FY2006 PROGRESS REPORT

SOUTH DAKOTA SPACE GRANT CONSORTIUM

http://www.sdsmt.edu/space/

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INTRODUCTION

Overview

FY2006 was the first full year during which the South Dakota Space Grant Consortium (SDSGC) operated under the new management guidelines that were developed as a result of the 15th Year Evaluation Program Improvement and Results (PIR) Report. Also during FY2006, NASA unveiled a new strategic plan for the Agency, and the NASA Office of Education formalized the Strategic Coordination Framework, which established the following three major educational goals:

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate)*
Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)*
Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission (Engage and Inspire)*

The report that follows describes and evaluates SDSGC's progress in addressing these major education outcomes. The principal programs and activities that map to each outcome are summarized in the table below. In addition to the three major education outcomes, it will be shown that three additional themes are threaded throughout all SDSGC programs; these are workforce development, diversity and partnerships with minority-serving institutions, and evaluation and longitudinal tracking.

Outcome 1 *(Employ and Educate)*	undergraduate and graduate scholarships and fellowships, NASA internships, USGS/EROS and industry internships, engineering design teams, robotics curriculum development, research infrastructure in remote sensing and internet-based telescope network, developing university-NASA contacts, coordinating efforts with SD NASA EPSCoR, alignment with state technology initiatives and entrepreneurial activities for STEM students	*Development of a highly trained STEM workforce* *Engagement of Native American students and Tribal Colleges* *Evaluation and longitudinal tracking*
Outcome 2 *(Educate and Engage)*	higher education programs for STEM students and high school-to-college bridge programs (especially Native Americans), precollege STEM programs for students (especially Native Americans and women), teacher training and grant programs, precollege robotics, coordination with three NASA Explorer Schools and NASA Aerospace Education Services Program	
Outcome 3 *(Engage and Inspire)*	NASA and STEM content at informal science centers, South Dakota Space Day, public presentations on NASA discoveries, astronomical societies, educational broadcasting featuring NASA content	

Description of Report Format

SDSGC's FY2006 program goals and objectives described below and in the Consortium's attached **Strategic Plan** (Appendix A, which includes additional details on the respective outcome measures) are closely aligned with NASA's Education Framework. Consortium outcomes reflective of each of NASA's three main education outcomes are listed below under Program Areas 2 through 6 (Fellowship, Research Infrastructure, Higher Education, Precollege, and Public Service.) Program Area 1 (Management) is discussed separately and first.

Each program area below begins with a "Quantitative Outcome Measures Matrix" indicating whether the outcome indicators from the Consortium's 2006 Strategic Plan (and based on the associated goals and objectives described in last year's FY2006 Program Plan) for each of the six Program Areas were either completed, partially completed, or incomplete.

Outcomes that are conceptually repeated in other program areas are shown in gray. Highlights of selected program accomplishments are given after the tables. For the outcomes that were only partially achieved or incomplete during FY2006, an explanation is clearly given in the FY2007 Program Plan (also included with this budget submission package) of how and when the desired outcome will be completed during FY2007 or whether the intended outcome has been revised.

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CONSORTIUM MANAGEMENT ACTIVITIES

This section summarizes progress toward achieving the FY2006 strategic outcomes for Management (Strategic Plan, Program Area 1).

Quantitative Outcome Measures Matrix (Program Area 1: 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 one position (one of two rotating 2-year positions) on Management Team to all Consortium members and affiliates and select one member by the start of the program year (May 15, 2007)		√	
	Relevant electronic communication sent to all member institutions, affiliates, teachers, and interested parties, as appropriate.	√		
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 maintained on the advisory board.	√		
1.5	At least one additional representative of state industry will be appointed to advisory board by February, 2006	√		
1.6	Electronic databases maintained and updated/reviewed as necessary thereafter.	√		
	Consortium website completely redesigned by faculty and students at the Center of Excellence in Computer Information Systems at Dakota State University by November, 2006		√	
1.7	Draft annual Development Plan complete by November 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 will continue to participate in quarterly meetings	√		
	In consultation with the Program Evaluator, the Management Team will continue to 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 and/or use of National Space Grant Foundation longitudinal tracking system so as to collect evaluation data consistent with national longitudinal tracking requirements.	√		
	Strategic Plan and Roles and Responsibilities document (appendix of Strategic Plan) updated at an annual performance audit meeting.	√		
	The advisory board will be convened for an annual meeting by November 15, 2006 (or later), assuming NASA EPSCoR plan has been released by NASA.			√

Selected Management Activities/Accomplishments for FY2006

- As a result of representation of the **SD Discovery Center & Aquarium** on the Consortium's Management Team in 2005 in one of the two rotating Management Team positions open to affiliates, a $20,000 subcontract was developed to this organization in FY2006 to improve SDSGC's impact in informal science education. This action, planned as a continuing annual budget item, resulted in a much more active and beneficial partnership with this key educational affiliate. Specific programs funded under this formal arrangement are discussed later under the section on NASA Education Outcome 2 (K-12 Informal Education).

- Likewise in 2006, representation on the Management Team from **Sinte Gleska University** located on the Rosebud Indian Reservation continued. This allowed the Consortium to forge even closer collaborations with minority-serving institutions and double the targeted goal of 10% of Space Grant awards to minority students.

- SDSGC entered into a formal subcontract with **St. Francis Indian School (SFIS)** to enhance STEM education for underrepresented Native American students on the reservation and prepare them for college. This formal arrangement is anticipated to develop into a 3-5 year partnership. Additional details are discussed later under the section on NASA Education Outcome 2 (K-12 Informal Education).

- SDSGC continued its **services of an independent qualified evaluator**, Ms. Shannon Lane (Ph.D. candidate in SDSU's Rural Sociology Department), to provide guidance on sustained self-evaluation of the Consortium and its programs pursuant to SDSGC's long-term evaluation strategy and logic model completed in February 2006.

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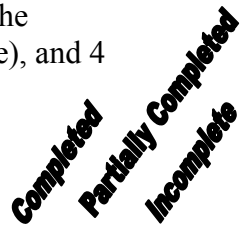
NASA EDUCATION OUTCOME 1 (EMPLOY AND EDUCATE)

Education Outcome 1 seeks to *"Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals."* This section summarizes the status of SDSGC's FY2006 strategic objectives related to Outcome 1. These include parts of the Consortium's Program Areas 2 (Fellowships/Scholarships), 3 (Research Infrastructure), and 4 (Higher Education).



Outcome 1 – Fellowships and Scholarships

Quantitative Outcome Measures Matrix (Program Area 2: Fellowships)

Objective	Outcome Indicator			
2.1	A centralized, Consortium-wide annual Call for Fellowship/Scholarship Applications shall be implemented in 2005 and made available in subsequent years 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 2006.	√		
	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, SDSM&T Aero Team, SDSU ACE Camp, etc.) At least three fellowships offered each year.	√		

2.3	In 2006, 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 three fellowships 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	√		
	Finalize arrangements with National Space Grant Foundation by December 2006 to include SDSGC in the longitudinal tracking system so that students funded during FY2005 and beyond can continue to be tracked in subsequent years at least through first-employment.	√		
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 FY2006

Forty-three (43) applications were received from students from five of the Consortium's universities in competition for $100,000 available in funding through the FY2006 Fellowship/Scholarship Program. **Thirty-six (36) student awardees** were selected.

Diversity in Fellowship/ Scholarship Program

- 8/36 awards to minority students
- 7/36 awards to Native Americans
- Four students at a Tribal College
- Native American female to JPL internship 2007

- Engaging Minority Serving Institutions and Minorities:
  - In an effort to maintain meaningful partnerships with minority-serving institutions, James Rattling Leaf of affiliate Sinte Gleska University remained on the SDSGC Management Team throughout FY2006. Three Tribal Colleges remain educational affiliates of the Consortium.

  - Of the 36 students funded through SDSGC's Fellowship/Scholarship program in FY2006, **eight (22%) were minority** students and **seven of those were Native American**. Thus, the vast majority (87.5%) of the funded minority students are Native American. Four of the seven Native American students funded by Space Grant in FY2006 attend a Tribal College.

  - Fifty percent (50%) of the funded minority students attend a minority-serving institution.

  - Of the $108,000 of NASA funds awarded to students under the administration of SDSGC's Fellowship/Scholarship Program during FY2006, $22,000 was awarded to minority students. NASA is specifically benefiting from one of these minority students,

Connie Giroux, a **Native American graduate student selected for a summer 2007 JPL Space Grant internship**.

o Twenty-two percent (22%) of funded students were minorities and over 20% of the total funds awarded to students during FY2006 went to minorities. Considering that South Dakota's minority enrollment in degree-granting institutions is *11.3% (*8.1% Native American), the Consortium roughly **doubled its targeted goal** of 10% of awards to minorities. This is a meaningful engagement of minorities and minority-serving institutions of which we are proud to have attained.
**Source: National Center for Education Statistics*
http://nces.ed.gov/programs/digest/d05/tables/dt05_208.asp

Workforce Development in Fellowship/Scholarship Program
- Six NASA interns 2006
- Six NASA interns 2007
- One NASA Academy
- Two aerospace industry interns
- Nine USGS/EROS interns
- Student/faculty research at KSC

- **Internship Placements at NASA Centers and Industry** - In the summer of 2006, SDSGC placed **six (6) students at NASA Centers for internships**, one of which included **NASA Academy** (Jacci Bloom at NASA Academy, Mark Hofacker at Marshall, James Hulka at Goddard, Cory Kauk at NASA SIP through Goddard's Higher Education Program, Michael Iseminger at KSC, and Scott Hansen at JSC's co-op.) These students are reported here because the internships occurred during SDSGC's FY2006 Program Year and were administratively supported by the Consortium's Fellowship/Scholarship Program, although direct funding to the students in the form of stipends was from the FY2005 Space Grant.

Eight (8) additional students have been selected and funded for NASA and industry internships during spring and summer 2007, seven (7) of whom are supported with FY2006 core Space Grant and ESMD internship funds (Paul Cooney and Garry O'Donnell at Goddard, Connie Giroux at JPL, Mark Hofacker at Marshall, Ashley Vayer-Jenkins at Hamilton Sundstrand Corp., Mark Oleson at KSC, and Mark Horton at ATI Allvac.) Although the eighth student did not receive a stipend from SDSGC, Consortium management staff at Augustana College facilitated the placement of student Neil Patel into a summer 2007 NASA USRP internship at KSC.

