

Nebraska

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# Nebraska EPSCoR/IDeA

Nebraska Experimental Program to Stimulate  
Competitive Research  
and  
Institutional Development Award Program

## Implementation Strategies

- Developing research infrastructure
- Promoting R&D competitiveness
- Fostering collaborations
- Increasing diversity
- Providing seed grants
- Facilitating technology transfer

April 2003

The cover art by James Eisentrager combines rectangles of root 3 and root 4 representing the 3 original NSF research clusters and 4 original universities involved in Nebraska EPSCoR.

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## Nebraska EPSCoR State Committee and Office

The State Committee is responsible for establishing necessary policies and strategies for successfully achieving the stated goals and mission of the Nebraska EPSCoR/IDEA programs, and fulfilling federal requirements. Its members are appointed by the Governor of Nebraska and include senior administrators and researchers from state research institutions, and industry leaders. The EPSCoR office interacts with federal agencies and state institutions for the purpose of implementing strategies and policies established by the State Committee.

## Our Mission

Nebraska EPSCoR assists Nebraska educational institutions in enhancing their science, technology, engineering, mathematics, and biomedical research and educational infrastructure to increase their research and development competitiveness, and fosters economic development through support of technology transfer.

## Introduction

The National Science Foundation (NSF) under a congressional mandate began the Experimental Program to Stimulate Competitive Research (EPSCoR) in 1979, and by early 1990s most other federal agencies received the required congressional mandates to develop similar programs. The National Institutes of Health (NIH) Revitalization Act authorized the NIH to establish the Institutional Development Award (IDeA) program in support of biomedical research and training in 1993; thus, making NIH the most recent federal agencies to establish an EPSCoR like program. In the year 2003, IDeA is the largest of the EPSCoR or EPSCoR-like federal programs, and the number of states or jurisdictions participating in the federal programs ranges from 20 for the Department of Defense to 24 for the NSF and NIH. The current intent of the program is to assist states in developing research and education infrastructures, thereby increasing the competitiveness of science and engineering researchers and attracting additional funding to participating states.

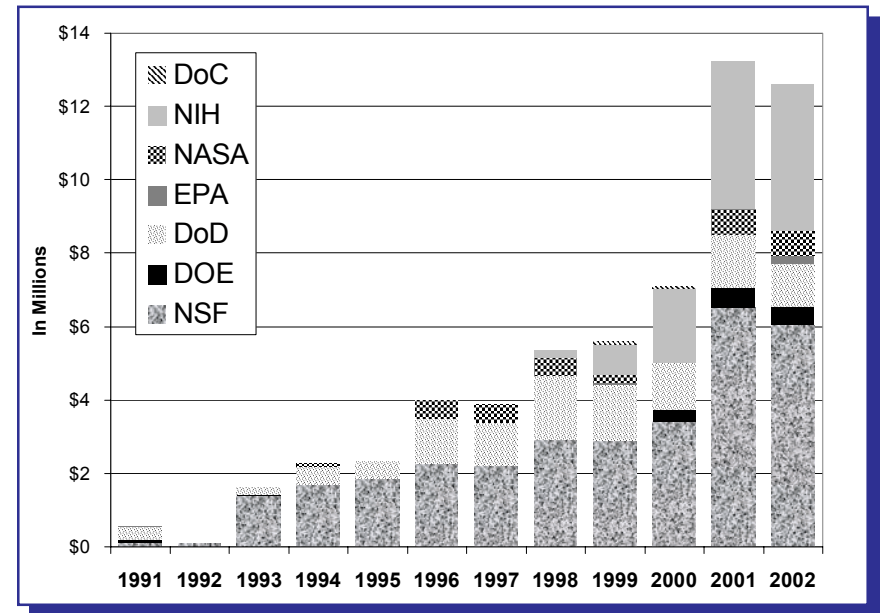
Nebraska has a long tradition of supporting science, technology, engineering, and mathematics (STEM) education and research dating back to the establishment of the University of Nebraska as a land-grant university in 1869. In addition, Nebraska has a long history of offering graduate programs and supporting research. The first graduate program west of Mississippi River was organized by University of Nebraska in 1896. The state has developed the research base in agricultural sciences to a highly competitive level. A more recent milestone for supporting STEM in the state is the Nebraska Research Initiative (NRI) initiated in 1988. During the last fifteen years the state has appropriated approximately 11 million dollars per year to NRI in support of research in areas such as engineering, materials science, biotechnology, water science, and computer and decision sciences.

