

Overview and Summary of Recent Initiatives

The **2010 Initiative** of Governor Mike Rounds outlines goals and objectives to grow the state's economy and improve the state's quality of life. One of the goals is for South Dakota to become a recognized leader in research and technology development by 2010. To accomplish this, the state is focusing on developing the state's research and technology infrastructure at its universities, health care providers, and other public institutions. Specific actions undertaken to achieve these objectives include improving universities' intellectual property policies; establishing an Office of Commercialization within the Department of Tourism and State Development; and providing funds for faculty research time, graduate assistants, and equipment to support research focused on concepts with commercial potential.

Another goal of 2010 is to increase gross state product by \$10 billion by providing assistance to entrepreneurs and start-up companies; enhancing existing industry clusters, which include health care and biotechnology; and providing capital to new and emerging technology companies through a restructured Revolving Economic Development and Initiative (REDI) Fund. The Governor's Office established the **South Dakota 2010 Research and Commercialization Council** to provide oversight of the 2010 Research Initiative, to make recommendations for funding of 2010 Research Centers, and to aid the commercialization process for technology transfer and innovation.

Another major initiative is the **Homestake Lab Conversion Project**, for which the state is seeking support from the National Science Foundation (NSF) to develop a deep underground laboratory using the now-closed Homestake Gold Mine in Lead, South Dakota. A deep underground laboratory developed at this site could be a resource for bioscience research in areas such as nuclear imaging (because it would lack background radiation) and geomicrobiology. The Homestake site is one of two under consideration by NSF.

The **South Dakota Science and Technology Authority (SDSTA)** exists to foster and facilitate scientific and technological investigation, experimentation, and development. Created in February 2004 by the Legislature in response to Governor Rounds' 2010 Initiative, the Authority is working to convert the closed Homestake Gold Mine. (See "Recent state investments in facilities," below.)

Building Bioscience R&D Capacity

Recent state investments in facilities

In 2005, the SDSTA announced that an agreement had been reached with Barrick Gold Corporation to transfer the Homestake Mine to the SDSTA. The South Dakota Legislature appropriated an additional

\$19.9 million for the establishment of the **Homestake Deep Underground Science and Engineering Laboratory**. With this additional appropriation, a total of \$45.6 million is available for the development and operation of this underground laboratory. The laboratory will provide the scientific community an opportunity to conduct experiments at a location in the United States that is the second deepest site in the world and offers a short timeline to science. The SDSTA will manage rehabilitation of the site and will participate in the management of the operation of the laboratory. The SDSTA plans to open the 4,850-foot level and some higher levels for beneficial occupancy in early 2007 for scientific and engineering experiments and other technical uses. The funds available from the State of South Dakota will cover rehabilitation and basic laboratory operations into 2012.

The 2006 Legislature approved and provided \$14 million for the acquisition of 260 acres of land and construction of a Board of Regents education and research campus in Sioux Falls. The first building to be constructed, the **Graduate Education and Research Facility** in 2006 will be a bioscience research facility. Funding of \$8 million for construction of a classroom facility to be used by all six South Dakota state universities was also approved.

Research programs

The **South Dakota Health Research Foundation (SDHRF)** is a nonprofit, 501(c)3 organization formed by the University of South Dakota School of Medicine and Sioux Valley Hospitals and Health System. SDHRF is dedicated to research excellence through the work of its Cardiovascular Research Institute, Signal Transduction Institute, Oncology Research Center, and Women's Health Center (see Research Centers Program, below).

The Governor requested and the Legislature approved approximately \$3.5 million for a Research and Development Initiative that is being undertaken jointly by state government and the Board of Regents. Almost \$2.8 million of this amount was designated to fund a **Research Centers Program**. In 2006, the Legislature approved an additional \$500,000 for 5 years to establish a fifth 2010 Research Center.