This equates to **14 students conducting internships at NASA Centers or industry** with direct stipend and administrative support from FY2006 Space Grant Fellowship/Scholarship Program funds as of this writing. Three (3) additional South Dakota college students have been pre-approved by SDSGC for summer 2007 ESMD internships at NASA Centers, pending selection by NASA. Thus, the total may increase to 17 students before the end of the program year. This is a significant student internship placement for which SDSGC has worked hard to achieve.

- In an effort to bolster longstanding relationships and collaborative research with the USGS Center for Earth Resource Observation and Science (EROS), SDSGC's Management Team facilitated the placement **of nine (9) student interns at EROS during FY2006**, triple the targeted number set in the Consortium Strategic Plan. Five students were from SDSU, three from Augustana College, and one from Southeast Technical Institute.

- Ms. Cassie Soeffing concluded her **NASA Einstein Distinguished Educator Fellowship** in July 2006 where she had worked for a year in the office of Dr. Ming-Ying Wei, Program Manager in the Earth Science Division of the **Science Mission Directorate at NASA Headquarters.**

- **Longitudinal Tracking** - During FY2006, SDSGC assessed how it could best provide NASA's longitudinal tracking requirements. The Management Team decided to formally enter into an agreement with the National Space Grant Foundation (NSGF) such that all students provided with "significant support" from Space Grant (defined as over $1,000 in a single award) will be tracked per NASA's longitudinal tracking requirements. Arrangements were finalized with NSGF by December 2006 to include SDSGC in the longitudinal tracking system so that students funded during FY2005 and beyond can continue to be tracked in subsequent years at least through first-employment. Longitudinal tracking data from FY2005-2006 is graphically displayed in the adjacent Figure 1. FY2006 data is quantified in tabular form in the table titled **"FY2006 Summary of Longitudinal Tracking Data"** (page 12.) Numerous anecdotal points of success are discussed under **"2006 Student Accomplishment Highlights"** below.

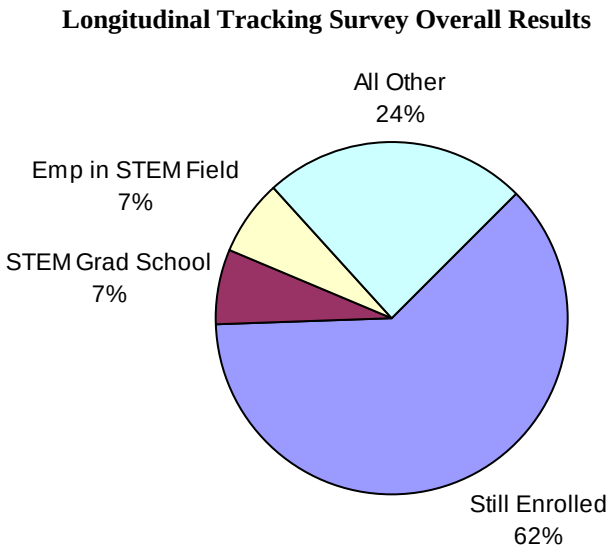


Figure 1: Next step taken by students who received significant support from Space Grant and whose funding ended in fiscal years 2005 - 2006.

- SDSU Electrical Engineering undergraduate student and SDSGC-fellow Michael Iseminger worked for SDSU's Prof. Alfred Andrawis on his SD NASA EPSCoR-funded project at **Kennedy Space Center** titled "Hypergolic fuel and Oxidizer Fiber Optic Leak Detector."

FY2006 Student Fellowship/Scholarship Stipend Awardees (Core Space Grant)

Last Name	First Name	School	Major	Amount
Suarez	Darlene	Dakota State U	Comp Info Systems	[redacted]
Bloom	Jacci	SDSM&T	Tech Management	[redacted]
Christopher	Kelsa	SDSM&T	Mechanical Engineering	[redacted]
Cooney	Paul	SDSM&T	Mechanical Engineering	[redacted]
Degen	Cassandra	SDSM&T	Metallurgical Engineering	[redacted]
Farrar	Nichole	SDSM&T	Interdisciplinary Sci	[redacted]
*Giroux	Connie	SDSM&T	Tech Management	[redacted]
Hocking	Crystal	SDSM&T	Geology	[redacted]
Hofacker	Mark	SDSM&T	Mechanical Engineering	[redacted]

Hulka	James	SDSM&T	Atmospheric Sci	[redacted]
Johnson	Andrew	SDSM&T	Mining Engineering	[redacted]
Johnson	Darren	SDSM&T	Geology	[redacted]
Kingsbury	Nicholas	SDSM&T	Electrical Eng	[redacted]
Musil	Eric	SDSM&T	Mechanical Engineering	[redacted]
Nelson	Sarah	SDSM&T	Atmospheric Sci	[redacted]
O'Donnell	Garry	SDSM&T	Comp Eng/Math	[redacted]
Priegnitz	Nathaniel	SDSM&T	Undecided	[redacted]
Rodriguez	Mitchell	SDSM&T	Mech Eng/Met Eng	[redacted]
Rowe	Becci	SDSM&T	Geology	[redacted]
Sanovia	James	SDSM&T	Geological Eng.	[redacted]
Schulz	Adam	SDSM&T	Comp. Eng.	[redacted]
Vayer-Jenkins	Ashley	SDSM&T	Metallurgical Engineering	[redacted]
Weidenbach	Jessica	SDSM&T	Comp. Sci. & Math	[redacted]
Bockorny	Todd	SDSU	Electrical Eng	[redacted]
Boyte	Stephen	SDSU	Geography	[redacted]
Bressler	Lindsay	SDSU	Geography & GIS	[redacted]
Derby	Solomon	SDSU	Construction Mgmt	[redacted]
Forrette	Eric	SDSU	GIS and Env. Mgmt	[redacted]
Janus	Allan	SDSU	Geography & GIS	[redacted]
Lahrs	Nathan	SDSU	Mechanical Engineering	[redacted]
Lane	Shannon	SDSU	Rural Sociology	[redacted]
Swanson	Seth	SDSU	Ag. & Bio. Eng.	[redacted]
Black Feather	Erin	Sinte Gleska U	Env. Sci.	[redacted]
Martinez	Andrea	Sinte Gleska U	Env. Sci.	[redacted]
Watson	Brandon	Sinte Gleska U	Env. Sci.	[redacted]
Wolfe	Sarah	Sinte Gleska U	Cultural Res. Mgmt.	[redacted]
TOTAL				***108000**
Graduate Student				
* [redacted]				

FY2006 Student AWARD SUMMARY	**Number of Students**	**% of Awards to Female Students**	**% of Awards to Male Students**	**% of Awards to Underrepresented Minority Students**	**Number of Undergraduate Awards**	**Number of Graduate Awards**	**Number of PhD Awards**
Total Awards	36	44%	56%	22%	24	11	1

FY2006 Student AWARDS by Affiliate	**Number of Students Funded**
South Dakota School of Mines & Technology	22
South Dakota State University	9
Sinte Gleska University	4
Dakota State University	1

2006 Student Accomplishment Highlights / Anecdotal Points of Success

Kelsa Christopher, Senior Mechanical Engineering student at SDSM&T and spring/fall 2006 Space Grant Fellow is also a member of SDSM&T's **Aero Design Team**. Kelsa has the long term goal of completing her doctoral degree in Aerospace Engineering and working for NASA. She said *"Without the NASA space grant stipend, the SDSM&T Aero Design team would not have had enough funding to complete the necessary design and testing, and travel to the SAE Aero Design competition. Because of the additional funding, my team was able focus their attention on the project and complete a successful season that culminated with a national win at SAE's Aero Design West competition!"* This was the **second consecutive year that the SDSM&T team has taken first place at the international competition**, which was held in Encino, CA in June 2006.

Connie Giroux is a Native American graduate student enrolled in SDSM&T's Technology Management Program and a continuing Space Grant stipend recipient. She has been accepted for a summer **2007 summer internship with NASA Jet Propulsion Laboratory's Safety and Mission Success** team with support from Space Grant and SD NASA EPSCoR. Of her spring 2006 semester stipend, Connie said *"Being a recipient of the Space Grant stipend, I have been able to focus directly on my graduate studies without worrying about my finances for graduate school for this semester. This has enabled me to achieve a 4.0 GPA for my first semester as a graduate student at SDSM&T."* She is very excited about her upcoming summer 2007 JPL Space Grant internship.

James Hulka, graduate student in Atmospheric Science at SDSM&T, participated in the 10-week summer **2006 NASA-Goddard Student Internship Program** in Greenbelt, MD. James worked at the Goddard Earth Sciences (GES) Data and Information Services Center (DISC) on a hurricane portal database website. James said *"The total experience of working the summer at Goddard Space Flight Center was one I won't forget anytime soon. All in all, I learned a lot, met some great people and had an experience that I wish I could do again. The stipend from the SD Space Grant afforded me an excellent opportunity to work with new technology and very smart people who wanted to see my present and future success."* James has been accepted into the **Ph.D. program in Earth and Planetary Sciences at the University of New Mexico.**

Mark Oleson is a Junior from Mitchell, SD enrolled in SDSM&T's Mining Engineering and Management Department. Mark is a Space Grant fellow who conducted a **Spring 2007 NASA internship at Kennedy Space Center** (KSC) under the Lunar and Planetary Surface Systems section of NASA's "Exploration Systems Mission Directorate". His project was titled "Fine Particle Analysis of JSC1A Lunar Simulant". Mark is interested in extraterrestrial mining and is worked on a lunar regolith project under the mentorship of Dr. Philip Metzger, a Research Physicist with KSC's Applied Physics Lab who leads their research into granular materials behavior. Mark wrote *"The most important thing I learned was that the*

most instructive classroom is the one that the student works with professionals away from the academic environment. Real projects require real results, so working with people that take the job seriously because a failure is not optional is refreshing and has also renewed my vigor in working hard at school so that I am ready for the demands at the job site." Although Mark's ESMD stipend did not come from the core FY2006 Space Grant, his placement at KSC was largely facilitated by SDSGC's continuing efforts at placing student interns at NASA Centers (a program funded by the core Space Grant.)