In 1991 NSF designated Nebraska an EPSCoR state and by this designation Nebraska joined a group of 17 states and Puerto Rico as eligible for grants from the

NSF EPSCoR program. The State legislature added specific funds in the NRI legislation to develop a statewide EPSCoR program. Subsequently, the Governor appointed a statewide Nebraska EPSCoR Committee consisting of research and education leaders from academia, government and the private sector and charged it to develop procedures to support the EPSCoR program in Nebraska.

The state Committee has developed an EPSCoR program that is cognizant of Nebraska tradition in STEM and biomedical research and is responsive to the funding opportunities available from

federal agencies, as well as supportive of teaching, research and outreach missions of the University of Nebraska and Creighton University. Currently Nebraska qualifies to participate in the National Science Foundation, National Institutes of Health, Department of Energy, Department of Defense, the Environmental Protection Agency, and National Aeronautics and Space Administration programs. The chart depicts a summary of total funds received from the federal EPSCoR programs. Titles of specific projects supported by those programs are provided in annual reports that have been published by Nebraska EPSCoR.



Nebraska EPSCoR Grant Funds Received by Agency and Year

## Role and Mission

Nebraska EPSCoR is a statewide organization dedicated to: (1) enhancing sustainable science, technology, engineering, and mathematics (STEM) infrastructure of state research universities, (2) enhancing biomedical research competitiveness and training, (3) fostering cooperation and collaboration among state institutions and researchers, (4) assisting state institutions in increasing diversity among students and researchers participating in STEM & biomedical education and research, (5) providing seed funds on a competitive basis to scientists and groups not previously funded at the national level, and (6) facilitating knowledge and technology transfer in support of elevating state STEM & biomedical education and economic development.

In addition, Nebraska EPSCoR identifies potential research and development (R&D) improvement strategies and promotes those most likely to succeed, promotes collaboration among state institutions, provides opportunities

for research development, and establishes linkages among the research and educational institutions and the private-sector to enhance STEM & biomedical activities and competitiveness.

Nebraska EPSCoR seeks advice and counsel from organizations and citizens of the state through its statewide committee. Nebraska EPSCoR also works in cooperation with the national EPSCoR programs and alliances. Interested individuals and organizations are encouraged to provide advice and assistance by contacting the statewide committee through any of its members or through its office on the University of Nebraska-Lincoln campus.

## Long-Term Objectives

The long-term expectation for Nebraska EPSCoR is the development of competitive programs of basic and strategic research that will:

- Create and enhance the necessary infrastructure to support STEM & biomedical activities in state research universities;
- Increase total research funds obtained by research institutions and individual researchers of the state for STEM & biomedical programs;
- Develop innovative interdisciplinary research groups or centers;
- Provide additional mechanisms for support and development of state initiated STEM & biomedical programs, and enhance diversity among individuals involved in those programs;
- Promote greater collaboration among researchers in the state; and
- Develop programs to assist in the transfer of scientific and technical knowledge and discoveries to industry and their resultant commercialization.

## Specific Objectives

Nebraska EPSCoR will attain its long-term goals and objectives by systematic and incremental pursuit

of specific policies and programs outlined below.

### Promoting Infrastructure Development

A primary objective of Nebraska EPSCoR is to play a significant role in developing the infrastructures that stimulate development of competitive research programs in the state and its research institutions. Infrastructure development includes but is not limited to mechanisms, facilities, and funding for enhanced involvement in science, technology, engineering, and mathematics (STEM) & biomedical research and development (R&D).

**Statewide Coordination:** The state Committee and the Nebraska EPSCoR Office assist in the development of research efforts that is consistent with the goals and long term objectives of EPSCoR/IDeA programs and the strategic plans of Nebraska's research institutions. The EPSCoR office assists in the preparation of proposals from throughout the state that enhance

coordination of programs, resources, and efforts to increase the competitiveness of STEM & biomedical research and development in Nebraska. In addition EPSCoR encourages and supports activities that promote systemic change in R & D opportunities.

