South Dakota Space Grant Consortium
South Dakota School of Mines & Technology
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The South Dakota Space Grant Consortium is a Capability Enhancement Consortium funded at a level of $430,000 for fiscal year 2012.

PROGRAM GOALS

Consortium Management: To ensure quality and fairness in all Consortium programs and alignment with the needs of NASA, the member and affiliate organizations, and the state of South Dakota.

Fellowship/Scholarship: To administer a fellowship/scholarship program that offers educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of science, technology, engineering, and mathematics (STEM) that align with NASA's mission and those of SDSGC members and affiliates.

Research Infrastructure: To promote the improvement of research programs and capabilities of Consortium members with an emphasis on the fields of aerospace, earth science, and supporting STEM disciplines.

Higher Education: To build interdisciplinary programs related to NASA's Education Outcome 1 at the state's institutions of higher education and to support related programs that serve to strengthen STEM education in South Dakota.

Diversity of Participants: To model diversity in all Consortium programs and activities, with an emphasis on Native Americans, which make up the state's largest minority group.

Workforce Development: To use the Consortium's statewide network of scientists, engineers, and educators to provide talented students with a pathway to careers that will contribute to a highly-trained and diverse workforce for NASA and expand the nation's research and development capacity.

Longitudinal Tracking: To acquire and maintain accurate longitudinal data on all students and faculty who have received significant support from SDSGC in order to assess the impact of the support on their education, career, and professional development.
Minority Serving Institutions: To ensure that Minority-Serving Institutions in South Dakota, which are exclusively Tribal Colleges and Universities, are represented in the planning and implementation of all Consortium programs.
Precollege: To increase student awareness and access to education and career opportunities in aerospace, earth science, and supporting STEM disciplines.
Public Service: To enhance public scientific literacy in aerospace and earth science, to complement community efforts in STEM education, and to inspire citizens of diverse backgrounds through the excitement of scientific exploration and discovery.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, & 3)

The following highlight reflects the impact of SDSGC programs in support of NASA Education Outcome 1: *"Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals."*
Lilly Jones, a Native American senior majoring in Earth Science at Tribal College affiliate Oglala Lakota College was one of only 12 students statewide selected to present her Space Grant-funded research at the 2013 Student Research Poster Session at the State Capitol Rotunda on Feb. 27, 2013. Lilly was provided a $3,500 research stipend from Space Grant during FY2012 for her project titled *"A Resource Inventory of Selected Sites Adjacent to the White Clay Fault in Southwest South Dakota,"* which is located within the badlands of the Pine Ridge Indian Reservation. She has applied to the MS Geology program at SDSM&T and eventually plans to earn her PhD in Earth and planetary sciences. Her research interests include stratigraphy, sedimentary geology, surficial processes, and the geology of Mars. This stellar student's goal is to become a planetary scientist/exogeologist and to work at or for NASA in interpreting geologic data coming from various missions (e.g., interpreting data from the Mars rovers in regard to sedimentary processes.) Lilly learned in April 2013, that she had been offered a prestigious, three-year NSF Graduate Research Fellowship Program (NSF GRFP) fellowship that provides her with $30,000/year + $10,500/year for tuition and fees contingent upon acceptance to graduate school. Lilly said: *"I credit SD Space Grant with getting me through my undergraduate years."*

The following highlight reflects the impact of SDSGC programs in support of NASA Education Outcome 2: *"Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty."*
SD State University (SDSU)-Flandreau Indian School (FIS) Success Academy was again supported by SDSGC during FY2012 in the form of direct funding for ten (10) FIS high school seniors to take a three-credit Basic Algebra course at SDSU during the school year. Seven of the ten students subsequently enrolled at SDSU as freshman during the Fall 2012 semester. FIS Success Academy is an early and intensive college preparatory program for Native Americans, serving about 250 FIS students in grades 9-12 each year. SDSGC's support of Success Academy began during the 2003-04 school year. As a result of these efforts, 111 FIS seniors have enrolled as concurrent high school students taking STEM courses at SDSU. Fifty-two (52) of these students enrolled at SDSU the following

year as college freshmen. Before FIS Success Academy and the Consortium's support of it, about one student per year graduated from Flandreau Indian School and attended SDSU. Since the inception of the program in 2003, 26 of the 52 Native American students who completed the STEM courses funded by SDSGC, went on to major in the following sciences during their college careers: Engineering (9), Mathematics (2), Chemistry (1), Pre-Nursing (4), Pre-Pharmacy (1), Pre-Dental (1), Sociology (6), and Psychology (2). Stories on FIS Success Academy have appeared in many local and national media, including KELOland Television, National Public Radio, *The Houston Chronicle*, *Indian Country Today*, and *Ikce Wicasta Journal*. Nationally syndicated columnist Tim Giago has written about FIS Success Academy. The national publication, *Native Village News*, headlined its story "Success Academy: A Model for Native American Education." Most of these stories have referenced NASA and SDSGC as important supporters of the program. A book titled *Success Academy: How Native American Students Prepare for College (and How Colleges Can Prepare for Them)* by Peter Lang will be published in 2013. One of the chapters discusses SDSGC's important role in making possible the students' senior year in FIS Success Academy.

