

Synopsis: *“Research is critical to the future of this state. It improves our health care, protects our environment, and allows us to adapt to today’s rapidly changing world.” —Gov. Mike Rounds*

South Dakota needs to participate fully in the knowledge economy of the 21st century. A knowledge economy is defined as one that makes use of the products of science, technology, engineering, and mathematics (STEM) to produce economic benefit. In 2008, the American Association for the Advancement of Science (AAAS) studied South Dakota’s research environment. It concluded that significant investment in human capital for research activity is needed to further develop the state’s research infrastructure.

South Dakota’s Coordinated Research Strategy

In order to compete successfully in a 21st century economy, South Dakota’s higher education environment must be transformed. Rather than emphasize only instructional activity, public universities must be positioned to create new knowledge that translates into commercial activity. This is done primarily through university-based research activities. In fact, an innovation-oriented economy is reliant upon graduate programs and students to build and sustain a research industry.

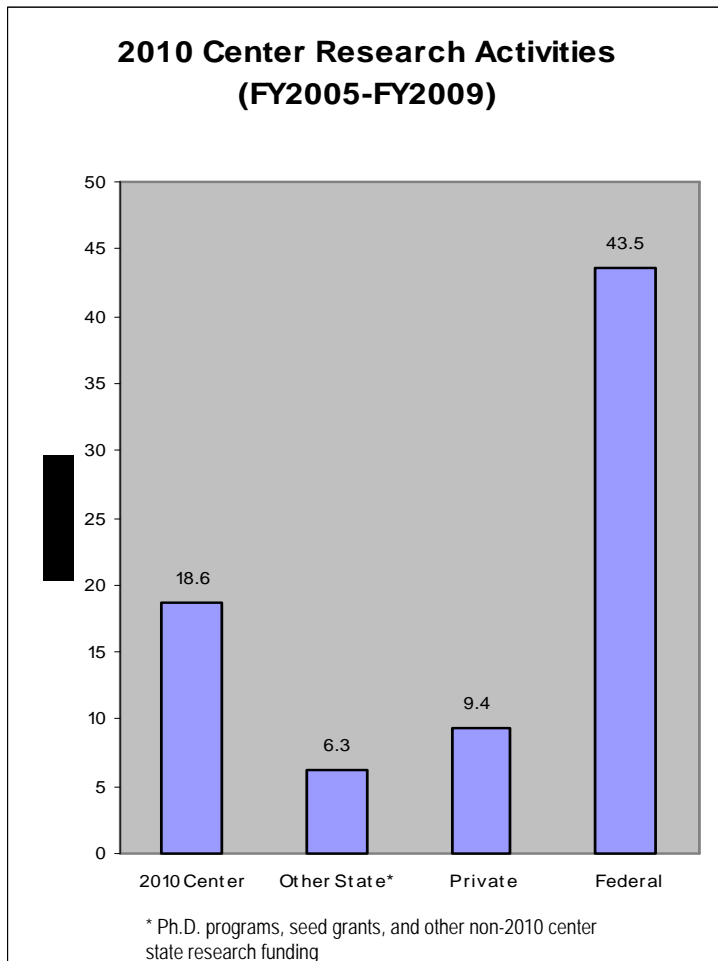
Recognizing that South Dakota has this underdeveloped capacity to create new knowledge or applications of knowledge, the state embarked on a concerted effort to build its research infrastructure. Overall growth in research activities has been significant. **Expenditures from public university grants and contract activity increased nearly \$45 million in just eight years—from \$33.8 million in Fiscal Year 2000 to \$78.6 million last year.** Major research initiatives in South Dakota have focused on 2010 research centers, competitive research grants, and new Ph.D. degree programs, all an integral part of the public university system.

2010 Research Centers

The state’s investment in 2010 research centers is paying off. The South Dakota Research and Commercialization Council created four 2010 research centers in 2004, and later added two more in 2006. To date, these research centers at the public universities have generated more than \$77 million in sponsored research activities. Using a conservative impact model, this has resulted in an economic impact of more than \$111 million to the state of South Dakota.

The original 2010 research centers have developed infrastructure and capabilities needed to be nationally competitive for research funding, which will help them continue to grow.

- ◆ **South Dakota Signal Transduction Center**, a collaboration between the Sanford School of Medicine at The University of South Dakota and Sanford Research, has generated more than \$30 million in biomedical research funding and has grown to more than 70 researchers, technicians, and students working on this exciting research.
- ◆ The **Center for Infectious Disease Research and Vaccinology**, a collaboration between South Dakota State University and USD, played a key role in attracting Chronix Biomedical Inc. to South Dakota. The center and Chronix recently announced a research collaboration with Dr. Luc Montagnier, winner of the 2008 Nobel Prize in medicine, to enhance research capabilities at the 2010 center and potentially at the Sanford Laboratory at Homestake.
- ◆ The **Center for Research and Development of Light-Activated Materials**, a collaboration involving USD, SDSU, and the Avera Research Institute, is working with major pharmaceutical, medical device, and animal health companies to further develop and commercialize technologies for use in vascular, ophthalmology, and other human and animal applications.
- ◆ The **Center for Advanced Applications at the Nanoscale** at South Dakota School of Mines



and Technology and SDSU played a key role in the current \$6.75 million National Science Foundation South Dakota EPSCoR project and a proposed \$20 million South Dakota EPSCoR project. This investment was also a key factor in Radiance Technologies Inc. establishing research and development collaborations in Brookings, Rapid City, and Mission.

- ◆ The **Center for Bioprocessing Research and Development** at SDSM&T and SDSU partnered with four universities and more than 30 companies throughout the country to be named the National Science Foundation's Bioprocessing Industry/ University Cooperative Research Center.

