FY2005 PROGRESS REPORT
SOUTH DAKOTA SPACE GRANT CONSORTIUM
http://www.sdsmt.edu/space/

INTRODUCTION

Overview:
FY2005 was a significant year for the South Dakota Space Grant Consortium (SDSGC) as our management team and affiliate members worked together on making improvements described in South Dakota's September 15, 2005 15th Year Evaluation Program Improvement and Results (PIR) Report. Key improvement documents developed during FY2005 included: 1) Consortium Improvement Plan, 2) new fellowship & scholarship stipend guidelines, 3) 2005 Strategic Plan (see Appendix A), 4) Roles & Responsibilities of Members, and 5) an Evaluation Framework & Logic Model.

Reinstatement to Full Performance Status:
On October 22, 2005, we were informed by NASA that the probationary special condition was rescinded and SDSGC was reinstated to full performance status. The Consortium remains headquartered at the SD School of Mines & Technology (SDSM&T), with 24 affiliates. As a result of improvement activities during FY2005, the Consortium reduced its number of affiliates by nine, bringing the current affiliate total to 24. It is possible that additional affiliates may be dropped as we continue to focus maintaining an active membership, prioritizing goals, and leveraging funds.

Challenges and Opportunities:
The SDSGC remains one of the key organizational forums in South Dakota for bringing together talented people, their ideas, and collaborative projects in research, education, and technology-based economic development. However, South Dakota faces many challenges in efforts to develop a competitive and sustainable science and technology (S&T) infrastructure. The state ranks 46th in population, and has the fifth lowest population density. South Dakota has five of the seven poorest counties in the nation, all of which are located on or adjoining the state's nine Indian reservations. Among the 52 federal jurisdictions, South Dakota ranks between 49 and 52 in the following S&T indicators: federal R&D (51), industry R&D (49), academic R&D (52), high tech employment as a percentage of total jobs (49), science and engineering doctorates awarded (49), science and engineering post-docs (49), public higher education expenditures (50), doctoral scientists in the workforce (50), and doctoral engineers in the workforce (51). Nonetheless, South Dakota's demographics and limited research capacity has resulted in Space Grant gaining the reputation within South Dakota's educational and research community as one of the most valuable programs to foster improvements in STEM education, research, and associated economic activity. Space Grant represents one of the largest sources of fellowships funding in the state. The only major federal research facility, the USGS Center for Earth Resources Observation and Science (EROS), is represented as a permanent member of the Consortium's management team.

Evaluation: A Foundation for Continuing Improvement:
Following NASA's 15th Year Evaluation, SDSGC initiated a comprehensive review of its structure, policies, and programs throughout 2005. Consistent with the Consortium's FY 2005 Proposal, we established a 2005 Strategic Plan (App. A) based on SMART (Specific Measurable, Acceptable, Realistic, Timeframe) goals and objectives to serve as a guide for improving the quality and effectiveness of the Consortium.

As part of this process, the Consortium's management 1) examined guiding documents from NASA, state government, affiliates, and other state consortia; 2) conducted monthly (and at times weekly) teleconferences; 3) met with state and NASA officials; 3) completed affiliate visits and interviews; and 4) contracted an independent expert in March 2005 for a yearlong evaluation of the Consortium and the improvement strategy, and to assist in establishing an evaluation regimen that will continue each year into the future. The final Evaluation Report and recommendations were completed in February 2006 and may be obtained upon request.

Results and New Guiding Principles: The results of the improvement process are embodied in a series of key documents (see adjacent box). At the heart of these documents and policies are SDSGC's new Guiding Principles for Improvement and Sustained Quality:

Key Improvement Documents
- Consortium Improvement Plan
- New Fellowship & Scholarship Guidelines
- SDSGC Strategic Plan (App. A)
- Roles & Responsibilities of Members
- Evaluation Framework & Logic Model

- ***Inclusiveness*** — The need to deliver a broad and equitable Fellowship/Scholarship program; to engage all affiliates in Consortium programs; to provide broader input into decision-making; and to recruit more Native American students.
- ***Focus*** — The need to set realistic goals consistent with available resources; to develop a strategic plan with specific short- and long-term objectives; to prioritize activities based on budget level; to formalize the benefits and expectations of management and affiliates; and to institute a policy to drop inactive affiliates.
- ***Alignment*** — The need to align the Consortium programs and strategic plan with NASA, state, and affiliate priori-ties; to recognize the major transformation in NASA direction and make appropriate changes in state programs; and to seek greater guidance from state and industry representatives.
- ***Impact*** — The need to maintain accurate and consistent measurements regarding programs and participants; to formalize methods for external and self evaluation; to carry on regular assessment of the strategic plan, activities, and outcomes; and to recognize and implement needed adjustments to achieve results.

ACHIEVEMENTS and PROGRESS

This report describes the Consortium's achievements and progress made via the FY2005 "base" Space Grant in the following categories (program areas): 1) Management, 2) Fellowship and Scholarship Stipends, 3) Research Infrastructure, 4) Higher Education, 5) Pre-college (K-12) Outreach, and 6) Public Service. Anecdotal workforce points of success are included.

Description of Report Format of the following FY2005 Progress Report

Each program area below begins with a "Quantitative Outcome Measures Matrix" table indicating whether the outcome indicators from the Consortium's 2005 Strategic Plan for that program area were either A) completed (or "realized"), B) partially completed, or C) incomplete. Outcomes that are conceptually repeated in other program areas are shown in gray. Highlights of selected accomplishments are given after the tables. For the outcomes that were only partially achieved or incomplete during FY2005, an explanation is clearly given in the FY2006 Program Plan (also included with this budget submission package) of how and when the desired outcome will be completed during FY2006 or whether the intended outcome has been revised.

1. Management

Quantitative Outcome Measures Matrix (Management)

Objective	Outcome indicator(s)	Completed	Partially Completed	Incomplete
1.1	All reports will be submitted on time and in accordance with NASA guidelines.	√		
1.2	At least two faculty will visit NASA Centers or EROS each year to promote collaborative research	√		
	At least three students will participate in internship programs at NASA Centers.	√		
	At least five student interns will be placed at EROS (SAIC)	√		
	Representatives of the Management Team will be present at biannual national meetings and the Western Region Space Grant Meeting.	√		
	Members of the Management Team also hold positions on the Technical Advisory Committee and the Steering Committee of the state NASA EPSCoR Program	√		
1.3	Announce available positions on Management Team to all Consortium members and affiliates and select two members by January, 2005.	√		
	Draft roles and responsibilities document by March, 2005.	√		
	Semi-annual electronic newsletter sent to all member institutions, affiliates, teachers, and interested parties.		√	
1.4	Members of the Management Team meet once per year with representatives of state government to discuss alignment with state priorities, such as the Governor's 2010 Initiative	√		
	At least one additional representative of state government will be appointed to the advisory board by August, 2005	√		
1.5	Aerospace industry survey of about 95 industries in South Dakota completed by May, 2005	√		
	At least one additional representative of state industry will be appointed to advisory board by February, 2006	√		
1.6	Electronic databases available by November, 2005 and updated quarterly thereafter	√		
	Consortium website completely redesigned by faculty and students at the Center of Excellence in Computer Information Systems at Dakota State University by February, 2006		√	
1.7	Draft annual Development Plan complete by November, 2005			√
	Review of other state strategic plans complete by February, 2006	√		
	At least 20 targeted announcements of opportunity will be disseminated through electronic newsletter and website each year	√		