Mark Hofacker is a senior Mechanical Engineering student at SDSM&T. During summer 2006, Mark interned at **Marshall Space Flight Center** and worked on developing a sandwich composite intertank for use with NASA's upcoming crew launch vehicle. During the ten-week program, he manufactured composite materials and performed a variety of destructive and nondestructive tests on them to determine their properties. Mark said *"I was given great freedom to use NASA's many manufacturing and informational facilities to complete my projects. I will be graduating in May '07 and hope to work at Marshall next summer and eventually gain full time employment after I complete graduate school. I would recommend a NASA internship with Marshall Space Flight Center to any engineering student. The facilities were state-of-the-art and the faculty was committed to developing my abilities as an engineer."* NASA Marshall personnel were so impressed with Mark's internship work in summer '06, they recently **accepted him again for a summer '07 internship** in the same office. He was awarded another Space Grant stipend for this purpose.

Sarah Nelson is completing her MS degree in Atmospheric Science with an emphasis in Earth Systems Science at SDSM&T. Her summer 2006 Space Grant stipend allowed her to work with the USDA Forest Service in the Black Hills and conduct research calculating fuel moisture content of Ponderosa Pine needles and comparing the measurements to data obtained by **NASA's MODIS satellite**. Sarah plans to graduate in May 2007 and either enter a career with the Forest Service or EROS, or pursue a Doctorate degree. Sarah said *"I am honored to have been named one of the Summer 2006 Space Grant Fellows. This fellowship has allowed me to complete research in my desired field of study, specifically regarding the estimation of fuel moisture content of Ponderosa pine using MODIS data."*

Darren Johnson is a graduate student pursuing an M.S. in geology at SDSM&T. He used his summer 2006 Space Grant stipend to conduct thesis research on his project titled "Geologic Mapping of the Darwin Hills Area based on Hyperspectral Remote Sensing". Darren said *"Funding I have received through the South Dakota Space Grant Consortium has allowed me the opportunity to do research in planetary geology and astrobiology. It has been especially beneficial in a small university setting like SDSM&T where space-related research and funding is very limited. Without this funding I would not have had the opportunity to do this research and find a thesis topic related to space exploration."* In the fall, Darren **will enter the Ph.D. program in Planetary Materials at Washington University in St. Louis**.

Sarah Wolfe graduated from Sinte Gleska University (SGU) Lakota Studies Department in August 2006 with her B.S. degree in Cultural Resource Management and began graduate school at SGU for an advanced degree in the same program. She was a spring and fall 2006 Space Grant stipend recipient conducting research on local indigenous plants for modern and traditional usages. She plans to continue this research during summer 2007 with help from a **USGS grant** entitled "Indigenous Knowledge Center for Education and Science Impact". Sarah expressed appreciation to SD Space Grant for *"assistance in furthering and securing my future as a professional."*

Andrea Jolene Martinez is a senior Environmental Science major at Sinte Gleska University (SGU) and works in the Geospatial Applications Center. She used her summer 2006 Space Grant stipend to attend an **ESRI GIS conference in California** where she made contacts and gave a presentation on a GIS course that she co-taught to Rosebud Sioux Tribe employees to promote the use of GIS throughout the tribe. She continued her research with financial assistance from Space Grant in fall 2006. She will graduate in summer 2007 and plans to attend graduate school in California. Andrea said *"I want to thank you and your management team for giving me the opportunity to attend the ESRI conference and receive a new laptop for my research, school studies and work. Your generosity has made a profound impact on my career studies and am truly grateful to have been a recipient of your summer 2006 student stipend program."*

Darlene Suarez is graduate student working on her M.S. in **Information Systems (Data Management and E-Commerce Specialties)** offered through Dakota State University. She used her fall 2006 Space Grant stipend to cover tuition for courses in Systems Analysis and Design Using Case-Tools and Information Retrieval. Darlene feels confident in her ability to perform all that is required in analyzing and documenting a systems project. She said *"For me, the attraction to work for an organization such as NASA is the sense of greater purpose that permeates the organization as a whole."*

James Sanovia is a Native American Tribal College transfer student from Oglala Lakota College in his senior year at SDSM&T completing a B.S. degree in Geological Engineering. He completed two summer internships at NASA Goddard Space Flight Center, where he conducted several studies using remote sensing/satellite imagery. **While at Goddard, James received the prestigious Rashaan Jackson Presentation Award**. He has continued as a Space Grant student fellow through 2006. His research project "*The Black Hills Race Track: A Lakota Cultural Exposition"* uses GIS, remote sensing, and Lakota mythology to produce maps and "fly-through" animations along the circular geologic formation commonly known as the "race track" which surrounds the Black Hills. In April 2007, he will present updated results of his research at Wind River Tribal College to educate both Native and non-Natives as to the cultural significance of these sites and the importance of preserving them for future generations. *"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."*

FY2006 Summary of Longitudinal Tracking Data: Appendix B in Budget Call

FY2006 Summary of Longitudinal Tracking Data

FY 2006 LONGITUDINAL SUMMARY		EDUCATION		STEM EMPLOYMENT				OTHER
For all students who received a "significant" award in Fellowships/ Scholarships, Higher Education, & Research Infrastructure	Number of Awardees Completed Funding in FY2006	Still Enrolled In Current Degree Program	Graduated and Pursuing Advanced STEM Degree	Graduated and seeking STEM Employment	Employed in STEM Position[1]	Employed by NASA/JPL[2]	Employed in STEM Academic Field[3]	All Other (e.g. non-STEM employment, non-STEM academic degree)[4]
Fellowship/Scholarship Recipients								
Number of Students	36	36	0	0	0	0	0	0
Percentage of Awards to Underrepresented Students	22%	22%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percent Male	55.6%	55.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percent Female	44.4%	44.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Number of Undgrad	24	24	0	0	0	0	0	0
Number of Graduate	11	11	0	0	0	0	0	0
Number of PhD	1	1	0	0	0	0	0	0
Higher Education & Research Infrastructure Recipients	0	0	0	0	0	0	0	0
Percentage of Awards to Underrepresented Students	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percent Male	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Percent Female	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Number of Undgrad	0	0	0	0	0	0	0	0
Number of Graduate	0	0	0	0	0	0	0	0
Number of PhD	0	0	0	0	0	0	0	0

[1] Employed in a STEM position with government, for profit, or non-profit organization

[2] Civil service employee or JPL employee

[3] Faculty, teacher, or other academic position (K-Higher Education) in a STEM field

[4] Employment or pursuing advanced degree in non-STEM industry, academia, or other government

Outcome 1 – Research Infrastructure

Quantitative Outcome Measures Matrix (Program Area 3: Research Infrastructure)

Objective	Outcome indicators	Completed	Partially Completed	Incomplete
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	√		
	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)	√		
3.3	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.	√		
	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)	√		
	A uniform system for longitudinal tracking SDSGC scholars and fellows will be in place by December 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 FY2006

In FY2006, SDSGC supported the following research infrastructure programs as reported in CMIS: 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.

Workforce Development in Research Infrastructure Program

- Engineering design teams
- New university-NASA contacts at 6 NASA Centers
- Travel to NASA Centers
- Research seed grants
- 53 new proposals or "white papers" on NASA research

- Working in close cooperation with SDSGC, the **SD NASA EPSCoR** strives to 1) identify emerging NASA-related research capability in the state's universities, 2) link state researchers with NASA researchers, and 3) provide state researchers seed funding to carry out NASA-related work, improve connections with NASA, and develop their research for potential funding from other sources. SD NASA EPSCoR encourages projects that are aligned with NASA and state strategic objectives as outlined in the 2006 NASA Strategic Plan and the 2006 Future of Research and Technology in South Dakota, A State Plan. In the past two years, **53 seed grant proposals or concept papers ("white papers")** have been generated in response to SD NASA EPSCoR attempts to refocus and identify new areas of collaboration with NASA. Through these submissions and related travel grants, new communications have developed between South Dakota researchers at **six different universities and eight of the NASA Centers** (GSFC, SSC, JSC, JPL, LaRC, ARC, KSC, and GRC) as well as NASA Headquarters.

- Dr. Dan Swets, member of the SDSGC Management Team and Associate Director of SDSGC at Augustana College remained chair of the NASA EPSCoR Steering Committee in South Dakota. Dr. Swets worked with SDSGC Director Dr. Ed Duke in assuring close connection between Space Grant and NASA EPSCoR.

Diversity in Research Infrastructure Program

- Remote sensing test site aligned with Tribal College research
- Seed grants and travel grants offered at three Tribal College affiliates

- Ten (10) **Research Initiation Grants** were funded during FY 2006 through SD NASA EPSCoR. Over $133,000 of NASA funds were awarded with an equal amount of matching funds committed through these projects.

- Four (4) **Travel Grants** were awarded during FY 2006 through SD NASA EPSCoR for planning trips to NASA Centers including ARC, JPL, and GSFC.

- Twenty-three (23) "**targeted announcements of opportunity**" were distributed to SDSGC affiliates in 2006 that involved NASA-related research.

- Dr. Daniel Swets of the Augustana College Computer Science Department visited EROS to promote collaborative research on the joint **NASA-USGS-Center for Drought Mitigation**

project. Dr. Brian Moore Augustana's Chemistry Department visited EROS to promote collaborative research on **high-performance systems in computational chemistry**.

- Likewise, the affiliation between SDSU and EROS in the **Geographic Information Science Center of Excellence** provides for frequent visits among seven SDSU faculty and eight EROS scientists aligned with the Center, promoting collaborative research between the two facilities. All seven SDSU staff visited EROS at least once during FY2006, which is over three times the targeted goal.

- In a continuing effort to make research results available for the benefit of the community, and to expand our commitment to technological commercialization, SDSM&T established a new **Office of Technology Transfer (OTT)** in 2006. The Director of OTT, Dale Skillman, Associate Professor in mechanical engineering, maintained an office adjacent to SDSGC headquarters throughout FY2006. The OTT office services a) the current intellectual property inventories, b) new disclosures submitted by faculty, and c) requests for advice. Working with the VP for Research and the Research and Intellectual Property Council at SDSM&T, the office reviews ongoing research activities by faculty and can identify potential opportunities.