The following highlight reflects the impact of SDSGC programs in support of NASA Education Outcome 3: *"Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission."*

Although the following metrics are not counted in SDSGC's precollege participant numbers in order to avoid duplication, the following is an excellent example of a strategic partnership with an informal educator. Under SDSGC affiliate The Journey Museum's 2010 three-year "Competitive Program for Science Museums and Planetariums" (CP4SMP) grant for ~$492,000, NASA STEM programming was provided to 112 Tribal, public, and private schools throughout South Dakota. SDSGC continued to support this strategic partnership by providing Consortium personnel who offered technical presentations and educational resources to 40 precollege teachers participating in teacher-training workshops associated with the Journey Museum's 2012 *"Journey Into Space"* CP4SMP program. The teachers were provided with NASA-focused STEM teaching tools that they can use in their classrooms to enhance their teaching of the state science standards. In the two and a half year period from mid-2010 through January 2013, the *"Journey into Space"* program reached 19,014 students and 955 teachers as direct participants. Of 12,101 students who reported their grade levels, 7,825 were elementary, 3,061 middle school, and 648 high school level. Of the 10,006 students who reported their ethnicity, 70.8% were White, 18.4% were Native American, 1.7% were Black, 0.9% were Asian, 1.8% were Hispanic, and 4.4% were Other.

PROGRAM ACCOMPLISHMENTS

The performance *Goals* for Fellowship, Research Infrastructure, Higher Education, Precollege, and Informal Education are listed above under "Program Goals." The specific *Performance Objectives* from Table G.3 "Summarized Table of Consortium Goals and SMART Objectives" and from the Consortium's Strategic Plan included in

SDSGC's FY2010 Program Plan that are applicable to the accomplishments listed below are given in *italics* at the start of each accomplishment.

NASA Education Outcome 1 Accomplishments

Fellowships/Scholarship

Annual Performance Objective: Statewide competition offered at all 10 higher education affiliates including three Tribal Colleges; emphasis on internships with NASA, aerospace industry, DUSEL, and EROS**. [At least 55 awards ($1,000-$12,000); all awardees enter longitudinal tracking system; at least 10% minority and 40% female; at least three NASA interns and five EROS interns]*

* DUSEL – Deep Underground Science & Engineering Laboratory, now referred to as Sanford Underground Research Facility (SURF)

** EROS – USGS Earth Resources Observation and Science Center

Exactly 100 applications were received from students from seven of the Consortium's universities in competition for funds provided under SDSGC's FY2012 Fellowship/Scholarship Stipend Program. The FY2012 "base award" budgeted $110,000 in NASA funding for fellowship/scholarship funds. SDSGC's Management Team reviewed the applications in October 2012 and made selections. Awards were provided to 46 students from six universities. Seven awardees were graduate level (15%) and 39 undergraduate (85%). The Consortium doubled its goal of 10% of awards to minority students in that nine of the 46 funded students (20%) are minority students, eight of whom are Native American. Forty-three percent (43%) of the total number of awards and 52% of the total dollar amount of awards were provided to female students, which exceeded the targeted goal of 40% of awards to females. As of this writing, the total number of students funded with FY2012 fellowship funds who will conduct spring and summer 2013 internships at NASA Centers and aerospace industry is undetermined. This is because two of the students are still waiting to hear back from NASA on their summer 2013 internship applications filed under OSSI:SOLAR. However, it currently appears likely that Space Grant will fully-fund about four student interns during summer 2013. At least three others were funded directly by NASA, for a current estimated total of seven interns during FY2012. This is a fair reduction from 11 student interns during FY2011, due to the lack of Space Grant augmentation funds in FY2012.

Research Infrastructure

Annual Performance Objective − (Research support) Support new and developing research, especially multidisciplinary and collaborative projects, in fields aligned with NASA's mission. [At least two SDSGC fellowships or scholarships are awarded each year for students to work on NASA EPSCoR or other NASA-related research projects.]