	Facilitate at least one multi-partner proposal each year to NASA or other agencies	√		
1.8	Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase -- participating organizations	√		
	Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase -- programs	√		
	Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase -- fellowships and scholarships	√		
	Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase -- faculty awards	√		
	Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase -- Management Team members	√		
	NASA content or other STEM educational opportunities are expanded at the South Dakota School for the Deaf and the South Dakota School for the Blind and Visually Impaired			√
1.9	Program evaluator selected by March, 2005 and participates in subsequent quarterly meetings	√		
	Following submission of the Program Evaluator's final report in February 2006, the Management Team will determine appropriate data collection and evaluation procedures that are consistent with available resources		√	
	Consortium website completely redesigned by faculty and students at the Center of Excellence in Computer Information Systems at Dakota State University by February, 2006 so as to collect evaluation data		√	
	Strategic plan updated at an annual performance audit meeting	√		
	The advisory board will be convened for an annual meeting by February, 2006			√

Selected Management Activities/Accomplishments for FY2005:

- Industry representative Dave Pullen of Aerostar International, a subsidiary of affiliate Raven Industries agreed to join the SDSGC Advisory Board/Technical Advisory Committee on February 2, 2006.

- Through new membership on the Consortium's Management Team in 2005, the SD Discovery Center staff has become more keenly tuned in to opportunities provided by NASA in terms of student, teacher and public education. In the short term, the Discover Center has added robotics to their student programming and a NASA Teacher Academy. For the long term, the Discovery Center is nurturing partnerships that should lead to an NSF STEP grant submittal and permanent robotics exhibit. They are considering adding a Lego Mindstorms Robotics Room to the science center.

- Likewise in 2005, new representation on the Management Team from Sinte Gleska University located on the Rosebud Indian Reservation has allowed the Consortium to forge even closer collaborations with minority-serving institutions. The highest number of Space Grant fellowship awards were given in 2005 to Native American students from Tribal Colleges.

- Dr. Dan Swets, member of the SDSGC Management Team and Associate Director of SDSGC at Augustana College, is chair of the NASA EPSCoR Steering Committee in South Dakota. He was a Visiting Scientist at EROS in 2005. One result of this was a drought

monitoring system collaboration among Augustana College, EROS, and the University of Nebraska-Lincoln, National Drought Mitigation Center.

- As a national Space Grant program activity and at the request of Dave Rosage, Program Manager for NASA Academy at Goddard Space Flight Center, Tom Durkin, SDSGC Deputy Director, served on the 2005 NASA Academy Executive Selection Board and reviewed/scored 28 student applications. Ed Duke, SDSGC Director, reviewed three state proposals for Designated Status.

- Although SDSGC's Management Team is not yet sure how fruitful the results will be, two targeted announcements of NASA workshops for the disabled were sent via email to the superintendents of the SD School for the Deaf and the SD School for the Blind and Visually Impaired in 2005.

2. Fellowships and Scholarships

Quantitative Outcome Measures Matrix (Fellowships)

Objective	Outcome Indicator	Completed	Partially Completed	Incomplete
2.1	A centralized, Consortium-wide annual Call for Fellowship/Scholarship Applications shall be implemented in 2005 and made available to all of the Consortium's higher educational members and affiliates via e-mail and the SDSGC website	√		
	Competitive review and selection of awardees	√		
	Awards reflect the diversity of the Consortium's membership and statewide balance	√		
2.2	Augustana College will provide opportunities for three students for research projects at EROS in 2005.	√		
	At least two SD Space Grant Fellows will participate in SD NASA EPSCoR research projects annually.	√		
	Offer research fellowships that support SDSGC initiatives (Badlands Observatory astronomical research or "Dark Skies, Bright Minds" program, robotics, NASA's "Microgravity University: Reduced Gravity Student Flight Opportunity Program, etc.) At least three fellowships offered each year.	√		
2.3	In 2005, at least three interns will be placed at NASA Centers and at least five student interns will be placed at EROS-SAIC	√		
	At least two STEP fellows receive supplemental funding through SDSGC each year.			√
2.4	100% of all student researchers funded through NASA South Dakota Space Grant will present results each year.		√	
	Opportunities will be offered to 100% of SDSGC student fellows to take advantage of professional development training.	√		
2.5	Awards to women/minorities equal or exceed 10% to minorities and 40% to females	√		
	At least one fellowship awarded annually to a student at a Tribal College or to a Tribal College student seeking to transfer to another SDSGC university	√		
2.6	Use of a web-based system will improve SDSGC's ability to assess the impact of its student programs and to maintain better contact with graduates of the program		√	
2.7	Adjustments are made to the fellowship and scholarship program to strengthen activities that are working and drop or correct activities that are not having the intended impact.		√	

Selected Fellowship/Scholarship Activities/Accomplishments for FY2005:

- In the summer of 2005 and with base Space Grant funding, SDSGC placed six (6) students at NASA Centers for summer internships. This was double our annual goal and appears to be more than most Space Grant Consortia. According to a presentation at the March 2006 Space Grant Directors' meeting, "most Space Grant Consortia place and support up to 4 students annually at NASA Centers". SDSGC has worked hard to encourage South Dakota college students to apply for internships at NASA Centers and we are pleased with the placement of six of those students.

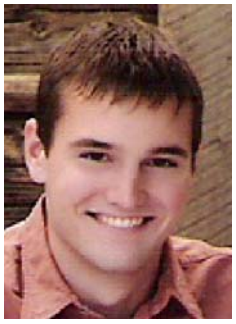
- SDSU and SDSM&T student Cassie Soeffing was named an Einstein Fellow in 2005 and worked for a full year in the office of Dr. Ming-Ying Wei, Program Manager of NASA's Earth Science Education program at NASA Headquarters.

- Three Augustana College students (Paul Marshall, Kari Pabst, and Stuart Ness) participated in research projects at EROS in 2005. Additionally, Paul Marshall participated in a NASA EPSCoR Program Initiation Grant project and Stuart Ness participated with the NASA EPSCoR Leaf Area Index project.