- **Design Team Support** – As explained in detail under the precollege and higher education program areas, SDSGC provided significant support to university and precollege design teams for participation in regional and national competitions. University team support includes SDSM&T's IEEE Tech **Robotics Team**, **Aero Design Team**, and **Unmanned Aerial Vehicle** Teams and Augustana College's **Robotics Team**. Precollege support was provided to middle and high school GEMS teams supported through SDSU and to **Lego robotics** teams at Madison Central Middle School and Brookings elementary.

Outcome 1 – Higher Education

Quantitative Outcome Measures Matrix (Program Area 4: Higher Education)

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 1.6 and 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	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 FY2006

During FY 2006, 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, 7) SD GEAR UP Honors Program, 8) State Science and Technology Entrepreneurship Program (STEP), 9) Flandreau Indian School (FIS)/SDSU "Success Academy", 10) Aero Design, Robotics, and Unmanned Aerial Vehicle Teams, and 11) South Dakota View.

Workforce Development in Higher Education Program

- Graduate student support increased by 22%
- Four engineering design teams
- Robotics integrated into math programming curriculum

- SDSGC programs continue to focus on developing strong undergraduate programs in aerospace and earth science through fellowships/scholarship program support. Forty-six percent (46%) of the FY2006 funding awarded to undergraduate students went to supporting **NASA and industry internships for** those students. Although undergraduate program support remained strong, **an increase in the percentage of graduate student support** was accomplished during FY2006 compared to the previous year. In FY2006, 62% of the $100,500 in fellowship/scholarship program stipends (available through the "base" FY'06 Space Grant) were awarded to undergraduates and 38% to graduate students. In FY2005, those percentages were 84% and 16% respectively. Thus, there was an increase of 22% in graduate student support from FY2005 to FY2006. We believe the FY2006 distribution is better aligned with NASA's Education Strategic Coordination Framework initiative to produce a well-trained workforce for NASA and the nation.

Diversity in Higher Education Program

- Four STEM support programs for Native American students
- Tribal College representative on Management Team
- NSF Opportunities for Enhancing Diversity project
- Higher Education opportunities offered to all three Tribal College affiliates

- In FY2006, SDSGC provided seven (7) **Space Grant fellowships to Native American students** at Sinte Gleska University, SDSM&T, and SDSU. 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. *(To avoid duplication, see additional details in the "Fellowship/Scholarship Program" section of this report for percentages of awards to Native American students and students at minority-serving institutions.)*

- As a member of the SD NASA Space Grant Consortium management team and the SD NASA EPSCoR Technical Advisory Committee, James Rattling Leaf plays an invaluable role in representing Native American needs and perspectives in the state decision-making processes. Since 2003 he has also been a principal investigator on the NASA REASoN (Research, Education and Applications Solutions Network) grant titled "**Using Geospatial Information to**

Enhance Tribal Rangeland Management through Education and Understanding." The project is implemented in cooperation with USGS/EROS and focuses on the sustainability of natural resources on the Rosebud Indian Reservation. Rattling Leaf is also a co-principal investigator on the state's current NSF EPSCoR Research Infrastructure Improvement (RII) grant, providing essential continuity in the diversity goals of the NASA and NSF research infrastructure programs.

- In a related effort, James Rattling Leaf and other SDSGC staff continue to collaborate on a three-year, $250,000 award through the **NSF program Opportunities for Enhancing Diversity in the Geosciences**. This award will allow SDSGC and Tribal College personnel to engage a larger segment of the Native American community with earth and space science education and research projects.

- **American Indian Science and Engineering Society (AISES)** – A national organization founded to increase the number of American Indians in STEM fields that continues to be supported by Space Grant through stipend support to member students, notification of NASA educational opportunities, and professional development training.

- **Bridges to Success Program** – Has the goal to enhance graduation of Native American students with baccalaureate degrees in STEM fields. The students work full-time as undergraduate research assistants for professional researchers on the SDSM&T campus. During summer 2006, Seven (7) Native American students from OLC and SDSM&T participated in the Bridges to Success Program and were required to a) attend weekly Bridges meetings, b) professional development workshops, c) keep a daily research journal, and d) produce a research paper, PowerPoint presentation, and poster of their project. The program is **funded by NSF through Salish Kootenai College in partnership with SDSGC-affiliate Oglala Lakota College (OLC)**. The program has been operating at SDSM&T since the summer of 2003 and has supported 44 students in a wide variety of labs across campus. 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.

- SDSGC again supported the **SDSU-Flandreau Indian School (FIS) Success Academy** in 2006 by providing funds for ten FIS seniors to complete six credits of **university coursework as part of the Academy's "Countdown to College" program**. The SDSU-FIS Success Academy is an early and intensive college preparatory program for about 210 Native American high school students each year. Success Academy began in SDSU's College of Engineering seven years ago and since has expanded to involve the entire university. Success Academy exposes students not only to college, but also to the careers open to college graduates. The program emphasizes career areas identified by tribal leaders as being of critical need to their communities (e.g., engineering, agriculture, education, pharmacy, nursing, journalism and nutrition.) Success Academy has two goals: 1) to help more American Indian students prepare for and succeed in college, and 2) to make SDSU into the kind of place where that can happen. SDSU-FIS Success Academy has

Thanks to you, an ever increasing number of American Indian high school students are taking college courses and using this experience as a springboard into college.

served over 1,000 American Indian students. It has evolved into a comprehensive, four-year college preparatory program serving all freshmen, sophomores, juniors and seniors attending FIS. Each individual FIS student visits SDSU 15 times before he or she is a senior in high school. Forty-five (45) Success Academy students have enrolled for classes at SDSU as concurrent high school students, and 12 of these students have enrolled at SDSU as college freshmen. This is a **500% increase over the number of FIS students continuing their education at SDSU before the start of Success Academy**. In addition, many Success Academy graduates have continued on with post-secondary education at other institutions throughout the state and nation. This program is another excellent measure of SDSGC's success at recruiting and training underrepresented minorities for academic and professional careers in science and technology.

Dr. MaryJo Benton Lee, Diversity Coordinator for SDSU's College of Engineering, wrote the following in appreciation for the support from NASA Space Grant. *"Thank you so much for your continuing and generous support of the senior-year SDSU-Flandreau Indian School Success Academy program.* ***Thanks to you, an ever increasing number of American Indian high school students are taking college courses and using this experience as a springboard into college.*** *Many of our Success Academy graduates are majoring in science, math, engineering and technology fields at institutions throughout the state and the nation. This would not happen without your wonderful support. The students and I are truly grateful. Thank you so much again for your help."*

- **SD GEAR UP Honors Program** – For the 14th consecutive summer and twice as big as ever, the SD GEAR UP Honors Program was held during the summer of 2006 on the SDSM&T campus. It is a **six-week residential college-preparatory program for Native American students**. The students live in the Residence Halls, eat at the dining hall, and attend classes on campus. Much of the funding for the program comes from a federal GEAR UP grant through the State of South Dakota Department of Education. The program is operated through Oceti Sakowin and 23 partner schools that include American Horse, Batesland, Cheyenne Eagle Butte, Crazy Horse, Crow Creek, Enemy Swim, Flandreau Indian, Little Wound, Lower Brule, Marty Indian, Our Lady of Lourdes, Pine Ridge, Porcupine Day, Red Cloud Indian, Red Shirt, Rocky Ford, Saint Francis Indian, Takini, Tiospaye Zina, Todd County, Wakpala Smee, Wolf Creek, as well as Rapid City Area Schools. Previous names of the program included "Scientific Knowledge for Indian Learning and Leadership" (SKILL) and NASA Honors.

In 2006, the SD GEAR UP Honors Program attracted 152 9th-12th graders and 12 college students overseen by 15 staff members which includes some of the college students. Many of the staff and college students are graduates of the program. About two-thirds of the students are female. About 85% of the students are Native Americans. Most are first-generation college students. Students must apply to enter the program and are selected based on academic achievement and teacher recommendations. Students represent all nine tribes in South Dakota: Cheyenne River, Crow Creek, Flandreau-Santee, Lower Brule, Oglala, Rosebud, Sisseton-Wahpeton Oyate, Standing Rock, and Yankton. The curriculum includes math (algebra, trigonometry, pre-calculus, and college algebra), science (physical science, biology, chemistry,

and physics including laboratories), english, computers, and life skills such as goal setting, leadership, study skills, personal finance, and college preparation. The curriculum also includes special initiatives including a Science Fair, Academic Olympics, SEMAA (Science, Engineering, Mathematics, and Aerospace Academy), and a daily seminar. Tom Durkin of SDSGC presented "Mars Mania" to the 164 Honors Program students on June 26, 2006. The curriculum is further enriched with field trips, recreation and sports, college visitation, and cultural activities. This program boasts some very impressive statistics. Of those students who graduate from the program, virtually 100% also graduate from high school, 85% attend college, and 7% enter the military. SDSM&T contacts include Dr. Carter Kerk (Industrial Engineering Dept) and Bruce Carter (Multicultural Affairs).

- **"Looking Beyond One's Self"** – SDSGC supported the dedication of a local piece of Native American art to the **Smithsonian's National Museum of the American Indian** on March 13, 2007. In 1994, SDSM&T commissioned Oglala Lakota artist Mr. Don Montileaux to create a work of art that depicts three American Indians looking beyond the immediate horizon and toward a vision of the future. The image symbolizes our desire of young American Indians to reach beyond themselves ... toward the stars and their visions. The original painting of "Looking Beyond One's Self" **flew aboard the March 1995 flight of STS-67 Space Shuttle Endeavor**. Endeavor also took the first American Indian Astronaut Commander John Herrington "to the stars" on November 22, 2002. Proceeds from sales of the print are used to continue to offer and expand educational programming for Native American students in South Dakota.

- On February 14, 2007, four (4) SDSGC student fellows from SDSM&T (Mark Hofacker, Mitchell Rodriquez, James Hulka, and Jed Brich) joined 85 other university students from around the state to present their NASA-supported research at the **Student Research Poster Session in the State Capitol Rotunda** in Pierre, SD. This event is visited by numerous State Legislators, Governor's Office staff, State employees, Board of Regents officials, lobbyists, and the public.