**University Infrastructures:** Infrastructures and policies assisting the development of research programs and researchers in universities of the state are important in the development of nationally competitive research programs. Nebraska EPSCoR encourages universities to develop policies and infrastructures consistent with increasing research competitiveness and the wise use of state resources. Nebraska EPSCoR will assist researchers and their institutions toward developing appropriate infrastructures. Nebraska

EPSCoR does not advocate any specific viewpoint or organizational structures as these may vary widely among research units in the state.

**Infrastructures at the State Level:** Nebraska EPSCoR operates under the assumption that the pursuit of competitive research programs enhances the quality of life, the economic development, and the opportunities of the citizens of the state. Nebraska EPSCoR encourages the development of programs, policies, and management strategies that will increase the competitiveness and stature of Nebraska's research institutions and scientific research and development community. In addition, Nebraska EPSCoR supports meaningful partnership among state colleges, community colleges and universities to

### Increasing Competitiveness in Research

An objective of Nebraska EPSCoR is to develop competitive research and technological development programs. The programs it develops or participates in are intended to assist researchers to compete for grants and contracts

improve quality of STEM & biomedical education and research activities.

**Interfacing with the Private Sector:** Advances made in knowledge in science, engineering and biomedical fields should be transferred to the private sector for maximum public good. Nebraska EPSCoR supports and encourages transfer of knowledge activities and programs and supports efforts of the private sector in research and development. Programs of Nebraska EPSCoR are also intended to assist private industry in identifying research expertise that will help solve particular scientific and engineering problems of industries in the state and support the expansion of private sector research and development in the state.

at the national level. The statewide committee has developed specific procedures (see Appendix A for schematic of grant development procedures) to identify and select research projects to be submitted to federal agencies. Program's

criteria vary depending on the agency and the program. Nebraska EPSCoR selects projects that will enhance the state's success in STEM & biomedical research and that will have the greatest impact on attaining the goals of Nebraska EPSCoR and Nebraska's research universities. In addition to specific programmatic criteria, priority is given to research projects that attempt to enhance collaborations among the researchers and organizations as well as focus on researchers with potential to develop nationally competitive programs, especially those that are early in their careers. More experienced researchers with nationally funded programs are encouraged to participate in projects as mentors and group leaders.

### **Assisting University**

**Researchers:** The Nebraska EPSCoR Office, following the advice of the state Committee's Grants Subcommittee, solicits potential projects when a grant announcement is issued by the EPSCoR program of a federal agency. Nebraska follows a process outlined in Appendix A in the development and selection of proposals. In general, depending

upon the specific time-frame of the announcement, a call for pre-proposals is sent to university units and researchers judged to have appropriate interest and expertise in the area of the federal announcement. Pre-proposals are normally short (2-5 pages) idea papers that demonstrate a researcher's (or research group's) expertise and potential of developing a nationally competitive EPSCoR proposal consistent with the characteristics of collaboration, demography of scientists, and purpose outlined in the previous section. The intent of the pre-proposal is to identify potential research projects suitable for a particular EPSCoR program with a minimum expenditure of time by individual scientists.

The Grants Subcommittee receives the pre-proposals and recommends to the state Committee those to be developed into full proposals. Following receipt of full proposals, the Nebraska EPSCoR staff arranges for external reviews of each proposal consistent with the federal agency evaluation criteria by experts in the discipline of the proposal. These reviews along with the review and discussion by

the members of the state EPSCoR Committee are considered at a regular meeting, at which time a specific proposal (or some combination of proposals) is selected to comprise the approved proposal(s) from the state. The Nebraska EPSCoR Office assists or facilitates the development and submission of the designated state proposal through the appropriate institutional office of the participating scientists.

### **Building Nebraska Strengths in STEM & Biomedical**

**Research:** Nebraska EPSCoR assists individuals and institutions in the state to build specific strengths in STEM & biomedical research. Modern research

requires considerable programmatic development at the level of the institution. Thus, the specific areas in which institutional research expertise and programmatic development occurs must reside within institutions of the state. Nebraska EPSCoR is a voice for state needs and attempts to identify areas of research that are particularly suited to or pertinent to the development of the state's research and development opportunities and goals. Nebraska EPSCoR promotes collaborations among the state's research institutions and attempts to enhance the strengths of STEM & biomedical research generally, but especially, as targeted by its scientists and institutions.