FY2005 Student Fellowship/Stipend Awardees (Core Space Grant)

Last Name	First Name	School	Amount
Anderson	Jill	SDSM&T	2000
Banik	Jeremy	SDSM&T	5500
Hudson	Richard	SDSM&T	2000
Johnson	Darren	SDSM&T	2000
Kingsbury	Nicholas	SDSM&T	6000
Landguth	Erin	SDSM&T	2000
Said	Saber	SDSM&T	3000
Sanovia	James	SDSM&T	2000
Weidenbach	Jessica	SDSM&T	2000
Burke	Megan	BHSU	2000
Hanson	James	BHSU	5500
Huebner	David	Augustana	2000
Entenman	Debbie	SDSU	3000
Stoebner	Timothy	SDSU	3000
Bezdicek	Paul	SDSU	8000
Emery	James	Sinte Gleska U	2000
Watson	Brandon	Sinte Gleska U	2000
Melvin	Jennifer	Si Tanka Reloc.	500
TOTAL			**58,000**

2005 Longitudinal Tracking Highlights
***Workforce Anecdotal Points of Success (NASA Civil Servants and Aerospace)**



Nicholas Kingsbury is a Rapid City native. He is currently a junior at SDSM&T working on his bachelor's degree in Electrical Engineering. He has been very involved with robotics since joining SDSM&T's Robotics Team in the fall of 2004. As team lead, he helped his team achieve second place in the IEEE Region Five competition. With his interest in robotics, he was selected for the **NASA Robotics Internship Program during summer 2005 at Goddard Space Flight Center**. His project was titled ARACHIE (A Robotic Chassis for Human Interface Experiments). *"In the (internship) program, I was able to hone my robotics skills and open my eyes to all of the interesting avenues that NASA is exploring in the field of robotics."*

Brooks Henderson, a native of Rapid City, participated in the prestigious **Space Scholars Program at the Air Force Research Lab** at Kirtland Air Force Base, NM, in the summer of 2004 and graduated from SDSM&T with a Master of Science degree in Materials Engineering and Science in 2005. He was hired by Caterpillar and currently works in Peoria, IL where he is in the Engineering Rotational Development Program (ERDP) for new engineers. In this program, he works in four different positions of his choosing within his first 18 months to get a broad view of the company and some of the possible areas at which he can work. In his first rotation, Brooks was an associate Engineer in the Materials Technology group responsible for the development and recommendation of all of the nonmetallic materials used on Caterpillar machines. *"A NASA Space Grant Fellowship was integral in supporting my research on the use of zirconium tungstate in composite materials. … Among many other applications, a material such as this can be used for a mirror backing structure in future space telescopes, eliminating changes in lens curvature caused by the ever fluctuating temperatures in space."*

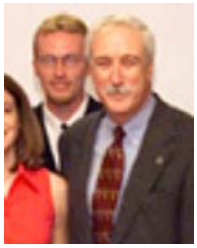
Debbie Entenman from Brandon, SD, is a December 2005 graduate in Geography and Geographic Information Science at SDSU. In the summer of 2005 she worked on the **International Famine Early Warning System Network at EROS**. Debbie collaborated with scientists from NOAA, USGS, NASA, and the US Dept of Agriculture to produce assessments of weather related hazards for regions including Africa, Afghanistan, Haiti, and Central America. The emphasis was on hazards that would affect food security within those regions. The goal of the monitoring is to provide early warning to at-risk populations and decision makers, and to direct the efforts of relief agencies. After completing her internship, she continued to work for EROS during the academic year.

Joe Schenkel believes that "*You can go anywhere from here*," even Mars. The SDSU Electrical Engineering senior and Air Force Reserve Officer Training Corps cadet has high-flying dreams of reaching the stars as a military pilot and an astronaut. Joe will graduate in May 2006 and will be a **pilot in the Air Force**. He received a prestigious 8-week summer **2005 internship at Johnson Space Center from NASA's Engineering Research Experience (NERE) program**. He worked with Dr. Chang-Diaz on the Variable Specific Impulse Magnetoplasma Rocket (VASIMR). Schenkel said, *"The VASIMR is expected to be the rocket that gets us to Mars. It really is the rocket of the future."*

***Jeremy Banik** graduated with a Master of Science degree in Mechanical Engineering from SDSM&T in 2005. As a NASA Space Grant Fellow in 2004-2005, his research included investigating the effects of thermal variations on solar sail performance. With the assistance of a NASA Space Grant Workforce Development Fellowship in 2005, Jeremy participated in a 10-week summer **internship at NASA Langley Research Center** in Hampton, VA, where he conducted dynamic testing and analysis on solar sails. Upon graduation, Jeremy was **hired by CSA Engineering**, a company specializing in **high-end aerospace applications** in Albuquerque, NM. *"I have always been fascinated with the high level of spacecraft technology developed through NASA, and through the South Dakota Space Grant Consortium I will be exposed to that technology first-hand."*

Paul Marshall is an undergraduate computer science student at Augustana College. Currently a NASA Space Grant Student Fellow in his senior year, Paul transitioned to a **NASA EPSCoR** research project this spring, will graduate in May 2006, and will go on to graduate school. His projects involve the efficient processing of enormous data sets of satellite information to extract relevant seasonality metrics and statistics about land cover and land cover trend analysis. *"My Space Grant activities have given me real-world experience on cutting-edge computer implementation techniques. I'm looking forward to this summer when I can work at EROS, and hopefully turn that into a position for the next year."*

***Kendra Kumley** was a NASA Space Grant Fellow in 2004 and she conducted a 10-week **Summer Internship at the Jet Propulsion Laboratory (JPL)** in Pasadena, CA. She worked with Dr. Neil Chamberlain, a previous Electrical Engineering faculty member at SDSM&T who is now employed by NASA at JPL. Kendra graduated with her M.S. degree in Electrical Engineering and immediately **began work at Rockwell Collins in January 2005**.



A native of Sturgis, **John Keefner** received his B.S. in Geological Engineering from SDSM&T in 2004. At SDSM&T John participated in the **NASA Undergraduate Student Research Program at Johnson Space Center (JSC)** and three experiments of **NASA's Reduced Gravity Flight Opportunities Program at JSC**. In 2003 he was one of 13 students nationwide selected to the **NASA Astrobiology Academy at Ames Research Center** (pictured at right with former NASA Administrator O'Keefe). He is

currently a graduate student at Arizona State University.

Erin Landguth is currently a Ph.D. student from Rapid City, in the Atmospheric and Environmental Sciences program at SDSM&T. Growing up in an engineering family that spent at lot of time outdoors in the Black Hills, it was natural for Erin to pursue advanced studies in mathematics and sciences. *"Ever since I was a small girl, I have wanted to be a part of the great NASA program, so I was very excited to become a 2004-2005 Space Grant Fellow. This fellowship allowed me to research modeling techniques for the spread of plague in prairie dog populations."*

James Sanovia is a tribal college transfer student from Oglala Lakota College, now completing his B.S. degree at SDSM&T in Geological Engineering. He has completed **two summer internships at NASA Goddard Space Flight Center**, where his projects included "Multi-kilohertz Microlaser Altimeter Real-time Scan Footprint Mapping Software" and "Migrating the Moderate-Resolution Imaging Spectroradiometer Data to GIS Freeware Systems." *"Being a Space Grant Fellow has given me the opportunity to start my own research project combining GIS, remote sensing and my culture, the Lakota 'Sioux' culture. The end product will be one of the first steps showing how science and Lakota culture are entwined entities."*

***Josephine Santiago** completed her M.S. degree in Electrical Engineering and Computer Sciences at SDSU in 2004. In 2003, with the assistance of a Space Grant Consortium Workforce Development award, Josephine carried out a 10-week **internship at Kennedy Space Center (KSC)** where her research focused on development of a fiber-optic leak sensor that can detect propellant leaks on the Space Shuttle. This project was so successful that Josephine was hired by NASA after graduation and is now a **full-time employee at KSC**.