Three of the four 2010 Research Centers focus on the biosciences:

- **Center for Infectious Disease Research and Vaccinology, South Dakota State University (SDSU) Department of Veterinary Science, \$780,000**—This center fosters research leading to the development of novel therapeutic and diagnostic technologies and products for infectious diseases in humans and domestic animals. Research targets include vaccines for diarrheal diseases of livestock and humans, an improved vaccine for porcine reproductive and respiratory syndrome, and improved diagnostic tests for transmissible spongiform encephalopathies, such as bovine spongiform encephalopathy in cattle and chronic wasting disease in deer.
- **South Dakota Signal Transduction Center, University of South Dakota (USD) Cardiovascular Research Institute, \$900,000**—This center examines the pathways that regulate cell growth and differentiation, cell death, response to stress, and the maintenance of constant physiological conditions, leading to improved detection and treatment of a range of serious heart and cancer conditions.
- **Center for the Research and Development of Light-Activated Materials, USD Department of Chemistry, \$503,741**—The center performs both basic and developmental research on materials with light-activated properties. The research relates to medical applications such as human tissue bonding, drug delivery, and antitumor agents and is important to developing phosphors for sensors,

new laser materials, and thin films that impart special properties and characteristics to the materials they coat.

Faculty development programs

In July 2005, Governor Rounds announced award of nearly \$445,000 in **Research Seed Grants** to 19 faculty members at South Dakota public universities to spur their research work. The awards are intended to help support faculty researchers as they develop research programs to become more competitive for external grants and contracts, and to help them develop ideas with commercial potential. The grants pay for 25 percent of a faculty member's salary for one academic year, plus one summer month's salary. Under the terms of the grants, funding is matched by the faculty member's university, so the researcher earns 50 percent release time and two summer months of salary to do research. The award is also intended to give the faculty member an opportunity to start a sustainable research program and to help build research capacity in his or her department.

Encouraging Academic/Industrial Interaction

One of the functions of the **Commercialization Office**, which is housed in the Department of Tourism and State Development, is to facilitate interactions between researchers and companies and to encourage greater commercialization of university-developed technologies in South Dakota.

Moving Technology into the Marketplace

Commercializing university research

The **National Network for Technology Entrepreneurship and Commercialization (N2TEC) Institute**, a nonprofit, 501(c)(3) organization designed to raise the level of innovation diffusion and wealth creation in America through technology innovation, commercialization, and entrepreneurship, was established and located at the Homestake Underground Laboratory. N2TEC began as an NSF Partnership for Innovation–funded initiative. N2TEC works to build a community of practice dedicated to innovation and technology commercialization that is virtually linked within an enterprise-level collaboration space—the N2TEC Commercialization Portal; partner with organizations that can contribute expertise and resources to support this effort; provide resources and educational opportunities to facilitate effective innovation, technology commercialization, and entrepreneurship; and develop best practices, standards of excellence, and models for communities and others to emulate.

N2TEC is a strategic collaboration of universities, industry, and government with a common purpose—to raise the level of technology innovation and commercialization in the United States. Partners are as follows:

University Partners	Public/Private Partners
California State University, Fresno	Center for the Commercialization of Advanced Technology
Caltech	Gibson Dunn & Crutcher LLP
Case Western Reserve University	Groxis Inc.
CENTECOM—Florida Central Univ.	Los Angeles Economic Development Corporation
Claremont Graduate University	Microsoft Corporation
Cornell University	NASA-AMES
Pennsylvania State University	National Collegiate Inventors and Innovators Alliance (NCIIA)
Rose-Hulman Institute of Technology	National Institute for Strategic Technology Acquisition and Commercialization (NISTAC)
San Diego State University	Pacific Northwest National Laboratory/Department of Energy
University of Arkansas	PricewaterhouseCoopers
University of Maryland	
University of Pittsburgh	
University of South Dakota	
University of Southern California	

Supporting bioscience entrepreneurs and emerging companies

South Dakota has two nonprofit entities that provide assistance to start-up and emerging South Dakota companies: the Enterprise Institute and Genesis of Innovation.

The **Enterprise Institute (EI)** is a nonprofit, 501(c)(3) organization formed by SDSU to provide support to entrepreneurs and start-up companies. The institute assists in developing university-generated technologies, mentors emerging businesses, and offers educational programs on entrepreneurship. Its Business Resource Center assists start-up companies by linking them to sources of capital and helping them with business planning, competitive assessments, and human resource issues. The EI also operates an Entrepreneur Network that links CEOs and business owners. It has worked with a number of bioscience start-ups. In 2004, the state allocated \$300,000 to support the work of the EI.