Considerable progress was again made on the Sanford Underground Research Facility (SURF), an affiliate of SDSGC formerly known as the Deep Underground Science and Engineering Laboratory (DUSEL) during FY2012. Closed in 2000 after 124 years of operation, the Homestake gold mine (the largest and deepest gold mine in the western hemisphere) was first proposed in 2001, and then selected by NSF in 2007 and later funded in 2010 by DOE, as the site to be developed as an underground laboratory that serves to shield sensitive physics research experiments from background cosmic radiation. The project is the most ambitious research infrastructure undertaking in South

Dakota history, and SDSGC has played an active role in funding students and research projects. SURF celebrated a milestone on May 30, 2012 when South Dakota Governor Dennis Daugaard dedicated the Davis Campus at the 4,850 level with 60 invited dignitaries including Anna Davis, widow of Nobel Laureate Ray Davis who made the Homestake gold mine a physics landmark, and T. Denny Sanford, who donated $70 million to the project. In November 2012, the SD Board of Regents granted authority to SDSGC's lead institution SDSM&T and affiliate USD to offer new PhD degree programs starting the fall 2013 semester to support the state's significant investment in SURF.

In February 2013, Mark Hanhardt was hired at SURF as the laboratory's Science Support Specialist where he is now working as a full-time employee on cutting-edge underground physics research. Mr. Hanhardt is a graduate of SDSM&T and was a Space Grant-funded graduate student researcher at SURF prior to his employment at the lab.

Building on the central role of physics in the state's research infrastructure plans, the Davis-Bahcall Scholarships were initiated by NSF in 2008 and augmented with SDSGC fellowship funding during FY2012. The Davis-Bahcall Scholarship is named after Nobel Prize winner Dr. Ray Davis and Dr. John Bahcall, the two scientists most responsible for a revolution in the field of solar neutrino physics and neutrino astronomy. Two of the Davis-Bahcall college freshmen selected for the summer 2013 program have been funded directly by SDSGC, each with a stipend of $4,000 from the FY2012 Space Grant. During summer 2012, 11 high school seniors and college freshmen spent one month at SURF. Those students then flew to Italy for a week of study at Gran Sasso National Underground Laboratory, currently the largest underground lab in the world. After their trip to Gran Sasso National Lab in Italy, the summer 2012 program students flew to Chicago for sessions at Fermi National Accelerator Laboratory, Argonne National Laboratory, the University of Chicago and Notre Dame University. Three of the 11 summer 2012 Davis-Bahcall Scholars were each supported with $4,000 Space Grant stipends, but those funds came from the FY2011 Space Grant. Because those students participated in Davis Bahcall program during the FY2012 program year and their participation was mentioned in the FY2011 APD report, they were not counted as direct participants in the FY2011 student numbers. Thus, they are reported here because their activity occurred during FY2012.

Annual Performance Objective − Support collaborative research proposals in NASA areas. [At least one collaborative proposal submitted]
Although no data or outcomes specific to SD NASA EPSCoR research will be reported here in order to avoid duplication in reporting, Space Grant working in concert with SD NASA EPSCoR resulted in one new major research grant proposal being funded by NASA during FY2012. Researchers from SDSGC affiliates SDSM&T, SDSU, and Sinte Gleska University collaborated with researchers at NASA Glenn Research Center, Langley Research Center, and Jet Propulsion Laboratory, as well as Argonne National Laboratory and Semprius, Inc. in Durham, NC. This collaboration resulted in the successful three-year major research project titled *"Flexible Electronics for Space Applications: Development of New Materials and Device Processing Technologies."* NASA received a total of 57 proposals for this 2012 solicitation. From these, 17 were

recommended for funding. As stated in the panel summary of SDSGC's proposal: *"The reviews are excellent. Flexible electronics are the next 'big wave' at NASA."* The panel also noted that the South Dakota project shows significant *"potential NASA spinoff technology."*

Additionally, SDSGC affiliate SURF responded to NASA's 2013 "Space Grant Innovative Pilot in STEM Education" CAN by submitting a two-year $497K student research/higher education proposal titled *"South Dakota CERES (Confidence, Equity, and Research Skills."*

Augustana STEM Pipeline Project – Four students were supported with FY2012 Space Grant funds for 10-week undergraduate research experiences at Augustana College. Two of the four students majored in physics, one in computer science, and one in math. Their research included nuclear jet structure, optical photons transport simulation, and abstract groups.