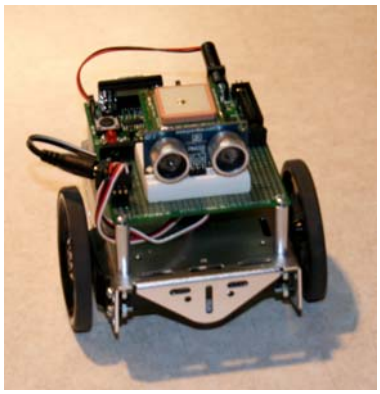
- **South Dakota View (SDView)** is a consortium of educational institutions, government agencies, and private sector organizations in South Dakota with a common goal of building **partnerships and infrastructure to facilitate the availability, timely distribution and utilization of remotely sensed satellite 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 sixth year of competition, SDSM&T's **Aero Design Team** captured **first place** in the Regular Class Division at the June 2006 Aero Design West remote-controlled airplane competition in Encino, CA. The Team was again supported by Space Grant. This was the **second consecutive year that the SDSM&T team has taken first place at the international competition**. Kelsa Christopher, Aero Design Team member and SD Space Grant student Fellow during the Spring 2006 semester has the long term goal of completing her Doctoral Degree in Aerospace Engineering and working for NASA. At the competition, the plane carried 24.08 pounds of added weight, the most of any of the nearly 40 teams. SDSM&T's Aero Design Team finished atop the regular class and ahead of some of the best-known universities in the world. For this accomplishment, the team was awarded the Elliott & Dorothy Green Award of Excellence. Eric Musil, a mechanical engineering sophomore from Huron, SD and FY2006 Space Grant student fellow added, *"This [win] will live with me for the rest of my life."*

- **SDSM&T Robotics Team Support** – SDSGC provided $6,242 in support of SDSM&T's "Tech Robotics Team" to prepare for and participate in the April 2007 IEEE robotics competition in Fayetteville, AR, to purchase materials to construct the robots, and to help cover travel expenses to the competition site. Robotics team members gain hands-on application of theoretical knowledge in mechatronics, electrical circuits, and programming.

- **SDSM&T's Unmanned Aerial Vehicle (UAV) Team finished first in the International Aerial Robotics Competition** at Fort Benning, GA in July 2006. The Association of Unmanned Vehicle Systems International sponsored the international contest, which requires students to launch a computer-controlled aerial vehicle capable of navigating a 3-km course using GPS. A computer, not an operator, controls the aerial vehicle. The vehicle must also launch a second vehicle (a sub-vehicle) capable of successfully entering a building and transmitting information back to its control site. SDSM&T's UAV Team has competed in the international contest for three years. This is the first time the team successfully flew its modified Bergen

helicopter in the competition. After crashing the primary helicopter two weeks before the event, the team's backup helicopter was wrecked during a practice flight when its engine failed the day before the flight competition. The team worked all night to rebuild the helicopter. SDSM&T and the University of Alabama had the only vehicles that successfully completed the flight course. The team website is http://uav.sdsmt.edu/uav.php?cpg=Home



- **Interdisciplinary Robotics Initiative** – SDSGC also provided $10,500 through a competitively-awarded "Project Initiation Grant" to Dr. Jeff McGough of SDSM&T's Math and Computer Science department for a project titled "Interdisciplinary Robotics Initiative" (IRI). The IRI project is aimed at increasing the number of graduates in computer science and engineering at SDSM&T and promoting careers in science and technology. To accomplish this, a **robotics component was introduced to entry level programming courses** [CSC150 (Introduction to C++)]. This includes introductory lectures on embedded programming, exposure to programmed electro-mechanical systems, and team based lab assignments with the robots. Robotics was selected as the motivating tool because it is engaging, practical, hands-on, and fun. While the experience is entertaining, students master traditionally difficult concepts of programming languages and prepare themselves for further study in computer science and computer engineering. Students also prepare for potential participation on the Tech Robotics Team or they may create robotics applications as part of another student project or senior design experience. Finally, the IRI **curriculum is leveraged to run demonstrations and workshops for middle and high schools to promote careers in science and technology**.

- In conjunction with nine (9) other Space Grant Consortia, SDSGC pursued the **"NASA Space Grant Telescope Network Project."** It is a collaboration between ND, SD, OR, VA, NC, NV, UT, CO, and IN Space Grants. The primary goal of this multi-consortium project is to provide university undergraduate/graduate students and faculty with greater access to research-quality astronomical observatories for both research and educational projects. SDSGC-affiliate Badlands Observatory with its high-quality, research-grade 26 inch f4.8 Newtonian Telescope is the participating entity in South Dakota. SDSGC committed $5,000 in the pending FY2007 budget to support this project.

- **Publications and Higher-Education Presentations (FY2006)**
  - D. Teets, May 2007, "The Mathematics of Go To Telescopes", *The College Mathematics Journal*
  - D. Teets and P. Rahn, in press, "Longitude, the Moons of Jupiter, and the Speed of Light", *Popular Astronomy*
  - D. Teets, in review, "Sighting the International Space Station," *American Mathematical Association of Two Year Colleges (AMATYC) Review*
  - P. Rahn and J. Rahn, April 2007, "Eclipse of the Inner Satellite of Jupiter", *Proceedings of SD Academy of Science*, v. 85.

- A. Boysen, March 24, 2007, "Designing a Career-Communications Strategy: Packaging, Assessing, and Marketing Yourself" presentation to South Dakota Council of Teachers of English (chapter of National Council of Teachers of English), Chamberlain, SD
- T. Durkin, July 10, 2006, "NASA's Mars Mission and Space Grant Student Opportunities" presentation to 2006 Bridges to Success Program, SDSM&T, Rapid City, SD
- T. Durkin, Oct. 2, 2006, "NASA Space Grant: The Moon, Mars and Beyond" presentation to SDSM&T's Institute of Atmospheric Science students in which Space Grant fellowship/scholarship opportunities were outlined, Rapid City, SD
- G. Grant, D. Herling , W. J. Arbegast, C. Allen, and **C. Degen**, "Superplastic Forming of Aluminum Multisheet Structures Fabricated Using Friction Stir Welding and Friction Stir Spot Welding", *Proceedings of the 2006 ICSAM Conference,* Chengdu, China, June 2006.

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NASA EDUCATION OUTCOME 2
(EDUCATE AND ENGAGE)

Education Outcome 2 seeks to *"Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty."* This section summarizes the status of SDSGC's FY2006 strategic objectives related to Outcome 2. These correspond to the Consortium's Program Area 5 (Precollege).

Outcome 2 – Precollege Education

Quantitative Outcome Measures Matrix (Program Area 5: Precollege Education)

Objective	Outcome indicator(s)	Completed	Partially Completed	Incomplete
5.1	Electronic databases of pre-college contacts available updated as necessary	√		
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 1.6 and 1.9)		√	
	At least two South Dakota schools (at least one Tribal school) apply for the 2006 NASA Explorer Schools Program	√		
5.4	At least 2,000 people will attend *"NASA South Dakota Space Days: The Moon, Mars and Beyond"* on Oct. 17-18, 2006 in Pierre	√		
	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 Precollege Activities/Accomplishments for FY2006

During FY 2006, Space Grant support was given to the following programs as reported in CMIS: 1) Regional Science Fairs, 2) Badlands Observatory's "Dark Skies, Bright Minds" program, 3) Robotics Support, 4) Engineer's Week, 5) K-12 Informal Education Program, 6) St. Francis Indian School Partnership Project, 7) NASA Teacher Training, 8) Women in Science conferences, 9) Aerospace Career and Education (ACE) Camp, 10) Flandreau Indian School Success Academy, 11) Summer Honors Program for Native American students, and 12) NASA Explorer Schools (NES).

- **NASA Explorer Schools (NES)** – With coordination between SDSGC, NASA's Angelo Casaburri and the NES program, and Mr. Arnold Lund of Kadoka School District, **the third NES school in South Dakota was established in May 2006.** The school district has over 50% Native American student population among its three schools: Kadoka Elementary/Middle School, Interior Elementary School, and Long Valley Elementary School. The Kadoka School District now joins the two other South Dakota NES schools that were selected in 2005 (Todd County Middle School and Little Wound School both located on the Rosebud Indian Reservation with near 100% Native American student population.) SDSGC supported South Dakota NES schools during FY2006 by augmenting NASA's NES program resources with educational presentations by Space Grant staff, teacher-training through AESP, and NASA Educator Resource Center materials.

- **NES School Reduced Gravity Flight** – NASA Explorer School Todd County Middle School (TCMS) located on the Rosebud Indian Reservation flew an experiment aboard NASA's Reduced Gravity Student Flight Opportunity Program modified DC-9 aircraft. In February 2007, the school's Assistant Principal and three teachers traveled to NASA's Ellington Field and Johnson Space Center in Houston to fly several student-designed experiments titled "Gravity Effects on Density" to demonstrate Newton's Second Law of Motion (F = ma). The Assistant Principal said *"This microgravity program was a great opportunity for our entire students and staff. We were able to put our scientific experiment together only with the excellent assistance of NASA professionals. The results have been a feeling of accomplishment for our students and staff alike. We are planning on using this experience to foster more interest in the sciences and math*

programs here at TCMS. ***Our partnership with NASA has been a once in a lifetime experience for all of us****. We are very thankful."* TCMS also has a "NASA Club." The adjacent photo shows several of the students and the school's Assistant Principal building a telescope. The NASA Club also has a robotics component in which students build and program robots.

Workforce Development in Precollege Program
- Engineers' Week
- NASA teacher training
- Aerospace Career and Education Camp
- Space Camp
- Lego Robotics

- **Formal Subcontract with St. Francis Indian School** – FY2006 represented a benchmark in SDSGC's formal collaboration with pre-college Tribal schools. After about two years of less formal educational projects with St. Francis Indian School (SFIS) on the Rosebud Indian Reservation in St. Francis, SD, SDSGC entered into a formal $47,000 program ($20K NASA funds, $27K match) with SFIS to enhance STEM education for underrepresented Native American students on the reservation and prepare them for college.