3. Research Infrastructure

Completed
Partially Completed
Incomplete

Quantitative Outcome Measures Matrix (Research Infrastructure)

Objective	Outcome indicators			
3.1	At least ten research announcements are distributed among appropriate SDSGC institutions each year	√		
	At least one NASA-related research proposal is submitted each year as a result of SDSGC coordination (see also 1.7.4)	√		
3.2	At least five Program Initiation grants are supported each year from SDSGC and/or state NASA EPSCoR funds	√		
3.3	At least five travel grants for research development are awarded each year from SDSGC and/or state NASA EPSCoR funds (see also 3.3.2)	√		
	At least two SDSGC fellowships or scholarships are awarded each year for students two work on NASA EPSCoR or other NASA-related research projects (see also 2.2.2)	√		
	Members of Management Team also hold positions on Technical Advisory Committee and Steering Committee of the state NASA EPSCoR Program (see also 1.2.3)	√		

	At least five planning trips to NASA Centers or EROS are supported each year from SDSGC and/or state NASA EPSCoR funds (see also 3.2.2)	√		
	An initial research needs and capabilities assessment of SDSGC academic institutions is completed by June, 2006			√
	An initial survey of state industries with potential aerospace capabilities is completed by May, 2005 (see also 1.5.1)	√		
	At least five announcements of research opportunities at state and federal agencies are distributed annually to faculty at SDSGC academic institutions	√		
3.4	Full or partial funding for new equipment and facilities is awarded to SDSGC institutions through SD NASA EPSCoR or SDSGC	√		
	At least three test sites are developed using imagery from the NASA-USGS EO-1 satellite (Hyperion and Advanced Land Imager sensors); two of the sites are located to support Tribal College research projects		√	
	A physical or electronic catalog of the remote sensing library holdings at EROS is prepared and distributed to SDSGC institutions and other interested parties	√		
	SDSGC members receive information on satellite imagery available through SDView	√		
3.5	At least two college or pre-college research or design teams receive SDSGC funds each year	√		
	SDSGC industrial and state government affiliates will be contacted regarding the needs and benefits of pre-college engineering design programs			√
3.6	Work with admissions officers at SDSGC academic affiliates and with SDSGC's network of K-12 and informal education contacts to improve recruitment of qualified female students and students from underrepresented groups into STEM careers through activities such as Women in Science Conferences, FIS Success Academy, NES, and Space Day at the Pow Wow.	√		
	SDSGC fellowship/scholarship funds for research or design experiences at SDSGC academic institutions, EROS, and NASA Centers will equal or exceed 10% to minorities and 40% to females (see also 2.5.1)	√		
	Uniform system for tracking academic performance and research activities of underrepresented SDSGC student scholars and fellows in place by June 2006		√	
3.7	Adjustments are made to the research infrastructure program to strengthen activities that are working and drop or improve activities that are not having the intended impact		√	

Selected Research Infrastructure Activities/Accomplishments for FY2005:

- In FY2005, SDSGC supported the following research infrastructure programs: 1) faculty development to enhance research opportunities, 2) faculty/graduate student research fellowships at NASA Centers and EROS, 3) research capability enhancement through program initiation grants and travel support, 4) Upper Midwest Aerospace Consortium support for earth science research and education, and 5) diversity coordination for Native American research.

- During FY2005, SDSGC supported multidisciplinary research aligned with NASA Mission Directorates. Through its research and educational programs, SDSGC remained committed to the following core research criteria: 1) integrating research and training; 2) providing students with hands-on, tangible experiences; 3) promoting collaborations among universities, industry, and government; 4) promoting research collaboration and mentoring between larger research institutions and smaller affiliates, especially Tribal Colleges; 5) supporting engineering design teams; and 6) developing shared research and training

facilities, such as remote sensing test sites, across the state. Since its inception, SDSGC has promoted Earth Science and remote sensing research themes. FY2005 saw the development of two new research themes; one focused on Flight Support and one focused on Space Hardware/Software Engineering. Through the coordinated effort of SDSGC and the SD NASA EPSCoR program, 19 new research contacts were established during FY2005 between state researchers and scientists and engineers at seven of NASA's Centers (GSFC, ARC, SSC, KSC, JPL, JSC, LaRC) and at NASA Headquarters. In addition, new contacts were facilitated with three major research universities, three federal agencies or national laboratories, and four industry partners.

- Resulting directly from SDSGC Management team efforts, a 3-year, $250,000 NSF Opportunities for Enhancing Diversity in the Geosciences (OEDG) award was granted to South Dakota in 2005. The program activities will begin in May 2006 and feature place-based geoscience activities for K-12 Native American students, their families and teachers with a focus on the geology and Lakota cultural significance of the Black Hills landscape.

- 127 "targeted announcements of opportunity" were distributed to SDSGC affiliates in 2005.

- Eight Program Initiation Grant (PIG grants) were funded during FY 2005 through SD NASA EPSCoR ($71,716 of NASA funds were awarded with $112,631 in matching funds committed through these projects).

- Eleven travel grants were awarded for planning trips to JPL, Stennis, Ames, Goddard, and a remote sensing workshop in Fort Collins, CO. Additionally, Dr. Dan Swets of Augustana College made many more than the targeted 5 trips to EROS in 2005 for enhanced collaboration planning purposes. He met with EROS's Dr. Zhou, Jess Brown, Dr. Brad Reed, Jim Rowland, Jeff Eidenshank, Dr. Kevin Gallo.

- A portable Raman spectrometer ($20,000) was purchased for mineralogical and geological studies and to simulate robotic mineral analyzers proposed for future planetary missions.

- NASA EO-1 Hyperion satellite imagery was acquired during FY 2006 for two of the three test sites. The third acquisition is scheduled for the 2006 growing season.

- Jess Brown (SAIC, EROS) and Daniel Swets (Augustana) submitted a proposal to the National Drought Mitigation Center at UNL (Funded with $1.02 M in NASA funds).