Genesis of Innovation (GOI) is a nonprofit, 501(c)(3) partnership between private enterprise and public universities within South Dakota that helps entrepreneurs with business development, start-up capital, and other assistance. Both GOI and EI can take ownership and equity positions in companies and can receive royalties from licensing agreements.

Making Capital Available

Pre-seed and seed capital

The state restructured its REDI Fund, a low-interest loan program, to make capital available to start-up companies. The subfunds include

- A \$12 million fund to make loans to “capital investment entities,” including angel investor networks, private venture funds, and nonprofit development corporations, that can take equity positions in start-up companies.
- A \$5 million Entrepreneur Support Subfund to make loans of \$30,000 to \$50,000 to South Dakota entrepreneurs and start-up businesses. The loans will be unsecured and interest free for the first

3 years. If the business fails, the loan is converted to a grant, and no repayment is due. If the business succeeds, the loan must be repaid over a 20-year time period.

The **Value-Added Agricultural Subfund** is a \$3 million fund within the REDI Fund that provides funding for feasibility and marketing studies for value-added agricultural projects. Loans can be for up to 50 percent of the total project cost; and proceeds can be used for salaries, consultant contracts, supplies, and necessary services for feasibility and marketing studies. The subfund has made loans to bioscience companies; one such company received funding to conduct a marketing research survey to provide information on the marketability of a biofungicide that it is developing.

The **EI** has partnered with **RAINs (Regional Angel Investment Networks)**, out of Minnesota, to help form LLCs for investment purposes. The LLCs can be either local or regional and will lead people through the due diligence process, making it easy to learn about angel capital investments. All of the LLCs will be for-profit entities.

Venture capital

The **Genesis Equity Fund, LLC** provides equity financing for emerging South Dakota companies. The **Genesis of Innovation** for South Dakota is based around four sectors: agriculture, biomed/health, materials, and communications technology.

Providing Space for Bioscience Companies

Incubators

The **South Dakota Technology Business Center** is a 38,000-square-foot business incubator facility in Sioux Falls that opened in January 2004. It is adjacent to the Southeast Technical Institute and USDSU (a campus shared by Dakota State University, SDSU, and the University of South Dakota). The incubator, which provides space and support services for early-stage companies, also houses the Department of Tourism and State Development (Office of Commercialization, Governor's Office of Economic Development, Workforce Development), Small Business Administration, Small Business Development Center, Procurement Technical Assistance Center, Manufacturing Extension Program, EI, and venture capital firms Prairie Gold Venture Partners and McGowan Group. The State of South Dakota provided \$1.4 million for the facility, part of which has been used to develop wet-lab space in the building. The center still has 3,000 square feet available for lease and has graduated its first company.

The **Black Hills Business Development Center** will open in May 2006 on the South Dakota School of Mines and Technology campus in Rapid City. In addition to providing space for start-up businesses, the facility will house the Governor's Office of Economic Development, Small Business Development Center, GOI, Genesis Equity Fund, and Rapid City Economic Development offices.

Facilities financing

In 2003, state government provided \$8.2 million in low-interest loans to support the development of a headquarters and plant in Sioux Falls for Hematech, a biotechnology company that hopes to make human vaccines from genetically modified cows.

Bioscience research parks

Brookings and SDSU will begin construction of a **bioscience research park** adjacent to the SDSU campus. The land has been acquired, and construction of the infrastructure and first build is expected to begin in 2006.

Addressing Talent Needs

The State of South Dakota and Black Hills Vision have partnered with N2TEC (described previously) to collaboratively develop business management teams. Through the **N2TEC Pilot Project**, management teams involving South Dakota entrepreneurs and researchers have partnered with management team members from Texas, California, and other states to start technology-based companies.

Specialized postsecondary programs

Lake Area Technical Institute in Watertown offers an associate of applied science degree in bioenvironmental technology.