### **Identifying Areas of Strength and Need**

Research units and their institutions in the state develop strengths in specific disciplines as appropriate and necessary to accomplish their individual goals and objectives. Nebraska EPSCoR assists in the identification of research barriers, strength and need in the state and encourages its institutions and research units to build research

capabilities that are focused and have sufficient depth to ensure national and international competitiveness. Given that resources are limited, Nebraska EPSCoR expects and encourages development of research groups with a depth of expertise consistent with the mission and plans of the institutions and units rather than development of

research expertise in all fields of research. Depth of expertise is essential to an overall successful development of research and will

most likely lead to knowledge transfer opportunities to enhance economic contributions by the science-based industrial sector.

and biomedical research for the benefit of Nebraska citizens and society. Nebraska EPSCoR encourages and facilitates

engagement of underrepresented groups in STEM & biomedical research and education.

## Strategic Planning

To maximize opportunities for development of science, engineering and technology in the state, Nebraska EPSCoR supports and encourages strategic planning in the state, the state's research institutions, and science based industry. Understandably, each institution and company identifies specific areas of interest and strength upon which to focus efforts in the development of expertise and participation in the state's research and development enterprise. Nebraska EPSCoR provides an opportunity and forum for discussion of ways to foster collaboration and coordination among various groups in areas of common interest.

Nebraska EPSCoR encourages development of Nebraska's research base whether as a result of deliberate planning for basic, strategic, or applied research or as a result of opportunistic situations. The state's plans are expected to be diverse and involve specific research units, companies, and individuals.

Nebraska EPSCoR is supportive of basic and fundamental research at the forefront of science and engineering disciplines that will lead to increased competitiveness. It also supports research identified by national priorities and needs as articulated by federal R&D funding opportunities.

## Promoting Diversity and Fostering Interactions

Research conducted at the state institutions must have a long lasting impact on people, ideas and tools. Conducting such research often requires diverse, internationally competitive, and

globally engaged teams of investigators. Nebraska EPSCoR promotes collaboration and interactions among diverse researchers and educators to establish new frontiers in STEM

## Nebraska EPSCoR Research Priorities

The state of Nebraska supports a large and diverse group of research programs in agriculture at UNL. The national standing of the Institute of Agriculture and Natural Resources and UNL's success in the competitive grants program of the United States Department of Agriculture (USDA) precludes participation of Nebraska in the EPSCoR program offered by the USDA. Thus, the Nebraska State EPSCoR Committee does not consider or prioritize topics in agricultural sciences because there is no opportunity to compete for EPSCoR-type funding in these areas.

cognizant state institutions' priorities. Success in obtaining EPSCoR grants from federal agencies requires our proposals to be a high priority of the funding agency.

The list of general areas below represents a collection of current R&D priorities of state institutions and Nebraska EPSCoR. The list is in alphabetical order and includes some illustrative examples of specific research topics in each general area. The examples are not intended to be exhaustive.

Nebraska EPSCoR research priorities are defined collectively by the state's science and technology policies, and research priorities of research institutions within state. From time to time Nebraska EPSCoR adjusts its R&D priorities based on revisions in

## *Nebraska EPSCoR Research Priority Areas*

**Basic Science** to include pursuit of new discoveries and development of ideas and techniques that advance the frontiers of the basic and applied science disciplines in the physical, biological, behavioral, computational, and mathematical sciences.

**Biotechnology** including molecular biology, genetics, biochemistry, cell biology, genetic engineering, gene expression, bioengineering, environmental biotechnologies, biocontrol, transgenic technology, mechanisms of bioregulation, bioremediation, genomics and protonomics.

**Engineering Sciences and Technology** including manufacturing processes, intelligent automation and robotics, optical communications, photonics, ultra-fast laser sciences, optical instrumentation, analytical measurements employing lasers, intelligent sensor technology.

**Energy Science and Technology** including alternative energy sources, materials science and engineering for energy technologies, energy consequences of climate and environmental change, site characterization and remediation, and biological effects of energy related chemicals and radiation.