4. Higher Education

Quantitative Outcome Measures Matrix (Higher Ed)

Objective	Outcome Indicators	Completed	Partially Completed	Incomplete
4.1	Reorganize the "Educational Opportunities (Higher Education)" section of SDSGC website to make it more user friendly; add a web counter to monitor access and an online feedback section (see also 1.9)		√	
	At least ten NASA education announcements are distributed among appropriate SDSGC institutions each year	√		
4.2	At least two faculty or students from SDSGC affiliates will participate in NASA education programs each year	√		
4.3	Directors of new research centers and new Ph.D. programs are informed of SDSGC fellowship/ scholarship and other programs	√		
	At least two STEP fellows will receive supplemental funding through SDSGC each year (see also 2.3.2)			√
4.4	An initial survey of state industries with potential aerospace capabilities is completed by May 2005. (See also 1.5.1.)	√		
	At least one representative of SDSGC will attend the conference and promote partnerships between industry and academic affiliates	√		
4.5	Participation by women and minorities will equal or exceed 10% to minorities and 40% to females (see also 2.5.2)	√		
4.6	Adjustments are made to the higher education program to strengthen activities that are working and drop or improve activities that are not having the intended impact		√	

Selected Higher Education Activities/Accomplishments for FY2005:

- During FY 2005, Space Grant support was given to the following programs as reported in CMIS: 1) student and faculty travel support to present technical papers, 2) American Indian Science and Engineering Society (AISES) student chapter support, 4) Space Grant Student Fellow Coordination, 5) Native American Bridges to Success Program, 6) Tribal College Relations Program, and 7) South Dakota View.

- SDSGC programs focused on developing strong undergraduate programs in aerospace and earth science through fellowships and scholarships and other program support. In 2005, 84% of the $58,000 in core Space Grant fellowships were awarded to undergraduates and 16% to graduate students.

- In just the first year since developing a **new consortium-wide Fellowship/Scholarship Program**, SDSGC has nearly doubled the number of institutions that host SDSGC fellows. This list includes of Sinte Gleska University (a Tribal College), SDSM&T, SDSU, Dakota State University, Black Hills State University, Augustana College, and Si Tanka University. In coming years, the response should be even greater and the number of institutions will likely increase. Thirty-five applications were received under the summer 2005 fellowship program from students representing eight colleges and universities, and 19 awardees were selected from seven institutions. As indicated earlier, six Space Grant student fellows from four institutions were placed at NASA Centers for summer internships in 2005 and six additional students conducted summer research programs through EROS.

- In FY2005, SDSGC provided three Space Grant fellowships to Native American students at Sinte Gleska University, SDSM&T, and a student relocating from Si Tanka University. SDSGC plays a vital role in SDSM&T's goal to achieve and maintain national prominence for the recruitment, retention and graduation of American Indians seeking mathematics, science, and engineering at the graduate and undergraduate levels.

- SDSGC Director Dr. Edward Duke attended the dedication of **Oglala Lakota College's Lakota Center for Science & Technology (LCST)** on June 25, 2005. The ceremony marked the opening of the NASA-funded Science, Engineering, Mathematics, and Aerospace Academy (SEMAA) and Aerospace Educational Laboratory (AEL). Dignitaries from NASA included Dr. Adena Loston (Chief Education Officer), Mr. John Hairston (NASA Glen Research Center), and Mr. John Bennett Herrington (NASA astronaut). In addition to the NASA SEMAA and AEL, the LCST includes environmental analytical laboratories funded by a $2.5 million NSF award and developed with close cooperation of Dr. Duke of SDSM&T.

- **American Indian Science and Engineering Society (AISES)** is a national organization founded to increase the number of American Indians in STEM fields. In 2005, SDSGC staff and student fellows organized and hosted the AISES Region Five Conference in Rapid City with about 150 Native American students and staff attending.

- The **"Bridges to Success Program"** is an undergraduate Native American student research program is a partnership between Oglala Lakota College (OLC) and SDSM&T and is funded by NSF with professional development training provided by SDSGC. Students conducted summer 2005 research projects under faculty mentorship. The objective is to create a support structure that increases retention and graduation of Native American scientists and engineers. Many of the "Bridges" students from OLC complete their two-year Tribal College degrees and then articulate into SDSM&T to complete a four-year science and engineering degree.

- The following SDSU contacts have been added to all Space Grant fellowship/scholarship and other announcements at SDSU: Dr Matt Hansen, Co-Director of the GIS Center of Excellence , Dr. Kurt Cogswell (Mathematics Head), Dr. Kevin Kephart (Dean of Graduate School) and Dr. Dennis Helder (Electrical Engineering and Computer Science Head). New PhD programs at SDSU include Geospatial Sciences, Computational Sciences and Electrical Engineering.

- On April 19, 2005, two SDSGC undergraduate fellows from Augustana College (Paul Marshall and Andrew Reinartz) presented their research at the **"Undergraduate Posters on the Hill"** meeting at the Rayburn House Office Building in Washington, D.C. The meeting was sponsored by the Council on Undergraduate Research (CUR) with the purpose of allowing undergraduate students to meet with and display their research to legislators and policy makers. One of these Space Grant students made the transition to a SD NASA EPSCoR project. A third Augustana College student (Roy Tewalt) on the NASA EPSCoR

project that did not present at the Washington DC meeting participated in a summer 2005 internship at JSC.

- **South Dakota View (SDView)** is a consortium of educational institutions, government agencies, and private sector organizations in South Dakota with a common goal of building partnerships and infrastructure to facilitate the availability, timely distribution and utilization of remotely sensed data. SDView is a charter member of AmericaView, a nationwide program that focuses on satellite remote sensing data and technologies in support of applied research, K-16 education, workforce development, and technology transfer. AmericaView is administered through a partnership between the U.S. Geological Survey and the AmericaView Consortium.

- In just its fifth year of competition, SDSM&T's **Aero Design Team** navigated to first place in the 2005 Aero Design West remote-controlled airplane competition in Fort Worth, TX. "This is like winning the NCAA championship," team adviser Dr. Dan Dolan said as the team drove home from the weekend competition. "This is absolutely awesome. It's truly something special." SDSGC provided $3,000 to the Aero Team during FY2005 which helped prepare them for this win. The Aero Design Team spent months designing, building, and testing the remote-controlled biplane that featured a 5-foot wingspan. At the competition, the plane carried 19 pounds of added lead weight with their plane called "Stinger", more than any of the nearly 40 other teams, and placed third in design. The team also won the best team award. Competition teams such as Aero Design are part of SDSM&T's Center of Excellence for Advanced Manufacturing and Production (CAMP) that uses teams for innovative engineering and science education.

- Additional higher education outreach included two presentations on March 2, 2005 by SDSGC's Tom Durkin on NASA's Mars Mission to introductory and advanced geology classes at Black Hills State University (75 students) and a similar April 19, 2005 presentation to the Math Association of America Student Group at SDSM&T (30 students). On Feb. 21, 2006, he gave a presentation NASA's Stardust and Deep Impact comet missions to SDSM&T's Department of Geology and Geological Engineering with about 50 students and faculty present.