SFIS was established in 1971 as a parent-controlled school chartered by the Rosebud Sioux Tribe and the State of South Dakota. SFIS is funded by Congress through the Bureau of Indian Affairs. The total enrollment is approximately 600 Native American students with limited English proficiency. Ninety-seven percent of the students receive free or reduced lunches.

Diversity in Precollege Program
- Intensive STEM education programs at Tribal schools
- Three NASA Explorer Schools with >50% Native American enrollment
- Women in Science and Engineering

The collaborative partnership leverages resources from Space Grant and the SFIS Gifted and Talented Program to bring educational opportunities to students that inform, inspire, and motivate them about educational and career options in aerospace, earth science, and other STEM disciplines. The program encourages students to use leadership skills in acquiring the education that enables them to have the opportunities to succeed. The SDSGC/SFIS collaborative program sponsored the following three projects during FY2006:

1) **Summer of Action Research** (SOAR) – On-campus training and team building as well as off-campus research at Yellowstone National Park that combines scientific inquiry and technical writing.
2) **College/Career Explorations** – Students travel to colleges and technical school campuses to expose them to varied post-high school educational opportunities.
3) Other Activities – Includes a **science fair**, **rocketry classes** for grades 9-12, and an after-school **robotics** program for grades 4-8.

On March 28, 2007, SDSGC's Tom Durkin assessed middle and high school science fair projects at SFIS and presented an astronomy lesson to about 220 students and their families using spectacular images from the Hubble Space Telescope.

- **Science Fair Support to 1,320 Students**
  - **SDSU's Regional Science and Engineering Fair** was held on March 2006 with 300 student exhibits and 425 participants. SDSGC Associate Director Kevin Dalsted judged the science fair exhibits and provided SDSGC-related display materials at the College of Engineering booth.

- **SDSM&T's 51st High Plains Regional Science and Engineering Fair** was held on March 23, 2007 where 400 students competed for prizes and the opportunity to compete at the Intel International Science and Engineering Fair.
- **St. Francis Indian School's (SFIS) Science Fair** - On March 28, 2007, SDSGC's Tom Durkin assessed middle and high school science exhibits at SFIS and he presented an astronomy lesson to about 220 students and their families using spectacular images from the Hubble Space Telescope.
- **22nd annual Augustana Science Day** was held at Augustana College on October 13, 2006 for all junior and senior high school students and teachers in the Sioux Falls, SD area. The purpose of this successful event is to provide hands-on science experiences for high school students in the areas of Biology, Chemistry, Computer Science, Health, Physical Education and Recreation, Mathematics, Nursing and Physics. A minimum of 1 teacher must accompany every 6-8 students attending. About 275 students attended. The opening session "Mad Scientists Doing Chemical Magic" was led by a Lincoln High School AP Chemistry teacher who has received numerous honors including ACS and Siemens Teacher of the Year Awards and an Augustana College chemistry senior who was previously a student of the Lincoln High School teacher. The special final session "Chemistry & Physics Demonstrations -- Almost Magic?" (an exciting show of lights, bangs, explosions, and fun) was presented by two Augustana College professors.

- "**Girls in Engineering, Math and Science" (GEMS) Workshop** was held March 24, 2007 at SDSU with 59 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 outside personnel from various professional careers.

- **Precollege Robotics Support**:
  - **Madison Central Middle School Lego Robotics** – In September 2006, SDSGC also provided $1,500 toward the purchase of Lego Robotics materials for 83 6th grade science students (42 girls and 41 boys) at Madison Central Middle School in Madison, SD. The Lego Robotics materials effectively supplemented the curriculum as a learning tool, specifically in the content standard areas of science and technology, forces and motion, simple machines, measurement, energy, magnetism, and general scientific problem solving. The teacher performed a modality questionnaire on each of the 83 students to highlight their preferred individual learning styles. The results of the modality questionnaire strongly indicated that the vast majority of students preferred to learn through auditory and kinesthetic activities. It was found that Lego Robotics help kinesthetic learners as the students learn by "doing, experiencing, and experimenting" which reinforces their knowledge in a given content area. By performing many hands-on activities and labs with the Lego Robotics, the

students acquire improved comprehension in the areas covered and they show increased excitement and growth in STEM education.

- **Brookings FIRST Lego Robotics Team** – The Consortium supported eight Brookings elementary students (grades 4 through 6) in a FIRST Lego Robotics regional competition on January 27, 2007 at UND with $500 in Space Grant funding from SDSU. The theme in 2006 was nanotechnology. Along with the robot challenge, the students gave a short presentation about how nanotechnology advancement is necessary to enable the building of a space elevator. The Brookings team had three attempts at operating the robot challenges and improved their score each time, placing 9th out of 18 teams. The students were very pleased to have finished in the top 10 for the competition phase. The Consortium is actively involved in efforts to sustain robotics programs in the state.

- **Hillcrest FIRST Lego League Robotics** – A FIRST Lego League Robotics team was started in 2005 as an after-school activity for nine Hillcrest Elementary students and one home-schooled student. In January 2006, the Hillcrest FIRST Lego Robotics team traveled to Grand Forks, ND to compete against 18 other teams in the FIRST Lego League tournament at UND. The Hillcrest team members were excited about their work and looked forward to participating in the 2007 FIRST Lego League. It is hopeful that within the next few years, South Dakota will have its own tournament.

- **NASA Teacher Academies** – SDSGC supplied instruction and organizational support for **two, two-day teacher-training academies for K-12 teachers provided by NASA Aerospace Education Specialist Angelo Casaburri from Johnson Space Center** in June 2006. Nineteen (19) precollege teachers (four of whom teach at Tribal schools) attended the Academy in Pierre, SD at SDSGC-affiliate SD Discovery Center and Aquarium. Twenty-two (22) pre-college teachers attended the Academy in Rapid City, SD at SDSGC-affiliate the Journey Museum. Teachers were shown how to add cutting edge science to their curriculum. Participants learned how to use NASA materials to inspire their students' curiosity. All participants received copies of the materials covered during the workshop. Teachers took part in a live learning event via NASA's Digital Learning Network where a real-time link was established with educational specialists at JSC. During this interactive learning opportunity, teachers learned of over 60 additional opportunities available for their students. Graduate credit and certificate renewal credit was made available. Workshop topics included Robotics, Plants in Space, Space Nutrition, Rockets and Rocket Launching, Aeronautics, Rocks from Space, and Engineering Design Challenges. As a direct result of the academy in Pierre, teacher Matt Nelson of Madison, SD middle school was motivated to start a Lego Mindstorms Robotics curriculum at his school (discussed above under Robotics support.) Three adult volunteers and three staff of St. Francis School also participated in a Lego Mindstorms Robotics training. As a result, robotics programs for students were started at the SD Discovery Center and St. Francis Indian School. In April 2007, SDSGC purchased 12 kits of Lego NXT robotics materials for teacher-training during summer 2007 and beyond.

- **Aerospace Career and Education (ACE) Camp** – South Dakota State University's (SDSU's) 14th annual ACE Camp was held on July 9 - 13, 2006 with 22 high school students (16 males and 6 females) attending, which was five more than in 2005. The primary goal of the ACE Camp is to create an aviation-aware society that understands and respects the importance of aviation and aeronautics at the federal, state, and local level. 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 unforgettable experience for high school students. Actual flying time, hot air ballooning, and tours of scientific facilities include discussions with professionals and experts from diverse fields. 2006 ACE Campers were treated to a model aircraft demonstration and air show at the Brookings radio-controlled airplane field. They toured the Air National Guard Base in Sioux Falls where they flew an F-16 flight training device. Before actual flights, students were introduced to flight principles via a computer lab flight simulator. They then flew aboard an aerobatic plane, a Cessna 172SP, and a glider. Campers were exposed to aviation maintenance at Consortium affiliate Lake Area Technical Institute. Other activities included telescopic stargazing and building and launching model rockets. 2006 ACE Camp participant Randall Vette said *"My week at camp was one I'll never forget. With all the awesome activities like flying an airplane and seeing Jupiter up close, how could I?"* Students from grades 9 - 12 from SD, ND, MN, NE, WY, IA and the surrounding areas have attended ACE Camp.

ACE Camp Evaluation in FY2006 – SDSGC's Program Evaluator Shannon Lane (Ph.D. candidate at SDSU's Rural Sociology Department) conducted **a survey on 291 alumni** that had graduated from ACE Camp over the past 14 years. Ms. Lane filed an ACE Camp Alumni Survey Report dated Oct. 19, 2006 to SDSGC's Management. Survey response rate was over 20%. Ninety-seven percent (97%) of respondents would recommend ACE Camp to current high school students, 81% had a greater interest in careers in aviation after attending ACE Camp, 68% indicated that their educational and career pursuits were influenced by their ACE Camp experience, and **69% of the respondent that are currently in high school indicated that they had signed up for classes in science, math, or pre-engineering as a result of ACE Camp**. As a result of this survey, SDSGC will continue to support ACE Camp in the future.

- **Alignment with State Standards –** SDSGC continued to focus attention on alignment of its precollege education programs with state and national education standards through the assistance of Kristie Maher, an informal science educator who sits on the Consortium's Management Team in one of the rotating positions available to affiliates. SDSGC again supported **"E-missions" math and science teacher-training workshops which embrace state education standards in math, science, and language arts.** Ten adults were trained by SDDC staff in E-missions: Moon, Mars & Beyond and Storm-E at the Britton-Hecla School. Two of the teachers commented the following after implementing the E-missions program with their students: *"Excellent program that helped meet earth science standards in a fun, hands-on way."* and *"Thank you very much for the Storm-e E-mission adventure! The students loved it, were quite challenged (3rd graders) and became very excited about predicting the weather. The experience was valuable to meeting some of our science and math standards as well."* During FY2006, the GEMS Space Science Sequence was aligned with grade level SD education standards.

- **St. Francis Indian School Science Consulting –** At the request of St. Francis Indian School, the SD Discovery Center (SDDC) was supported by SDSGC to provide consulting services to increase teacher skills in inquiry-based science teaching methods and to help institutionalize a school science fair. SDDC staff met individually with 10 teachers within the elementary and middle school grades, taught model inquiry-based lessons in 10 classrooms, and spent two days working with groups of Native American students to design, conduct and communicate science fair projects. The science fair was held on March 28, 2007 and Tom Durkin, Deputy Director of SDSGC helped assess/judge the student projects.

