

Synopsis: Governor Rounds' 2010 Initiative seeks to expand the state's capacity to conduct and commercialize scientific research at the public universities. The Governor recommends \$1,088,164 for three new Ph.D. programs that will increase South Dakota's research capacity, offer new educational opportunities to its young people, and support the four research centers lawmakers funded in 2004.

Governor Rounds' 2010 Initiative, a series of specific goals for economic growth in South Dakota, includes a substantial investment in scientific research. In 2004, the Legislature set the groundwork for this important development by funding four 2010 research centers.

Doctoral (Ph.D.) programs are an essential component in building a state's capacity to conduct research. Ph.D. students carry out a significant portion of the work in scientific laboratories. Why are Ph.D. programs so important?

- Faculty who generate large research grants expect to have advanced students available to work in their labs.
- Ph.D. programs help recruit exceptional faculty who can generate more research grants for the state.
- The programs will attract students who currently enroll at universities in other states to continue their education here.

The Board of Regents invited Ph.D. proposals from the public universities. All proposals were evaluated by external reviewers who are experts in their fields. The \$1.088 million requested of the Legislature represents a portion of the resources needed to operate these programs. Universities will provide substantial investments of their own—from internal redirections and grants/contracts. The budget request and university contributions are summarized in the table:

Universities & Programs	State Request	University Contribution	Total Cost
SDSMT Ph.D. in Nanoscience & Nanoengineering	\$224,954	\$220,255	\$445,209
SDSU-USD Ph.D. in Computational Science & Statistics	\$183,192	\$338,535	\$521,727
USD Combined M.D./Ph.D. Physician Scientist Program	\$680,018	\$375,759	\$1,055,777
Total	\$1,088,164	\$934,549	\$2,022,713

Here are brief descriptions of the three Ph.D. programs proposed for state funding:

South Dakota School of Mines & Technology -- Ph.D. in Nanoscience & Nanoengineering

- Nanotechnology deals with objects at the scale of 1 to 100 nanometers. A nanometer is one billionth of a meter. To compare, a human hair has a diameter of 80,000 nanometers. At this scale, matter has different properties which hold the promise of new applications. Nanoscientists and nanoengineers characterize the properties of materials at the nanoscale and create new materials that capitalize on these properties.

- This new Ph.D. program will prepare graduate students to support economic growth in this technologically emerging area. It will attract graduate students to work in SDSMT's 2010 Center for Accelerated Applications at the Nanoscale. The program will help the center recruit and retain faculty and make it more competitive for federal research grants.

**South Dakota State University and The University of South Dakota –
Ph.D. in Computational Science & Statistics**

- Computer simulations allow research into phenomena that may be too complex, expensive, time intensive, or dangerous to study with experimentation. Examples include the evolution of antibiotic resistance or the movement of contaminants in a watershed. High-performance computers and networks and advanced software have changed the way scientific research is conducted. Computational science is a new research discipline in which computers are used to complement traditional scientific theory and experimentation, through the use of mathematical models on high-performance computers.
- Faculty and students in the new Ph.D. program will support all four 2010 research centers in Infectious Disease Research and Vaccinology, Signal Transduction, Accelerated Applications at the Nanoscale, and Research and Development of Light-Activated Materials. The new program will lead to applied research in a variety of areas. These may include artificial neural networks, biological computing, biological information processing, biological modeling, biostatistics, computational biology including transport processes, computational chemistry, ecological modeling, and spatial data modeling.

The University of South Dakota — Combined M.D./Ph.D. Physician Scientist Program

- This program will develop a cadre of clinician scientists who combine state-of-the-art research with state-of-the-art patient care. The most significant discoveries in medicine result from collaboration between the basic sciences and clinical medicine. Historically, this effort has involved teams of medical doctors partnered with Ph.D. researchers. Physician scientists play a unique role in contemporary medical research because they have combined their M.D. and Ph.D. degrees. Their M.D. training allows physician scientists to identify unique patient problems and to work directly with patients. Their graduate training allows them to design, conduct, and interpret controlled patient-based research studies.
- The combined M.D./Ph.D. program will support three of the 2010 research centers in South Dakota and is expected to contribute to proposals for future research centers:
 - The Signal Transduction Center is a logical placement for students while they are in the research phase of their M.D./Ph.D. program.
 - M.D./Ph.D. students are expected to work with School of Medicine faculty involved in research work at the Center for Infectious Disease Research and Vaccinology.
 - The Center for Light-Activated Materials has a significant component associated with biomedical applications.

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