- **SDSGC Publications and Presentations** supported by FY2005 Space Grant:
  - Anderson, S.W., *McColley, S., Fink, J.H., and *Hudson, R., 2005. The development of fluid instabilities and preferred pathways in lava flow interiors: insights from analog experiments and fractal analysis; in Manga, M., and Ventura, G., eds., Kinematics and dynamics of lava flows; Geological Society of America Special Paper 396, p. 147-161, doi: 10.1130/2005.2396(10).
  - Kozak, P., "Ag/Range PARC - Enhancing Tribal Rangeland Management through Education", UMAC Annual Meeting, Feb. 9-11, 2006, Grand Forks, ND.
  - Sanovia, J., "Culture PARC - Black Hills Visualization Project", UMAC Annual Meeting, Feb. 9-11, 2006, Grand Forks, ND.
  - V. N. Smelyanskiy, A. G. Petukhov, and V. V. Osipov., 2005. "Quantum computing on long-lived donor states of Li in Si"**.** Phys. Rev. B 72, R081304

- V. N. Smelyanskiy, A. G. Petukhov, and V. V. Osipov., 2005. “Qubit readout in Si:Li based quantum computers”, to be submitted to APL
- E. Wells, K.D. Carnes, H. Tawars, R. Ali, Emil Y. Sidky, Clara Illescas, I. Ben-Itzhak, "One- and two-electron processes in collisions between hydrogen molecules and slow highly charged ions," in Nuclear Instruments and Methods in Physics Research, B 241 (2005), 101-108.
- Nora G. Johnson, R. N. Mello, Michael E. Lundy, J. Kapplinger, Eli Parke, K. D. Carnes, I. Ben-Itzhak, and E Wells, “Single ionization of hydrogen molecules by fast protons as a function of molecular alignment," Physical Review A 72, 052711 (2005).
- E. Wells, Vidhya Krishnamurthi, K. D. Carnes, Nora G. Johnson, Heather D. Baxter, David Moore, Kristana M. Bloom, B. M. Barnes, H. Tawara, and I. Ben-Itzhak, "Proton-carbon monoxide collisions from 10 keV to 14 meV," Physical Review A 72, 022726 (2005).
- Paul Marshall and Daniel Swets, "Developing Parallel Algorithms for Seasonality Analysis," the Council on Undergraduate Research Posters on the Hill, Washington, DC, April, 2005.
- Paul Marshall and Daniel Swets, "Developing Parallel Algorithms for Seasonal Metrics Extraction," South Dakota Academy of Science, Vol. 84 (2005).
- Paul Marshall and Daniel Swets, "Parallel Algorithms for Seasonal Metrics," Augustana Symposium, April, 2005.
- Stuart Ness and Daniel Swets, "Satellite Data Calibration," Augustana Symposium, April, 2005.
- S. Tan, R. Narayanan and D. Helder, *Polarimetric Reflectance and Depolarization Ratio from Several Tree Species using a Multiwavelength Polarimetric Lidar,* Proc. SPIE, Polarization Science and Remote Sensing II, Vol. 2988, 2988-23, 2005
- S. Tan, R. Narayanan and S. Shetty, *Polarized Lidar Reflectance Measurements of Vegetation at Near-infrared and Green Wavelengths*, International Journal of Infrared and Millimeter Waves, 26(8), 1175-1194, 2005

5. K-12 Outreach

Quantitative Outcome Measures Matrix (Precollege)

Objective	Outcome indicator(s)	Completed	Partially Completed	Incomplete
5.1	Electronic databases available by November, 2005 and updated quarterly thereafter	√		
5.2	SDSGC members will participate in at least one precollege education proposal by the end of 2006	√		
5.3	SDView will conduct and publish the results of a K-12 geospatial education needs assessment survey		√	
	At least 100 teachers will participate in workshops facilitated by SDSGC such as NASA AESP training, GIS/GPS training, E-missions, GEMS, StarLab Planetarium astronomy training, UMAC's Earth Science Tools for Educators workshop, and NASA Speaker's Bureau	√		
	Website is updated at least monthly: add a web counter to monitor access and an online feedback section (see also 1.9)		√	
	At least two South Dakota schools (at least one Tribal school) apply for the 2005 NASA Explorer Schools Program	√		

5.4	At least 1,000 people will attend South Dakota Space Days at the Black Hills Pow Wow, Oct. 7, 2005, in Rapid City		√	
	Over 3,000 students each year participate through Women in Science Conferences, K-12 science fairs, Aerospace Career and Education Camp, Flandreau Indian School Success Academy, Badlands Observatory's "Dark Skies, Bright Minds" educational program, RoboCamp, and related programs	√		
5.5	These teacher-training programs embrace state education standards in math, science, and language arts and will introduce at least 50 teachers to NASA and space science curricula	√		
5.6	Over 1,000 females and students from underrepresented groups participate each year through Women in Science Conferences, K-12 science fairs, Aerospace Career and Education Camp, Flandreau Indian School Success Academy, Badlands Observatory's "Dark Skies, Bright Minds" educational program, RoboCamp	√		
5.7	Adjustments are made to the precollege education program to strengthen activities that are working and drop or improve activities that are not having the intended impact		√	

Selected K-12 Outreach Activities/Accomplishments for FY2005:

- In FY2005, SDSGC supported the following programs: 1) Regional Science Fairs, 2) Badlands Observatory's "Dark Skies, Bright Minds" program, 3) FIRST Robotics, 4) Engineer's Week, 5) SDSGC Visiting Scientist Outreach Program, 6) SD Student Signatures in Space, 7) UMAC EdPARC, 8) Women in Science conferences, 9) Aerospace Career and Education Camp, 10) Flandreau Indian School Success Academy, and 11) Summer Honors Program for Native American students, and 12) NASA Explorer Schools.

- **NASA Explorer Schools (NES)**: The first two NES schools in South Dakota, both at Tribal Schools on the Rosebud Indian Reservation with near 100% Native American student population, were established in FY2005, and at least one additional school (Kadoka middle and high school) has applied for 2006 NES selection. SDSGC will continue supporting the NES schools in our state during FY2006 by augmenting NASA's NES program resources with Space Grant support staff, teacher-training coordination through AESP, and NASA Educator Resource Center materials.

- **K-12 Outreach Presentations:** SDSGC Deputy Director and Outreach Coordinator Tom Durkin conducted 17 precollege educational outreach events throughout FY2005 reaching 1,565 students and teachers with presentations on various space-related topics including NASA's Mars mission, Cassini, Stardust, Deep Impact, Apollo, the International Space Station, Space Shuttle, and other space-related topics such as the solar system. Some of these events collaborated with NASA AESP teacher-training courses at teacher conferences. SDSGC also provided outreach to NASA Explorer School Todd Co. Middle School on the Rosebud reservation in October 2005.

  A particularly successful outreach to a Tribal school was a space program to 200 Native American middle and high school students and their families at **St. Francis Indian School (SFIS)** on the Rosebud Indian Reservation in St. Francis, SD on Dec. 7, 2005. The program consisted of two presentations on NASA's Mars mission and an evening of star gazing through SDSGC's 11 inch Celestron telescope. The event was very well received by the Native American community and school administrators. It helped lead to the significant partnership with SFIS described in the attached FY2006 Program Plan and budget.

On two occasions, SDSGC's portable **StarLab Planetarium** was used for presentations and it was loaned out periodically to teachers and museum staff. Space Grant student Fellows also presented their research to K-12 groups and taught a week-long astronomy course for precollege students during summer 2005.