N2TEC operates a **Science and Technology Entrepreneurship Program (STEP)** in which students participate in a 10-week Summer Institute in the Black Hills working as part of a team to develop a plan for a technology venture. They also participate in technology entrepreneurship outreach activities on their home campus during the school year. Students may apply as a three-member team or individually for the program. Each team includes a science or engineering major, business or management major, and education or other major. Each STEP team will also be partnered with a community entrepreneur mentor team and faculty researchers. The N2TEC Summer Institute is led by a team of entrepreneurs from around the United States. The 2005 STEP program included several teams working to develop bioscience businesses.

K-12 outreach programs

Science On The Move is a statewide project to provide students in South Dakota schools with high-quality science laboratory experiences. Two large semitrailers (Mobile Science Laboratories, or MSLs) are equipped with a broad range of equipment, from powerful microscopes to molecular biology tools such as gel electrophoresis cells to interfaced computers. Science On The Move may be the first (and only) experience that students in small and/or rural South Dakota schools have with this kind of equipment. The MSLs circulate around the state and usually remain at a school for 2 to 5 days.

The Office of Commercialization is working with South Dakota Junior Achievement and the Center for Applied Mathematics and Science Education to develop and implement programs at the K-12 level to expose students to bioscience and other technology entrepreneurial opportunities. A statewide business idea competition will be held in 2007.

Pending Proposals

In continuation of the 2010 Initiative, for FY 2007 the Governor recommended and Legislature approved the following:

- \$1,813,060 in general funds for the addition of three new Ph.D. programs.

- \$500,000 in other fund expenditure authority for funding of new research centers. The Governor's 2010 Research and Commercialization Council will review and choose the proposal(s) with the greatest potential for commercial return.
- An increase of \$500,000 in general funds for the Division of Research Commercialization. Included in the increase is \$500,000 to fund a fifth research center.
- An increase of \$17,884,031 in other fund expenditure authority to begin the process of constructing the underground laboratory at the former Homestake Mine. The total FY 2007 recommended budget consists of \$19,182,583 in other fund expenditure authority.
- House Bill 1129 was approved, exempting certain business incubators from property tax liability. The legislation applies to incubators in South Dakota that are paying real estate taxes with taxpayers' money.