Higher Education

Annual Performance Objective − Statewide competition for Program Initiation Grants for research development offered at all 10 higher education affiliates including three Tribal Colleges; emphasis on interdisciplinary research focused on NASA, DUSEL, or EROS priorities. [At least two awards for research ($5,000-$20,000)]

SDSGC annually supports Project Innovation Grants (PIG grants) in the areas of Higher Education, Research Infrastructure, and Precollege. The SDSGC Management Team decided during late FY2011 that the most effective PIG projects are the larger ($20,000+) projects. PIG funds had always been budgeted in SDSGC's augmentation budgets and there was only $18,900 budgeted for PIG projects in the FY2011 augmentation, which arrived very late into the program year. The Management Team submitted a change to SDSGC's FY2012 base budget that included $32,900 in PIG project funds in the base budget. Combined with the FY2011 augmentation PIG project funds, an FY2012 announcement of $51,800 in PIG grant opportunities was recently released, anticipating between one and three awards in the program areas of Precollege and Higher Education that focus on NASA's priority education areas. Because the FY2012 base budget also arrived late in the program year, the announcement (i.e., "call for proposals") for the FY2012-funded PIG projects is still in the application and competitive review phase, so the details of the winning proposals will be reported in OEPM at the end of the program year.

Annual Performance Objective − Support interdisciplinary student engineering design teams in NASA priority areas. [At least three engineering design teams]

SDSGC supported four multi-disciplinary university student teams that also participated at national competitions during FY2012. These teams included SDSM&T's Robotics Team, *Moonrockers* Lunabotics lunar regolith excavator team, Unmanned Aerial Vehicle Team, and Autonomous Underwater Vehicle Team. All of the SDSGC-supported teams have outreach programs to precollege students.

At the 3rd annual NASA Lunabotics competition held at KSC on May 21-26, 2012, the *Moonrockers* had redesigned their lunar excavator from the previous year. The nine-member, multi-disciplinary undergraduate team included members from four majors. The goal was to develop an autonomous or telerobotic vehicle to collect as much lunar regolith simulant in a 10-minute time period as possible. The *Moonrockers* placed 16th out of 55 in the 2012 competition and received a perfect score for their Outreach Report. The team was actively engaged in K-12 outreach. Three SDSM&T students from the *Moonrockers* team and their advisor Jason Ash also participated in NASA's Lunabotics College Recruitment Event on May 26, 2012 at KSC. The event focused on connecting high school juniors and seniors with STEM education opportunities available at colleges and universities across the nation. The *Moonrockers* coordinated several other STEM-related outreach activities during 2012. This ranged from holding exhibit booths at the Lakota Nation Invitational basketball tournament, the Rapid City Mall Expo, assisting a FIRST Robotics Competition team, and their primary outreach project which dealt directly with middle school students in an engaging, hands-on manner. The main component of their primary outreach project included a presentation of STEM careers and their *Moonrockers* robot design process, a working demonstration of LEGO Mindstorm robots, and helping students build their own LEGO robots at North Middle School in Rapid City.

Annual Performance Objective − Enhance faculty and undergraduate/graduate student development through planning visits, internships, and fellowships at NASA Centers and EROS.

In an additional Higher Education accomplishment, 13 South Dakota undergraduates (12 females and one male) majoring in Mechanical Engineering, Industrial Engineering, and Metallurgy at SDSM&T visited NASA Johnson Space Center with $3,000 in FY2012 support from SDSGC. The students and several faculty members spent a day on Nov. 9, 2012, visiting NASA JSC while attending the annual ASME and Society of Women Engineer's meetings in Houston. NASA's Betsy Kluksdahl organized an amazing tour of JSC including the historic and current mission controls, robonauts, Saturn V rocket, and many other facets of JSC including a meeting with Diego Rodriquez of NASA's Education Office about JSC's women's mentoring program and internship/co-op opportunities. At the Society of Women Engineers conference, the 12 female students attended sessions on issues relating to women in engineering as students and emerging professionals. There was a Career Fair section with over 250 exhibitors where several students interviewed for co-ops and internships. The group also toured plant facilities at Toshiba. The NASA JSC tour was the highlight for many of the female students who decided they'd like to attend again in 2013 and have already begun fundraising initiatives.

In the absence of any state aerospace industries, SDSGC established a major partnership with L-3 Communications West (Salt Lake City) in 2011. This partnership included four SDSM&T student summer 2012 internships funded by L-3 for a total of $44,251 in L-3 matching funds, two Space Grant fellowships in the robotics MS program at SDSM&T for a total of $12,000 in Space Grant funds, $3,000 in Space Grant support for middle school girls' STEM camps, and significant hardware donations to the SDSM&T robotics laboratory by L-3. As a result of Michael Cowan's summer 2012 internship, and upon his subsequent graduation in December 2012, L-3 hired him as a full-time engineer in

January 2013. This is an excellent example of a workforce development successful story prompted by Space Grant resources.