- During the summer of 2006, the SD Discovery Center hosted **Eyes on Earth**, a highly interactive science exhibition that focuses on **NASA's Earth Observing System (EOS)** and examines how satellite observations are made and what can be learned about the Earth using space technology. Approximately 5,000 people toured the exhibit.

- **Women in Science Conferences** – SDSGC financially supported and participated in four highly successful **"Women in Science" (WIS) conferences** held throughout South Dakota in March 2007 in Rapid City, Sioux Falls, Pierre, and Aberdeen to introduce precollege girls to careers in science. During the events, professionals visit with the girls and answer questions about particular careers and the education that is necessary for those jobs. Business cards are distributed and contacts are made. The conferences are designed to teach girls how to successfully "network" with science professionals.

    - In March 2007, the first annual WIS conference was held in Rapid City on the campus of SDSM&T. Approximately 250 6th through 12th grade girls from 17 different schools from around the area, including Rapid City, Box Elder, Sturgis, Lead, Belle Fourche, Wall, Custer, and Hot Springs participated in the conference. Professional women served as speakers in break-out sessions and helped students see career possibilities in science and technology. Dr. Michele Tuttle, a research geochemist with USGS, presented the keynote address on the Lake Nyos Disaster. This event complemented SDSM&T's ongoing "Women in Science and Engineering" (WISE) program which is dedicated to addressing the university's continuing concern about the under-representation of women in science and engineering disciplines and a national concern about the future pool of scientists and engineers in the face of changing demographics.

    - The WIS Career Day held at Southeast Technical Institute in Sioux Falls on March 16, 2007 reached 350 8th grade girls.

    - Two-hundred and twenty (220) 6-12 grade girls, thirty teachers and forty adult volunteers participated in the March 8, 2007 Pierre WIS conference hosted by the SD Discovery Center. This is an increase of 78 students, 10 teachers and 20 volunteers over 2006. Approximately 50% of the participants (youth and adults) were Native American. Ethlie Anne Vare, the author of the *Mothers of Invention*, promoted a "can-do" attitude with many historic and modern day examples of successful female inventors. With the support of SD NSF EPSCoR, the SD Discovery Center initiated a long-term evaluation system for tracking the results of participation in the WIS conference.

- In continuation of a partnership in a NASA Parent Science Research Award to the UC Berkeley Space Science Laboratory that made the SD Discovery Center the region's only Great Explorations in Math & Science (GEMS) site, the SD Discovery Center trained 23 teachers as GEMS Leaders with funding support from Space Grant. In 2006, a **SD 21st Century Learning Program Grant** made GEMS teaching kits and outreach programs available to all 21st Century after school programs in the state. Three additional GEMS trainings are scheduled during the remainder of FY2006 and will reach a total of 40 teachers.

- **NASA/NOAA Earth Science Electronic Theater** – On Sept. 16, 2006, Dr. Arthur Frederick (Fritz) Hasler, NASA Emeritus of Goddard Space Flight Center presented the NASA/NOAA Earth Science Electronic Theater to **several hundred Native American students at Todd County High School and St Francis Indian School on the Rosebud Sioux Indian Reservation**. E-Theater is a visual presentation of Earth Science datasets and visualizations using a portable system of computers and projectors which allow scalable presentations to be viewed on large screens including IMAX and HDTV screens. SDSGC Management Team member James Rattling Leaf of Sinte Gleska University helped organize this event.

- **Kelly Lane Earth & Space Science Grant** – On March 2, 2007, SDSDG awarded its first-ever Kelly Lane Earth & Space Science Grant to Mary Frederick and Karen Gordon of Mickelson Middle School, Brookings, S.D. This $5,000 grant will be awarded annually by the SDSGC to science or math teachers in South Dakota in recognition and support of outstanding teaching and innovative educational programs at the pre-college level in the fields of STEM. Frederick and Gordon's project, *"Engaging Students in Authentic Science Studies in Their Own Community,"* will reach **600 middle school students per year**. The project is research-based, takes advantage of a local study area, incorporates "hands-on" use of geospatial technologies and has collaborative support from Brookings School District, city government and SDSU. The newly-implemented Kelly Lane teacher grant is one additional way that SDSGC can reward and encourage excellence in precollege science and math education in South Dakota. Additional information on the grant can be found online at www.sdsmt.edu/space/KellyLaneTeacherGrant.htm

- On Sept. 21, 2006, South Dakota was one of four locations nationwide to provide teachers and their students the opportunity for a **live one-hour link with NASA Astronaut Rick Hieb**. The South Dakota link was organized by the SD Discovery Center and Aquarium and was made possible through a partnership between SDSGC and the Challenger Center at Wheeling Jesuit University in WV.

- Ms. Cassie Soeffing concluded her **NASA Einstein Distinguished Educator Fellowship** in July 2006 where she had worked for a year in the office of Dr. Ming-Ying Wei, Program Manager in the Earth Science Division of the Science Mission Directorate at NASA Headquarters. She returned to South Dakota where she will continue her graduate research and teach Earth Science in Sioux Falls, SD. During her tenure at NASA HQ, she oversaw the Earth Science Education product reviews and NASA's collaboration with the American Geological Institute on Earth Science Week. She was actively engaged in the coordination of formal education activities with NASA's Office of Education. She also conducted interagency coordination for GLOBE and the International Polar Year, including special Education sessions at NSTA conferences. In addition, Ms. Soeffing participated in the management of Earth Science Education projects and policy discussions relating to U.S. STEM education.

- **Team American Rocketry Challenge** – During FY2006, four (4) South Dakota high schools competed in the 2007 Team American Rocketry Challenge sponsored by the Aerospace Industries Association and the National Association of Rocketry. The 2007 challenge is to design, build, and fly a model rocket carrying a raw egg and return it safely to the ground while staying aloft for 45 seconds and reaching an altitude of 850 feet. The four South Dakota schools include 1) Milbank High School (two teams), 2) Brandon Valley High School in Brandon, 3) O'Gorman High School, and 4) Winner Middle School.

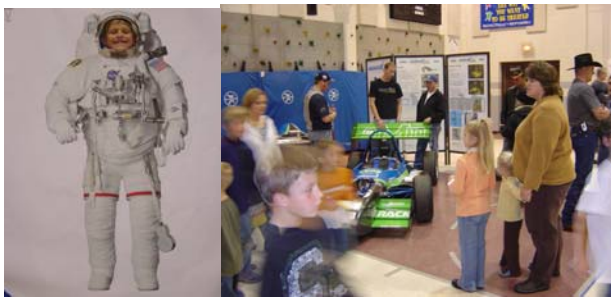
- SDSGC helped support the **30th Annual Engineer's Week** from February 16-24, 2007 on the campus of SDSM&T. From building bridges, programming computers, and participating in MathCounts, Rube Goldberg machine contests, and numerous hands-on activities provided by all campus engineering departments, about 1,500 grade school and middle/high school students from western South Dakota and Wyoming attended the 2007 Engineer's Week. This popular annual event is designed to show teachers and students that science, math, and engineering are fun and exciting. SDSGC provided numerous presentations on NASA's Mars Exploration Rover Mission to 250 middle and high school students and provided several space-related educational door-prizes.

- **Youth Engineering Adventure (YEA)** – Three YEA programs were offered at SDSGC's SDSM&T and SDSU during summer 2006. YEA is intended for high school students, freshman to seniors, interested in math and science. Approximately 300 students have participated in YEA during the program's first five years. The program provides an introduction to engineering as a career and encourages students to have fun while learning about technology and engineering. Students also toured local engineering firms and explored engineering career opportunities. Tom Durkin of SDSGC presented talks on NASA Mars Rover

Mission to two YEA groups during June 2006 reaching 40 high school students. More details and photos are at http://yea.sdsmt.edu/

- **Space Camp 2006** – The Consortium sponsored a week-long Space Camp wherein 10 high school students were in-residence at SDSM&T from July 30 – August 4, 2006. SDSGC provided **$2,500 in scholarships for six (6) of those students** (two Asian females, one Native American female, two Caucasian females, and one Native American male) to assist with their registration fee. Students explored the birth of the universe, the life cycle of stars, the solar system, black holes, relativity, time travel, Greco-Roman and Native American star mythology, satellites and GPS, physics, and other space-related topics. The Space Camp provided an atmosphere of discovery and guidance for students making critical decisions about college courses that will prepare them for science-based professions. Tom Durkin gave the students a presentation on NASA's Mars Exploration Rover Mission.

- SDSGC supported the Corral Drive Elementary School Science Night in Rapid City on Nov. 16, 2006. Space-related educational materials; presentations on NASA's Stardust, Deep Impact, and Mars Exploration Rover mission; and an astronaut cut-out for student photos was provided and 86 students were provided their photo in the space suit. SDSM&T students from several Center for Advanced Materials and Production (CAMP) Teams showcased their projects such as the Formula Car pictured here.



- **SD School for the Deaf** – SDSGC funded a "Light and Color Exhibit" at the SD School for the Deaf to expand STEM educational opportunities for the disabled. The exhibit, provided by the "Hands-On Partnership for Science, Literature, and Art in South Dakota", offered 70 students 15 different hands-on science activities that help them understand the visible spectrum in terms of light, reflection, and color. The coordinator that evaluated the exhibit said *"I rate this exhibit a 5 out of 5. The students spent an average of 1/2 hour to an hour trying out the exhibit pieces. We definitely want to host another exhibit."*

- **"Dark Skies, Bright Minds" Program** – In keeping with Objective 4.6, the funding amount for the Badlands Observatory/SDSGC "Dark Skies, Bright Minds" remote-use telescope program was reduced from $5,000 in previous years to $3,000 in FY2006 because not enough pre-college schools in SD were making use of the program at the $5,000 level.

