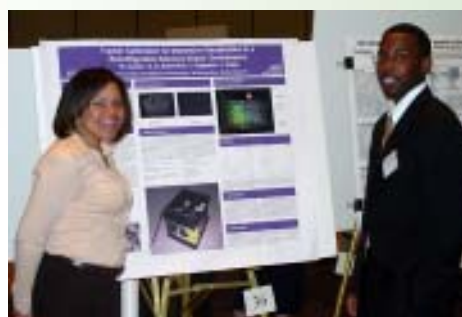
Outreach/Educational Activities

Diversifying the Sciences: Nebraska EPSCoR maintained strong commitment to recruiting students who are members of underrepresented groups in the sciences by supporting

the following programs in 2004 and 2005. The Summer Enrichment Program for Minority Undergraduate

Students at UNMC had 23 participants in 2005. The program's many topics included forensic science, bioterrorism defense, careers, ethics, and professionalism. The UNL Summer Research Program had 29 undergraduates. It included career, GRE, oral presentation, and technical writing classes as well as poster presentations and conference attendance at UC Berkeley. CU's Summer Research Program had 20 high school participants in 2005. Six summer program students from UNL and UNMC's 2004 programs presented posters at the Nebraska Research Expo (see story p. 4). EPSCoR Summer Saturday at Mahoney State Park brought together students from the summer programs at CU, UNL, UNMC, and UNO for the first time in 2005. They heard speakers on "Life Journeys and Opportunities" and on development of equal opportunity under the law. The afternoon brought lunch, swimming, and miniature golf. "Research Opportunities for Minority Students" is available in print and online. Additionally, EPSCoR supported summer science opportuni-

ties.



UNL summer research participants Whitney Austin & Gregory Richard at the Expo



Tyrone Cherry, a UNMC summer research student, at the Expo

ties for ethnic minority elementary students in 2004 and 2005 through the Bright Lights program as well as summer opportunities in engineering education for ethnic minority middle and high school students through the MESA program in 2005. EPSCoR also



Bright Lights students

sponsored the Good Medicine Camp, providing math and science opportunities for 45 American Indian children in 2005.

Tribal College Outreach: NSF EPSCoR provided continued support for Little Priest Tribal College outreach activities. As

NASA EPSCoR enters its fifth year of the current grant, many outreach activities with the Winnebago Native American Reservation continue, including further training on global positioning systems (GPS) and programs like the Environmental Systems Research Institute's ArcView, which will allow the mapping of collected points, such as historical sites.



Good Medicine Camp participants

Women in Science: EPSCoR and the UNL Center for Science, Mathematics, and Computer Education co-sponsored the seventh annual Women in Science Conference on February 25-26, 2005. Approximately 55 high school women (identified by teachers as showing interest in science), along with their teachers, attended from 14 Nebraska schools. Activities included poster presentations, student panels, hearing academic and industry speakers in the sciences, and lab tours. Additionally, EPSCoR and the College of Information Science and Technology (IS&T) at UNO co-sponsored the third annual Women

in Information Technology and Engineering Program April 15-16, 2005. One student and one teacher from each of 22 Nebraska schools participated in this interactive experience. The counselor at each school nominated a top sophomore female student interested in technology. Blair, Gordon, Holdredge, Imperial, the Lincoln-

Omaha area, Seward, and South Sioux City schools were among those represented.

Other Outreach Activities: EPSCoR and UNO's College of IS&T co-sponsored IT summer camps in 2004 and 2005 for members of underrepresented groups. There were camps for female, ethnic minority, and hearing-impaired high school students. EPSCoR and the Nebraska Academy of Sciences co-sponsored research and travel activities for professors and students from Chadron State College, the College of St. Mary, Midland Lutheran College, Union College, UNK, and Wayne State College. Grants enabled professors and students to attend conferences and meetings held by the American Association for the Advancement of Science, the American Junior Academy of Sciences, and the Nebraska Academy of Sciences.



Dr. Cheryl Bailey (right) with student in the new Biofilms Research Lab at Midlands Lutheran College. Dr. Bailey is an EPSCoR undergraduate research experience grant recipient.