**Environment and Natural Resources Sciences** including environmental toxicology, waste management, water sciences, global climate change, biodiversity, contamination of surface and ground water, geographic information and remote sensing technologies, hazardous and medical waste management, risk analysis, and biosecurity.

**Health Sciences and Technology** including basic biomedical sciences, disease diagnosis and treatment, transplantation, prevention, epidemiology, nutrition, ethics, risk analysis, health systems research, and biosecurity.

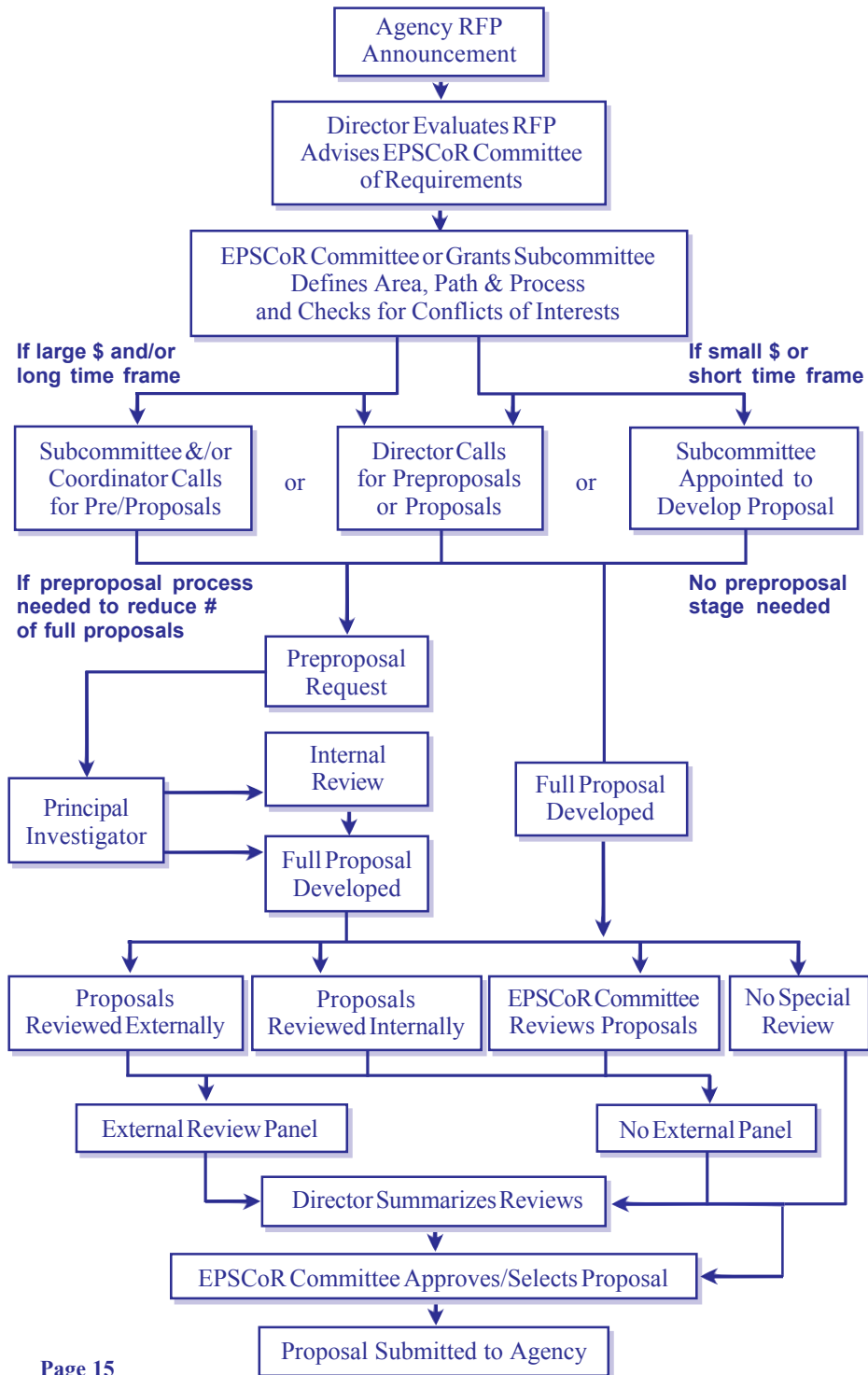
**Information and Communications Science and Technology** including software engineering, high performance and fault tolerant computing, parallel and distributive computing, data compression, optical communication, telecommunications, remote sensing technologies, coding theory and secure transmission, mobile computing, artificial intelligence, and data mining.