- **K-12 Informal Education Presentations** – SDSGC Deputy Director Tom Durkin conducted the following 15 "pre-college" informal education events since last year's progress report, reaching about **1,400 students and teachers** with presentations on various space-related topics including NASA's Mars mission, Hubble and other Space Telescopes, Cassini mission, Stardust mission, Deep Impact mission, Apollo, the International Space Station, Space Shuttle, and other space-related topics such as general astronomy. Some of these events collaborated with NASA AESP teacher-training courses in summer 2006 and the annual joint conference of South Dakota

science and math teachers in February 2007. SDSGC also provided two informal education programs during FY2006 to Kadoka School District, the newly selected NASA Explorer School in South Dakota.

- March 29, 2006 – Tom Durkin traveled to NES school in Kadoka to present Mars Mania to six high school science classes totaling 110 students.
- April 7, 2006 – SDSGC organized an evening astronomy program for 45 Girl Scouts in Wall, SD where the girls rotated between concurrent programs at Badlands Observatory, the StarLab Planetarium, and a "Mars Mania" presentation. SDSGC members and affiliates SDSM&T, Badlands Observatory, and the SD Discovery Center and Aquarium provided the programming.
- April and May 2006 – Tom Durkin presented to 90 homeschoolers in grades 3-8, 80 2nd and 3rd graders and 75 kindergarteners at St. Elizabeth Seton Elementary School. Topics included NASA's Mars mission, comet missions, Apollo 11, the solar system, and the Hubble Space Telescope.
- May 17, 2006 – Tom Durkin presented two talks to NES school at Kadoka, including a "Walk Through Space" to grades K-2 and "Mars Mania" to grades 3-5, totaling about 150 students.
- Mars Mania to 40 highs school students (33 boys, 7 girls) attending summer 2006 week-long "Youth Engineering Adventure" (YEA) course at SDSM&T.
- June 26, 2006 - Mars Mania to 164 SD GEAR UP Honors Program Native American students.
- June 30, 2006 - Mars Mania to 22 teachers at NASA AESP's "NASA Teacher Academy" at the Journey Museum, lead by education specialist Angelo Casaburri. Mr. Durkin's PowerPoint presentation was made available to each teacher to use in the classroom. A live Digital Learning Network (DLN) feed from JSC was provided at SDSM&T.
- July 12, 2006 – Tom Durkin presented Mars Mania to 16 high school girls attending the week-long "STEPS Engineering Camp for Girls" at SDSM&T.
- July 19, 2006 – Tom Durkin presented Mars Mania to 12 high school teachers taking part in the Research Experience for Teachers (RET) Program, a teacher-training program hosted at SDSM&T where teachers work on a research project that they can take into the classroom.
- August 2, 2006 - Tom Durkin presented Mars Mania to 10 high school students attending a week long Space Camp at SDSM&T from July 30 – Aug. 4, 2006.
- Nov. 16, 2006 – Hubble Space Telescope presentation to 20 5th grade students at St. Elizabeth Seton School.
- Nov. 22, 2006 – Hubble Space Telescope presentation to 50 8th grade students at St. Elizabeth Seton School.
- February 23, 2007 – Tom Durkin presented Mars Mania to 250 middle and high school students at SDSM&T's 30th annual Engineer's Week.
- March 9, 2007 – Tom Durkin gave a presentation on career opportunities with NASA and in the field of space science to 35 students at Jefferson Academy (an alternative high school in Rapid City) and focused on the Mars Exploration Rover mission.
- March 28, 2007 – Tom Durkin assessed middle and high school science fair projects at St. Francis Indian School on the Rosebud Indian Reservation and presented an astronomy

lesson to 220 students and parents using spectacular images from the Hubble Space Telescope.

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NASA EDUCATION OUTCOME 3
(ENGAGE AND INSPIRE)

Education Outcome 3 seeks to *"Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission."* This section summarizes the status of SDSGC's FY2006 strategic objectives related to Outcome 3. These correspond to the Consortium's Program Area 6 (Public Service).

Outcome 3 – Public Service

Quantitative Outcome Measures Matrix (Program Area 6: 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 featured daily during the work week in 2006 in space/science education broadcasts	√		
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 FY2006

In FY2006, 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) Community Education Astronomy Program, 3) SD Solar System Ambassador Program, 4) Public Relations/Visiting Scientist Program (General Public), and 5) *StarDate* on South Dakota Public Radio.

- SDSGC sponsored **"South Dakota Space Days 2006: The Moon, Mars & Beyond"** on Oct. 17-18, 2006 in Pierre, SD. This highly successful event was hosted by the South Dakota Discovery Center & Aquarium, an educational affiliate of the Consortium. Speakers included **NASA Astronaut Mike Fossum and NASA Astrophysicist Dr. Ted Gull** from Goddard Space

Flight Center. Both men are natives of South Dakota and represented to about **2,000 students, teachers, and members of the general public** how students from South Dakota can excel in their fields. Considering that the city's population is about 14,000 and rural schools from as far away as 140 miles attended, the turnout was exceptional. Astronaut Fossum recently returned from his first mission to space aboard STS-121 Space Shuttle Discovery, which was special because of the Shuttle's first-ever Independence Day launch. Space Day 2006 included an appearance by **Governor Rounds who issued a proclamation honoring SDSGC and recognizing Space Day in South Dakota**. Astronaut Fossum spoke four times over the two-day event including an evening presentation to about 200 Native American students who board at the **Pierre Indian Learning Center**. Other speakers included Jessica Weidenbach, a SD Space Grant student fellow who presented "I Want to be a Space Cadet" and Tom Durkin, SDSGC's Deputy Director who spoke about NASA's Vision for Space Exploration and the Mars Exploration Rover mission. To kickoff the event, a spectacular aerial acrobatics program was provided by Jim Pietz Aerosports, Inc. and flown over the Missouri River for the entire capitol city of Pierre, SD. The aerial program was broadcast over local radio. SDSGC's headquarters office received hundreds of thank-you notes from students and teachers that attended. Photos of the 2006 event, including several of the many "hands-on" educational exhibit booths, are online at http://www.sdsmt.edu/space/SpaceDay2006Photos.htm

Feedback comments that SDSGC received from literally hundreds of students and teachers attending Space Days 2006 included:

- *"Thank you for sponsoring South Dakota Space Days. It was a great experience and the booths were really interesting. Mike Fossum was great to listen to. We're going to dream big and reach for the stars!" (4th grade class)*
- *"Thank you for your support and generosity that made 2006 SD Space Days possible. I took my students to the event today and we all had a great time. We know and appreciate the fact that we wouldn't have been able to attend such an awesome event if it wasn't for outstanding sponsors like you who go out of your way to make South Dakota a great place to live and receive an education. Thanks again!" (Junior High Math and Science Teacher)*
- *"Thank you for making it possible for our class to go to SD Space Days. It was a lot of fun. I learned many fascinating things. SD Space Days is a wonderful thing to have. I really enjoyed the Star Exhibit. It was a lot of fun going into the dark dome and seeing all the different constellations. Thank you again for making this possible and sponsoring SD Space Days. I really enjoyed it." (7th grade girl)*

- *"I would like to thank you for help sponsoring Space Day. My favorite part was the hands on activities. …" (Middle School Native American boy)*
- *"Thank you for donating money to SD Space Days to allow us to go free. I had a lot of fun. I learned how fast a space shuttle can go, what is in a space shuttle, how astronauts eat, how they sleep, and where to look for constellations. I hope good people like you keep donating money so that younger kids can go also." (7th grade girl)*
- *"Thank you for contributing your time and effort to Space Days so that we could come. After attending Space Days, I felt like I have truly learned something. …" (Middle School boy)*
- *"I would like to thank you for sponsoring Space Days. Inviting our school to participate in the activities was an experience that I will remember all my life. …" (6th grade boy)*
- *"We liked everything about Space Days." (3rd grade class)*
- *"Thank you for making Space Days fun!" (1st grade class)*

Workforce Development in Public Service Program

- 2,000 attend Space Day
- NASA content in public astronomy programs
- NASA content on Public Radio

Diversity in Public Service Program

- Space Day presentations at Pierre Indian Learning Center

- **Community Education Astronomy Program** – On Nov. 28 and Dec. 5, 2006, SDSGC's Tom Durkin and Badlands Observatory's Ron Dyvig presented a course entitled "Introduction to Astronomy and Current Events in Space" to 10 members of the public through the Career Learning Center of the Black Hills Community Education Program in Rapid City. The two-session course focused on A) the solar system and Milky Way Galaxy; B) NASA's current Mars Exploration Rover and recent Stardust missions; C) local research of near-Earth asteroids and related projects conducted at Badlands Observatory in Quinn, SD, D) discoveries and observations made from the Hubble Space Telescope, and E) a demonstration in StarLab, a portable planetarium. The course was rated very high in a participant survey.

- **Black Hills Astronomical Society (BHAS) Public Presentations** – SDSGC continues to support public presentations given to the general public by members of the Black Hills Astronomical Society. Monthly presentations are given on astronomy and NASA/space-related issues during the school year and nearly weekly public Star Parties at the Society's Hidden Valley Observatory during the summer months. The location for presentations moved to the large-screen theater (almost IMAX size) at the Journey Museum in Rapid City, an educational affiliate of the Consortium. Public participation has increased significantly as a result.

- **Public Relations/Visiting Scientist Program –** This program directly reached 165 people during FY2006. Ron Dyvig of SDSGC affiliate Badlands Observatory of Quinn, SD provided a live "remote observing" session of the Nov. 8, 2006 Mercury transit of the Sun to 150 members of the public and school students using the Journey Museum's large screen theater in Rapid City to project images of Mercury's transit of the Sun captured by the large 26", f/4.8 Newtonian Telescope at Badlands Observatory. Tom Durkin presented "NASA and the Comets" to 15 professionals at the IEEE Black Hills Chapter Meeting in April 2006. The talk focused on NASA's Stardust and Deep Impact comet missions.

- **Solar System Ambassador Program** – After five years serving as South Dakota's Solar System Ambassador and given dozens of presentations to the public about space and NASA's missions, Dr. Bob Polcyn of Hot Springs, SD wound down his tenure as ambassador by giving a presentation titled "What we know about Galaxies" to the Black Hills Astronomical Society on Feb. 19, 2007.

- ***StarDate* on South Dakota Public Radio** – SDSGC continued its support of *StarDate* throughout FY2006. *StarDate* is a daily SD Public Broadcasting (SDPB) Radio broadcast provided by McDonald Observatory's 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.