Nebraska EPSCoR: State Committee Changes

In December 2004, terms ended for two State Committee members, who had served since early 1991: Dr. Dennis Alexander (Director, Center for Electro-Optics/Kingery College Professor of Electrical Engineering at UNL) and Dr. David Sellmyer (Director, Center for Materials Research and Analysis/University Professor of

Physics and Astronomy at UNL). Dr. Lee Jones, vice chair, presented certificates and letters of appreciation to Drs. Alexander and Sellmyer. Dr. Choobineh noted that their "commitment to the public good not only promotes scientific research but also benefits the wider Nebraska community in such areas as economic devel-

opment and public health." Dr. Gregg Rothermel (Professor and Jensen Chair of Software Engineering at UNL) and Dr. Anthony Starace (George Holmes University Professor of physics at UNL) have accepted appointments to the State EPSCoR Committee.

Nebraska EPSCoR Newsmakers

Stephanie Adams (EPSCoR minority coordinator) has been named assistant dean for research at UNL and has received an American Association for the Advancement of Science/NSF Science and Engineering Fellowship for 2005-2006.

Richard Baier (State Committee member) received a Fort Hays State University Young Alumni Award from the FHSU Alumni Association.

Ken Cassman (DOE EPSCoR Co-PI) was one of three UNL scientists included in *Discover's* 100 top science stories in 2004. Cassman was included for research with scientists at the International Rice Research Institute in the Philippines, which indicates that global warming could harm food production.

Fred Choobineh (EPSCoR director) was named Milton E. Mohr Distinguished Professor of Engineering at UNL.

Vadim Gladyshev (NSF EPSCoR nutritional genomics researcher) was named a Bessey professor of biochemistry and spoke at the second annual Symposium in Redox Biology, sponsored by the Nebraska Redox Biology Center at UNL, which is supported by a NIH COBRE grant.

George Gogos (former DEPSCoR grantee) and Hendrik Viljoen received a \$1.44 million five-year NIH grant to continue their development of faster Polymerase Chain Reaction (PCR) technology, used to amplify DNA for diagnostic purposes.

Yongfeng Lu (DEPSCoR AFOSR grantee; see story p. 4) received a three-year, \$3 million DoD Multidisciplinary University Research Initiative grant to refine technology that coats surfaces with thin diamond film making them stronger and more resistant to abrasion or corrosion. Process applications include military hardware and surgical tools.

Byrav Ramamurthy (former NSF EPSCoR area leader) discussed applications of his research to help secure wireless networks when he appeared in a two-part segment on KLKN Channel 8 TV.

Gregg Rothermel (State Committee member; see story p. 6) joined the computer science and engineering faculty at UNL as Jensen Chair in Software Engineering.

David Sellmyer (former NSF EPSCoR cluster leader and former State Committee member; see story p. 6) oversaw the MRSEC (Materials Research Science and Engineering Center) Review and Symposium at UNL.

Anthony Starace (State Committee member; see story p. 6) received UNL's Outstanding Research and Creative Activity Award.

James Van Etten (State Committee member and former NSF EPSCoR cluster leader) presented the keynote address, "Unusual Lifestyle of Giant Algal Viruses," at the American Society of Virology annual meeting in June 2005 at Pennsylvania State University. The meeting was attended by approximately 1500 virologists.

Don Weeks (founding NSF EPSCoR director) and colleagues have identified a gene that can make crops resistant to the herbicide dicamba, resulting in an exclusive licensing agreement between UNL and Monsanto to develop dicamba-tolerant crops.

John Woollam (former State Committee member) received an honorary doctorate from the Linköping Institute of Technology in Sweden. In past years, he has traveled to the Institute and hosted Swedish students conducting research at UNL.

Xiao Zeng (NSF EPSCoR nanomaterials researcher) directed UNL students' use of the PrairieFire supercomputer to help determine the point where the element boron changes from a sheet of molecules to a 3-D ring, and *The Proceedings of the National Academy of Sciences* published the experiment.

State EPSCoR Committee Members

Dr. Robert Allington, Chair, Senior VP & Chief Scientific Officer, Teledyne Isco, Inc., Lincoln

Dr. Lee Jones, Vice Chair, Executive Vice President and Provost Emeritus, 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. F. Joseph Daugherty, Management Consultant, Omaha

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

Dr. Richard Murphy, Chairman, Biomedical Sciences, Creighton University

Dr. Jay Noren, Executive Vice President and Provost, University of Nebraska

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

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

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. James Van Etten, William Allington University Professor, Department of Plant Pathology, UNL

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



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, 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