**Management and Decision Sciences** including decision support systems, feasibility analysis of start-up and spin-off ventures, decision and control issues in production and supply chains, assessment of linkages among scientific/engineering and management disciplines, models for selection of R&D projects, risk analysis, assessment of technology investments, optimization of complex systems, leadership behavior, and marketing strategies for e-commerce.

**Materials Sciences and Nanotechnology** including multifunctional nanostructured materials, nanocrystalline ceramic materials, nanofiber fabrication, high temperature superconductors, permanent-magnet materials, high-density data storage, nonlinear optical materials, advanced amorphous and composite materials, advanced semiconductors for microelectronics, biomolecular materials, and materials mechanics.

**Transportation and Infrastructure Sciences** including design and production procedures for construction products, highway safety, transportation of solid and hazardous wastes, use of recyclables, bridge deterioration (causes, remedial, and rehabilitation) technologies, nondestructive structural evaluation technologies and infrastructure security assurance.

## A.1 Schematic of Grant Development Process



## A.2 Grant Development Conflict of Interest Statement

*It is the policy of the state EPSCoR Committee that members of the Committee must recuse themselves from the selection process if they have a role or disciplinary-vested interest in any of the proposals or pre-proposals under consideration for a particular competition. This provision does not apply to academic Committee members who hold an administrative position of Dean or above.*

## NOTES

### Statewide Nebraska EPSCoR Committee

- Dr. Robert Allington, Chair, *CEO and Chairman, ISCO, Inc., Lincoln*
- Dr. Lee Jones, Vice Chair, *Executive Vice President and Provost Emeritus, University of Nebraska*
- Dr. Dennis Alexander, *Kingery College Professor of Electrical Engineering, University of Nebraska-Lincoln*
- Dr. Judith K. Christman, *Stokes-Shackleford Professor & Chair, Department of Biochemistry & Molecular Biology, University of Nebraska Medical Center*
- Dr. Joseph Daugherty, *Management Consultant, Omaha*
- Dr. Derek Hodgson, *Vice Chancellor for Academic Affairs, University of Nebraska at Omaha*
- Mr. Lyle Middendorf, *Senior Vice President & Chief Technical Officer, Advanced Research and Development, LI-COR, Inc., Lincoln*
- Dr. Richard Murphy, *Endowed Carpenter Chair in Biochemistry, Creighton University, Omaha*
- Dr. Jay Noren, *Executive Vice President and Provost, University of Nebraska*
- Dr. Prem Paul, *Vice Chancellor for Research, University of Nebraska-Lincoln*
- Mr. Herman Person, *Director, Corporate Product Development, Vishay Dale, Columbus, retired*
- Dr. Thomas Rosenquist, *Vice Chancellor for Research, Ardith & Anna Von Housen Chair & Chairperson & Professor of Cell Biology and Anatomy, University of Nebraska Medical Center*
- Dr. David Sellmyer, *University Distinguished Professor, Physics & Astronomy, University of Nebraska-Lincoln*
- Dr. James Van Etten, *William Allington Distinguished Professor, Department of Plant Pathology, University of Nebraska-Lincoln*
- Mr. Al Wenstrand, *Director, Department of Economic Development*
- Dr. M. Roy Wilson, *Vice President for Health Sciences, Creighton University*
- Dr. Ilze Zigurs, *Mutual of Omaha Distinguished Chair of Information Science & Technology, College of Information Science & Technology, University of Nebraska at Omaha*
- Senator Ronald E. Raikes, Ph.D., *Ex Officio, Nebraska Unicameral Representative, Nebraska Legislature*

### Staff of Nebraska EPSCoR Office

- Dr. Royce E. Ballinger, *Director and Professor, Biological Sciences, UNL*
- Dr. F. Fred Choobineh, P.E., *Assistant Director and Professor, Industrial & Management Systems Engineering, UNL*
- Ms. Karla Roth, *Administrative Assistant*
- Ms. Nancy Simnitt, *Administrative Technician*