SDSGC and SDSM&T faculty and staff co-led the NSF Fire Ecology Research Experience which was a field-based event offered through SDSM&T during the week of June 13, 2005. Twenty-one students from the Rosebud reservation that are part of Sinte Gleska University's GEAR UP Program participated in the event. Five teachers also attended and participated in a new "teacher professional development" component.

- **Science Fair Support to 1,200 Students**: SDSU hosted a Regional Science and Engineering Fair at SDSU in March 2006 with over 500 student exhibits. SDSGC Associate Director Kevin Dalsted judged the Earth and Space Category exhibits and provided SDSGC-related display materials at the College of Engineering booth. SDSGC Associate Director Dan Swets assisted with Augustana College's annual Science Day in the fall of 2005 where 300 high school students participated in hands-on science, technology, and engineering sessions. Participants were treated to a sophisticated collection of chemistry and physics demonstrations, followed by break-out sessions to investigate science, math, engineering, and technology in their interest areas. SDSGC Deputy Director Tom Durkin served as a judge at the 50th High Plains Regional Science and Engineering Fair at SDSM&T on March 18, 2005 where 400 students annually compete for prizes and the opportunity to compete at the Intel International Science and Engineering Fair.

- In March 2006, a "**Girls in Engineering, Math and Science" (GEMS) Workshop** was held at SDSU with over 80 middle school girls in attendance for a hands-on workshop designed to elicit interest in STEM areas and focus on contributions and success of women in science and technology. Mentors and role models included SDSU faculty/staff and personnel from IBM Rochester. Quotes from girls surveyed about the workshop included "I wish school would be this much fun". To the question asking what was the most surprising thing that they learned, answers included "That there are so many different fields of science that have jobs available and that I actually am interested in some of them" and "How many different famous women that there were that made a difference in the world".

- **Robotics Support**: SDSGC paid for the registration fees of two SD high schools (Sisseton and Faulkton) that maintained their participation in the March 2006 FIRST Robotics competition beyond the three years that SDSGC was funded by a $100,000 NASA grant to support FIRST Robotics in South Dakota. The funding of the two teams in FY2005 was done as A) a reward for their success in raising outside funds, and B) an incentive to continue participating in FIRST Robotics in the future. Additionally, nine Brookings elementary students participated in a regional Lego Robotics competition during FY2005 with funding from SDSGC and SDSU. The Consortium is actively involved in efforts to sustain robotics programs in the state.

SDSGC partnered with SDSM&T's Electrical and Computer Engineering Department and hosted a **"Robo Camp"** on campus in June 2005. SDSGC partnered with Sinte Gleska University's Department of Education GEAR UP Program which gives disadvantaged Native American students and their families on the Rosebud Sioux Reservation pathways to college by linking middle/high schools with colleges and community organizations. Sinte Gleska University brought thirty 7th-12th grade students and six advisors/teachers to the Robo Camp. Participants learned how to control servo motors, perform robotic navigation, interface a variety of sensor systems, and operate a variety of actuators. This introductory camp served as the basis for developing more advanced camps in the future. $10,000 of SDSGC funds were used to purchase reusable robotic equipment for this and future camps sponsored by SDSGC. Significant media coverage of the Robo Camp was provided on three Rapid City TV stations and the local newspaper, as well as in the *Lakota Nation Journal* and *Indian Country Today* Native newspapers.

- SDSU's **Aerospace Career and Education (ACE) Camp** was held at South Dakota State University (SDSU) on July 10 - 14, 2005 with 17 high school students attending. ACE academies were introduced to colleges and universities by the FAA in 1989. Hosted every year since 1992, SDSU, through SDSGC, continues to support ACE Camp. NASA funding and support from numerous other sponsors provide an experience for high school students who want to find out first hand about aerospace, aviation, and related careers. Actual flying time, hot air ballooning, and tours of scientific facilities include discussions with professionals and experts from diverse fields. Students from grades 9 - 12 from SD, ND, MN, NE, WY, IA and the surrounding areas have attended ACE Camp.

- **Alignment with State Standards:** Alignment of SDSGC's Precollege education programs with state and national education standards has received new attention in the past year with the addition of an informal science educator to the Management Team. SDSGC supports the "E-missions" math and science teacher-training workshops, which embrace state education standards in math, science, and language arts. Also, in 2005, after two years of development and support from NASA and SDSGC, Dr. Lee Vierling and his colleagues at Virginia Tech and the University of Colorado completed the "Earth Systems Connections" standards-based, elementary educational curriculum. The ESC curriculum is now available to teachers nationwide from NASA in CD-ROM format.

  SDSGC financially supported and participated in five highly successful **"Women in Science" (WIS) conferences** held throughout South Dakota in March 2005 in Pierre, Aberdeen, Watertown, Sioux Falls, and Hot Springs. The conferences reached 1,075 middle & high school girls and 150 parents and teachers and included a keynote speaker and hand-on educational experiences including breakout sessions led by professional women in STEM careers, vendor booths, and an optional field trip. The SD Discovery Center and the SDSGC headquarters office provided staff support.

  The SD Discovery Center partnered with the Space Science Laboratory at the University of CA, Berkeley in FY2005 and established a Parent Science Research Award. As a result, the SD Discovery Center was launched as South Dakota's first Great Explorations in Math & Science site. Forty teachers and two teacher trainers were trained as a result of this funding.

On March 3, 2005 in St. Francis, SD, 20 teachers from the St. Francis School District participated in a workshop provided by the SD Discovery Center to examine ideas for starting and improving upon science fairs at this Bureau of Indian Affairs school on the Rosebud Indian reservation. Likewise, on March 18, 2005 in Mission, SD, 14 teachers from Todd County, St. Francis, and Okreek schools took part in a project overseen by the SD Discovery Center titled "*E-missions: Operation Montserrat*" which reached 100 Native American students.

- Student recruitment and diversity in underrepresented groups was enhanced in 2005 by SDSU's workforce development activity which provided funds to the **Flandreau Indian School (FIS) "Success Academy"**. About 400 Native American FIS freshman, sophomores and juniors had their grasp of NASA career opportunities enhanced through a combination of hands-on SDSGC workshops and NASA events. SDSU's FIS Success Academy is an early and intensive college preparatory program for American Indian students and is another excellent measure of SDSGC's success at recruiting and training underrepresented minorities for academic and professional careers in science and technology.

- SDSGC again participated in the **2005 "Student Signatures in Space" Program** by organizing over 1,000 signatures from SD students, teachers and parents that will be flown in space upon the next Space Shuttle launch.

- In 2005, Cassie Soeffing, a middle school science teacher at Axtell Park Middle School in Sioux Falls, SD and former Space Grant student fellow in 2003 and 2004 and graduate student at SDSM&T, received a Bush Foundation award, an award from President Bush for excellence in math and science teaching, a grant from NSF, and a trip to Washington, D.C. Also in 2005, **Ms. Soeffing was named an Einstein Fellow and worked for a full year in the office of Dr. Ming-Ying Wei, Program Manager of NASA's Earth Science Education program at NASA Headquarters**.