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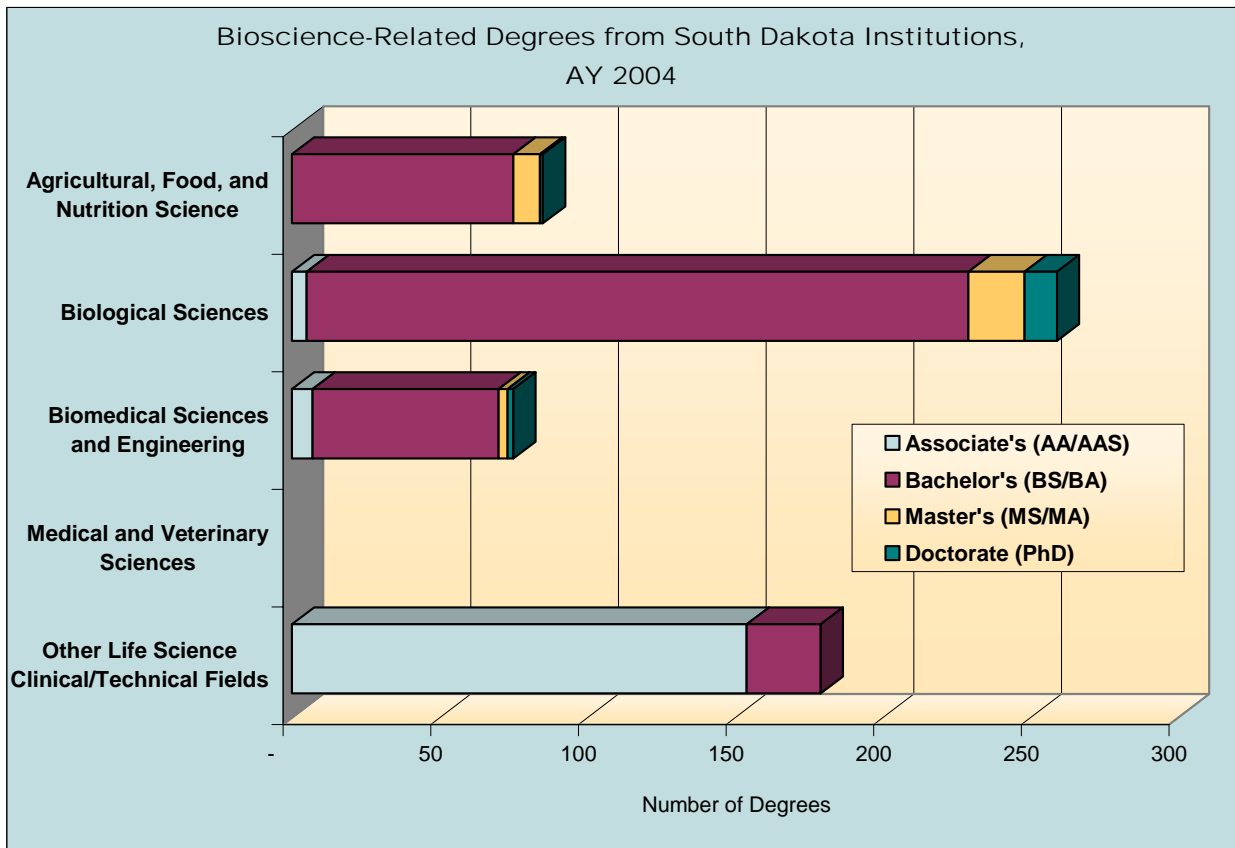
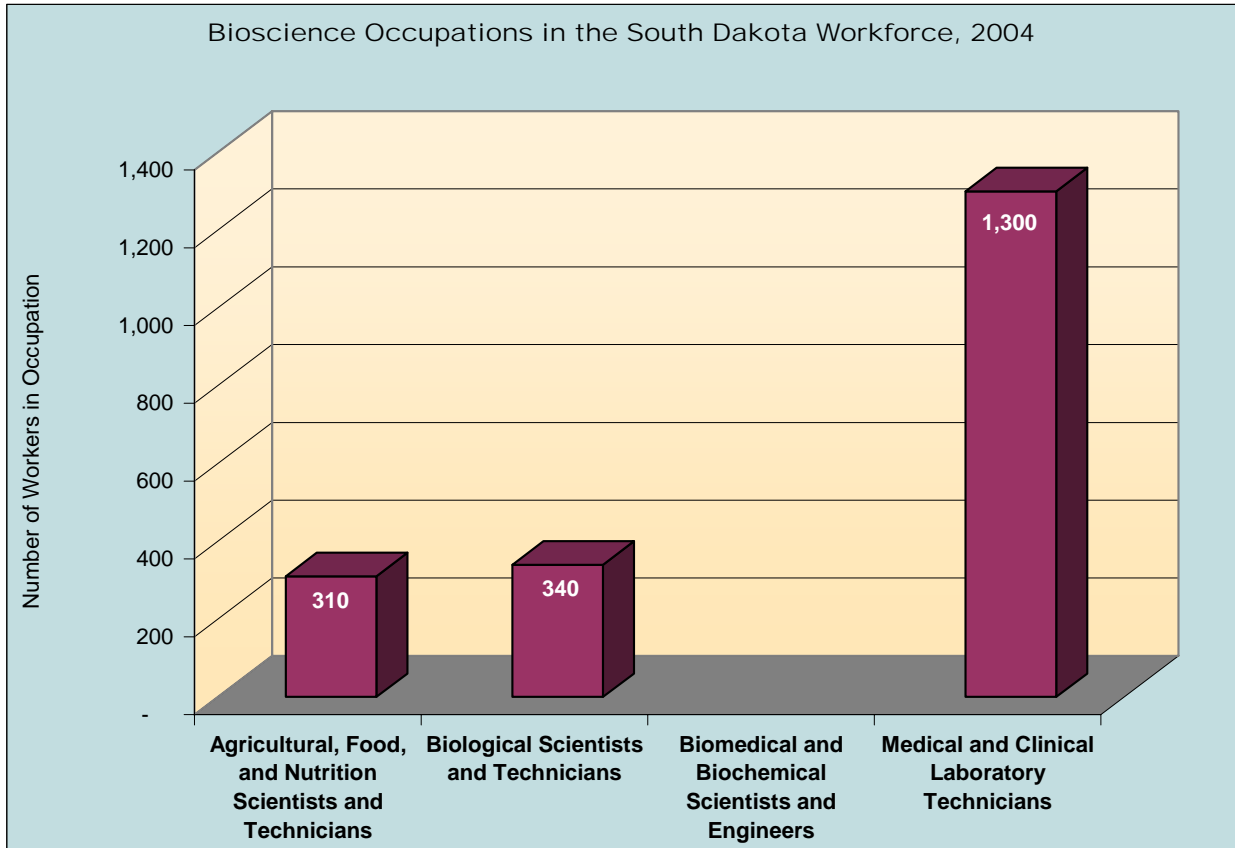
A new statewide bioscience association, the South Dakota Bio Association, is currently being organized. The President is