- ◆ The **Center of Excellence in Drought Tolerance Biotechnology Research** established at SDSU has generated more than \$6.5 million in

research funding from industry and \$5 million in federal research funding.

With the original research centers well established, the Research and Commercialization Council in September 2008 created the **National Center for the Protection of the Financial Infrastructure** at Dakota State University. This center builds on DSU's nationally recognized leadership in information security and South Dakota's financial services industry to create a national center that advances the security and safety of the nation's financial infrastructure. The Federal Reserve Bank and Department of Homeland Security are partners in this new center.

State resources support the centers in their first five years of operation. At the end of that period, the centers were expected to become self-sufficient and sustained by outside funding. State funds supporting the four original 2010 centers can now be redirected; no new state general funds are needed to support newer centers coming online. In January 2009, the Research and Commercialization Council recommended four new research centers, funded with existing resources, to capitalize on unique opportunities for South Dakota to develop leadership positions in focused areas. The four new centers, to be supported over the next five years, are:



The **Center for Detecting Rare Physics Processes with Ultra-Low Background Experiments**, led by USD at the Sanford Lab and the Deep Underground Science and Engineering Laboratory (DUSEL), will enable physics researchers at South Dakota's public and private universities to contribute to research and science education activities under way at Homestake. It will build the infrastructure needed to produce super-clean materials for ultra-low background experiments conducted at the Sanford Lab, DUSEL, and in other facilities around the world.



Two new centers at SDSU, the **Center for Biological Control and Analysis by Applied Photonics** and the **Translational Cancer Research Center**, will partner with Sanford Research and USD to link basic research activities under way at SDSU in the development of innovative materials, chemicals, and processes with the clinical research activities under way at Sanford Research and USD, in order to more efficiently move biomedical discoveries from the laboratory to the bedside.



The fourth new center planned is the **Repair, Refurbish, and Return to Service Applied Research Center** at SDSM&T. It will involve a wide range of industry partners in South Dakota and across the nation, along with the Department of Defense. It will develop, certify, and implement innovative methods to extend the useful life of military equipment. The center not only will help to save the defense department billions of dollars, but could also provide another mission for Ellsworth Air Force Base, help expand existing South Dakota businesses, and potentially attract several large defense contractors and manufacturers to South Dakota.

With modest investments, these four new research centers will position South Dakota to capitalize more fully on major opportunities associated with development of the Sanford Lab and DUSEL at Homestake, the \$400 million Sanford Initiative, and the need to refurbish and return to service vital military equipment.

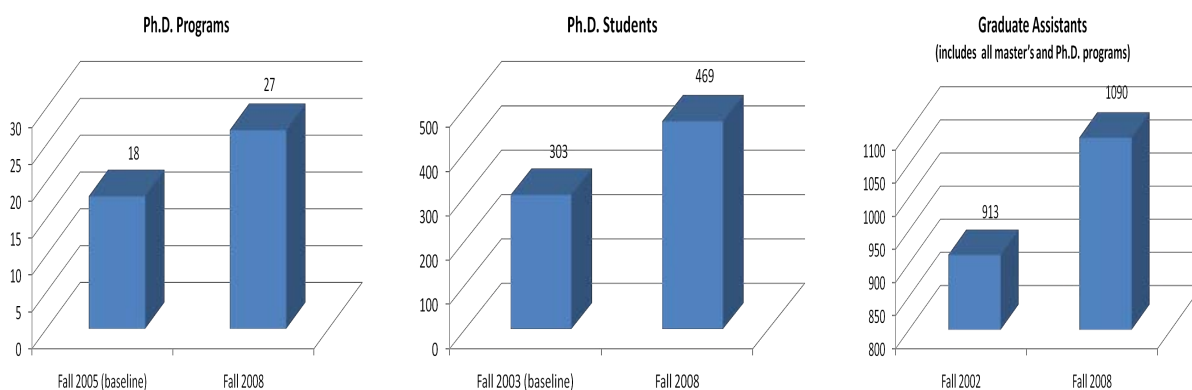
Competitive Research Grants

To further the goals of Gov. Rounds' 2010 Initiative, competitive research grants for individual researchers are awarded. These "seed grants" help university researchers develop and implement research programs, become more competitive for external grants and contracts, and develop new ideas with commercial potential.

Ph.D. Programs

University research is closely linked with graduate education. Faculty members with interests in research who pursue significant grants and contracts typically want to work at institutions with a graduate program in that discipline. Graduate students also are interested in studying with active researchers and are an important part of the research workforce.

Building South Dakota's Research Workforce



Public University System Ph.D. Programs (as of February 2009)

South Dakota School of Mines & Technology

Atmospheric and Environmental Sciences
Biomedical Engineering (joint degree USD)
Chemical and Biological Engineering
Geology and Geological Engineering
Materials Engineering & Science
Nanoscience and Nanoengineering

South Dakota State University

Agronomy
Animal Science
Biological Sciences (joint degree USD)
Chemistry
Computational Science & Statistics (joint degree USD)
Electrical Engineering
Geospatial Science & Engineering
Nursing
Nutritional Sciences
Pharmaceutical Sciences
Rural Sociology/Sociology
Wildlife and Fisheries Sciences

University of South Dakota

Basic Biomedical Sciences
Biological Sciences (joint degree SDSU)
Biomedical Engineering (joint degree SDSM&T)
Computational Science & Statistics (joint degree SDSU)
Counseling and Psychology in Education
English
Materials Chemistry
Political Science
Psychology

** Also created in FY06 was a combined M.D./Ph.D. (physician scientist) program at USD and a Doctor of Science in Information Systems at Dakota State University in FY07.