- Three South Dakota high schools competed in the **2005 Team American Rocketry Challenge** sponsored by the Aerospace Industries Association and the National Association of Rocketry. The 2005 Challenge was to design, build, and fly a model rocket carrying a raw egg and return it safely to the ground while staying aloft for 60 seconds. The three South Dakota schools include 1) Brandon Valley High School in Brandon, 2) Rapid City Jefferson Academy in Rapid City, and 3) O'Gorman High School in Sioux Falls, SD. Two of these team registered again for the 2006 Team American Rocketry Challenge.

- In May 2005, SDSGC Associate Director Kevin Dalsted presented South Dakota's **NASA Student Involvement Program (NSIP)** winners with a plaque and medals on behalf of NASA and SDSGC. Mary Husman's 2nd grade class of 22 students at Hillcrest Elementary school in Brookings, SD won a 1st Place Regional award for their NSIP category. Their project was titled "My

Planet Earth" which was a study of the prairie. They competed against a pool of 2,860 students to win their category.

- SDSGC affiliate representative Kathy Quinn of BHSU CAMSE NASA Educator Resource Center attended **NASA Earth and Space Science Education Products Workshop** in Houston, TX on February 14-18, 2006.

- SDSGC helped support the **29th Annual Engineer's Week** from Feb. 19-25, 2006 on the campus of SDSM&T. From 100 future engineers at the Kid's Block Building Contest to two recent NASA missions, the faculty, staff, and students at SDSM&T joined forces with practicing engineers, scientists, and K-12 teachers to show that science, math, and engineering are fun and exciting. SDSM&T hosted everything from Computer Programming to Rube Goldberg Machine contests; Mars Mania presentations to a Hot/Cool Chemistry show; and Department Tours for Middle School students to the Order of the Engineer luncheon. Of special note, SDSGC Deputy Director Tom Durkin provided two presentations: 1) *Mars Mania: The search for signs of water* and 2) *NASA's Comet Missions: STARDUST and Deep Impact*, along with high quality NASA video simulations of the missions. Both presentations have been made available to the public via the SDSM&T Alumni Association website at www.sdsmt.edu/alumni posted under "Engineer's Week 2006".

6. Public Service

Quantitative Outcome Measures Matrix (Public Service)

Objective	Outcome indicator(s)	Completed	Partially Completed	Incomplete
6.1	Reorganize the "General Public" section of SDSGC website to make it more user friendly: add a web counter to monitor access and an online feedback section (see 1.9.3)		√	
	NASA and SDSGC will be advertised daily during the work week in 2005	√		
6.2	SDSGC staff will produce and give formal and informal presentations to various civic and other public groups, and will generate press releases about Consortium activities	√		
	At least 1,000 students, parents, and teachers will hear from NASA speakers and experience hands-on demonstrations and exhibits from SDSGC academic, government, and industry affiliates	√		
	Approximately 2,500 middle and high school students across the state will have been engaged with hands-on science activities and SDSGC will have awarded prizes at all three science fairs		√	
6.3	Participants in South Dakota Space Days and science fairs will include at least 10% Native Americans and 40% females	√		
6.4	Adjustments are made to the public service program to strengthen activities that are working and drop or improve activities that are not having the intended impact		√	

Selected Public Service Activities/Accomplishments for FY2005:

- In FY2005, Space Grant supported the following programs that promote the excitement of space exploration and scientific discovery to several thousand people each year: 1) South Dakota Space Day, 2) SD Solar System Ambassador Program, 3) Public Relations/Visiting

Scientist Program to non-K-12 educational and civic groups, and 4) *StarDate* on South Dakota Public Radio.

- In a special effort to engage a higher percentage of Native American precollege students in science and math, SDSGC sponsored **"South Dakota Space Day at the Pow Wow: Merging Technology and Tradition"** on October 7, 2005 at the Black Hills Pow Wow in Rapid City. Speakers included NASA Astrophysicist Dr. Ted Gull from Goddard and NASA Emeritus Dr. Fritz Hasler from Goddard. The State's "Science On The Move" mobile science laboratory and several hands-on science exhibits were provided. About 250 Native American youth and their families attended Space Day. SDSGC's annual Space Day event provides participants with hands-on educational activities and allows them to personally visit with experts in aerospace, aeronautics, earth science, engineering, etc. about their field. Guest speakers with nationally recognized credentials present programs and meet with students and expose them to the excitement and opportunities of various STEM careers and the impact that NASA has on their lives. Photos are at http://www.sdsmt.edu/space/SpaceDay2005PHOTOS.htm

- In April 2005, SDSGC's Tom Durkin, with assistance from Black Hills Astronomical Society members, presented a course entitled "Introduction to Astronomy and Current Events in Space" to 18 members of the public through the Career Learning Center of the Black Hills Community Education Program in Rapid City. The four-session course focused on A) the current view of the solar system and comparative planetology; B) the Milky Way Galaxy; C) constellations; D) NASA missions, such as the Mars Exploration Rover Mission and Cassini Mission to Saturn; E) telescopes; F) the construction and mission of the International Space Station, G) local research of near-Earth asteroids conducted at Badlands Observatory , and H) other NASA and space-related subjects. One evening included a demonstration in StarLab, a portable planetarium and another, a trip to a local observatory for a star party.

- **SDSGC's Public Relations/Visiting Scientist Program directly reached 470 people**: Ron Dyvig of SDSGC affiliate Badlands Observatory of Quinn, SD gave a presentation to 120 members of the public in December 2005 using the Journey Museum's (SDSGC affiliate) large screen theater in Rapid City to project images and describe the astronomical research capabilities of the large 26", f/4.8 Newtonian Telescope at Badlands Observatory. Tom Durkin presented NASA's Mars mission to 30 women at 21st Century Women's Club in Newcastle, WY in November 2005 and again to 60 people at Westminster Presbyterian Church in Rapid City in December 2005. In April 2005, Durkin presented the keynote presentation "Mars Mania: the search for signs of water" to 140 professional people at the Western South Dakota Hydrology Conference in Rapid City, SD. He also gave presentations on NASA's Stardust and Deep Impact comet missions to 100 professional engineers, students and faculty at the SD Engineering Society meeting in February 2006 and to 20 members of the Black Hills Astronomical Society in January 2006. In addition to the in-person presentations mentioned above, Tom Durkin served as a Panel Member of a SD Public Radio "call-in" program on the future of space exploration.

- Dr. Bob Polcyn of Hot Springs, SD continued as South Dakota's **Solar System Ambassador** during FY2005, giving numerous talks throughout the Black Hills area on specific NASA missions and astronomy/space-related subjects.

- SDSGC continued its support of **StarDate** during FY2005, a daily SD Public Broadcasting (SDPB) Radio broadcast as part of the McDonald Observatory astronomy program. SDPB provides a very effective means of informing the public about the Consortium's resources and reaches 155,700 SDPB Radio listeners across South Dakota every day. StarDate plays after a popular morning show where 62% of the listening audience is tuned in. Thus, it is estimated that 96,500 people hear StarDate daily.