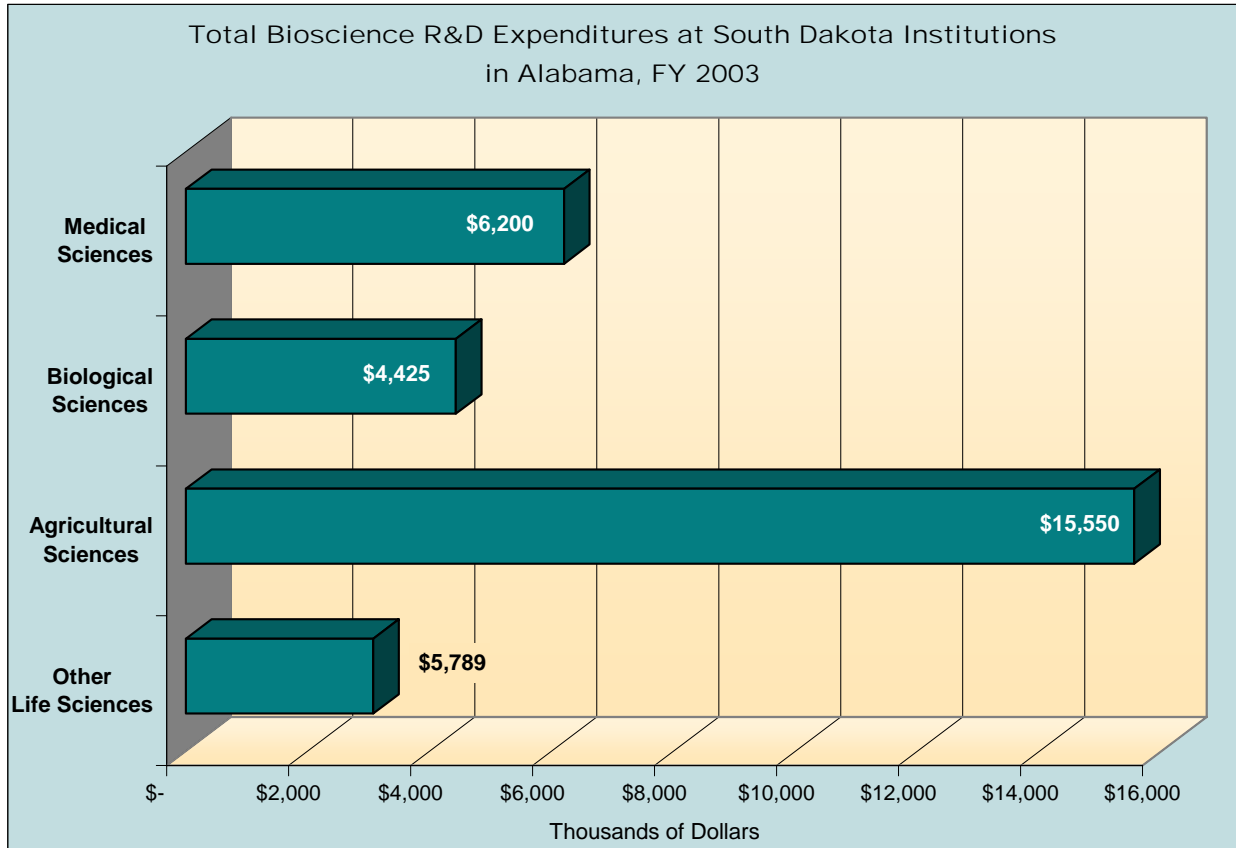
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Industry Subsector	South Dakota	United States
Agricultural Feedstock & Chemicals		
Establishments 2004	18	2,111
2001-2004 Establishment % Change	49.1%	0.4%
Employment 2004	533	104,893
2001-2004 Employment % Change	89.6%	-6.9%
Share of U.S. Employment	0.5%	100.0%
Location Quotient	1.85	n.a.
Average Annual Wage 2004	\$45,219	\$63,383
Direct-Effect Employment Multiplier	5.00	10.91
Total Employment Impact	2,668	1,212,094
Drugs & Pharmaceuticals		
Establishments 2004	1	2,589
2001-2004 Establishment % Change	-66.7%	-0.6%
Employment 2004	84	313,207
2001-2004 Employment % Change	35.4%	2.7%
Share of U.S. Employment	0.0%	100.0%
Location Quotient	0.10	n.a.
Average Annual Wage 2004	\$49,258	\$79,303
Direct-Effect Employment Multiplier	3.02	9.51
Total Employment Impact	253	2,731,321
Medical Devices & Equipment		
Establishments 2004	34	15,190
2001-2004 Establishment % Change	-8.5%	0.2%
Employment 2004	1,344	411,460
2001-2004 Employment % Change	-9.0%	-3.6%
Share of U.S. Employment	0.3%	100.0%
Location Quotient	1.19	n.a.
Average Annual Wage 2004	\$47,033	\$56,449
Direct-Effect Employment Multiplier	2.57	4.56
Total Employment Impact	3,459	1,817,705
Research, Testing, & Medical Laboratories		
Establishments 2004	37	20,565
2001-2004 Establishment % Change	20.4%	19.4%
Employment 2004	320	413,550
2001-2004 Employment % Change	4.8%	8.2%
Share of U.S. Employment	0.1%	100.0%
Location Quotient	0.28	n.a.
Average Annual Wage 2004	\$75,054	\$65,414
Direct-Effect Employment Multiplier	1.94	3.15
Total Employment Impact	622	1,272,936
TOTAL PRIVATE SECTOR		
Establishments 2004	26,328	8,156,137
2001-2004 Establishment % Change	4.4%	4.8%
Employment 2004	300,583	109,249,195
2001-2004 Employment % Change	1.2%	-0.7%
Share of U.S. Employment	0.3%	100.0%
Location Quotient	n.a.	n.a.
Average Annual Wage 2004	\$27,793	\$39,003

Source: Battelle calculations -- based on Bureau of Labor Statistics QCEW data from the Minnesota Implan Group, RIMS II Employment Multipliers from the Bureau of Economic Analysis, and the Census Bureau's Economic Census.

Note: n.a. = metric is not applicable.





	South Dakota	United States	Rank
University R&D Expenditures, FY 2003			
Total (\$ thousands)	\$49,977	\$40,104,621	52
Life Science R&D (\$ thousands)	\$29,246	\$24,062,088	48
Percent of Total R&D	58.5%	60.0%	
Life Sciences Per Capita	\$38.26	\$82.74	
Change in Life Sciences FY 1999–2003	84.6%	52.7%	
NIH Support to Institutions, FY 2004			
Total (\$ thousands)	\$15,324	\$22,556,459	49
Per Capita Expenditures	\$20.05	\$77.56	
Change in Expenditures FY 2000–2004	92.0%	53.2%	
Higher Education Degrees in Bioscience Fields, AY 2004			
	598	111,329	41
Bioscience Occupations in the Workforce, 2004			
	1,950	616,140	43