NASA Education Outcome 2 Accomplishments

Precollege

Annual Performance Objective − Support statewide precollege robotics programs, including resources, teacher training workshops, and state competition. [At least 30 teams participate in SD FLL robotics state competition (400 students)]

Forty-one (41) middle school teams competed in the **4th Annual South Dakota FIRST LEGO® League (FLL) Robotics Championship Tournament** held at SDSGC's affiliate Augustana College in Sioux Falls, SD, on Feb. 10, 2013, with $10,000 in support from SDSGC. As a result of the 62 teams that competed at the event the previous year, the need developed during FY2012 to form several "regions" within the state in which regional teams participate in five qualifying tournaments before earning the chance to advance to the state tournament. Among approximately 80 SD FLL middle school teams across the state during FY2012, 41 teams qualified at their respective regional competitions to advance to the state finals, at which a total of 275 students participated. Two of the 41 teams advanced to national competitions; one of which advanced to the FLL World Competition in St. Louis and the other to a national competition held at Legoland Park in Carlsbad, CA. SDSGC provided travel assistance to both of the advancing teams. The number of students involved with the FLL activities in South Dakota has grown from 140 students in the 2008/09 season to 600 who participated in one of five SD FLL regional competitions in the 2012/2013 season.

Nine (9) applications were received for the 2013 (FY2012) **2nd Annual Daniel Swets Robotics Materials Award**, named in honor of SDSGC Associate Director Dr. Dan Swets of Augustana College. This annual award is provided to a South Dakota teacher or educator of robotics who carries on the traditions in memory of Dr. Swets and the three other gentlemen who tragically lost their lives in an airplane crash on December 9, 2011, while on their way to a robotics session in Rapid City. The nine FY2012 applications represented the highest number of robotics proposals received in a single year since SDSGC began supporting robotics in the state ten years ago. The winners of a combined total of $10,000 from SDSGC included Jason Schlichtemeier of Sturgis Williams Middle School in Sturgis, SD, Chris Stewart of Harrisburg School District in Harrisburg, SD, and Beth Odenbach of St. Thomas More Middle School's robotics program in Rapid City, SD. Additionally, for the second year in a row, LEGO Education North America donated a $2,500 package consisting of an 8-pack of LEGO MINDSTORMS NXT Base Sets with software and site license in the honor of Dr. Swets. The winners of the LEGO donation were Aren Field and John Madison of the 4-H program in Huron, SD.

FIRST TECH Challenge (FTC) Team Formation in South Dakota – Two FTC high-school-level robotics teams formed in Pierre, SD, in 2012 and competed in the FTC regional competition in Sargeant Bluff, IA, on Feb. 10, 2013. The first SD team went undefeated in seven rounds and won the regional event. The second SD team won two awards: 1) the FTC INSPIRE award (i.e., the best score overall), and 2) the Qualifying Tournament Winners Alliance (i.e., the award for the best field competition). Both teams

were also in the running for the Rockwell Collins Innovation Award and the Community Connections award. Winning the regional event advanced the first SD team to the FTC Iowa state tournament in Iowa City, IA, on February 23, 2013, for which SDSGC provided $500 for team travel. In addition to the two Pierre, SD FTC teams, Robyn Swets (*SD FLL Operational Partner and President of the SD Robotics Association)* received inquiries from several middle school FLL teams in eastern SD who want to start FTC teams for high school students. Because of this desired growth, SDSGC decided to help build FTC robotics teams in the state, and ideally hold the first SD FTC state tournament next year. In this way, SDSGC continues to build "Pathways to STEM" by providing tournament opportunities that bridge the gap between elementary, middle, and high school robotics programs within the state. These efforts feed the higher education robotics programs and university teams supported by SDSGC.

During FY2012, **SDSU's Robotics Club** had two student teams prepare for the "Midwest Instruction and Computing Symposium" (MICS) Robotics Competition in LaCrosse, WI, to be held on April 19-20, 2013, at which one of the two SDSU teams will compete.

Annual Performance Objective − Sponsor statewide competition for precollege STEM teacher grant. [At least one precollege teacher grant ($5,000)]
Kelly Lane Earth & Space Science Grant – This annual $5,000 grant is awarded by 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. Three applications were received for the FY2012 Kelly Lane Earth & Space Science Grant and two winners were selected in February 2013: 1) Amber Stout of Jefferson Elementary School in Pierre, SD, for her project titled *"Stellar Solar Sessions,"* and 2) Betsy Ann Koenig of South Central School in Bonesteel, SD, for her project titled *"South Central's Very Own Weather Station."* Tragically, Mrs. Koenig was killed in an automobile accident during a winter storm shortly afterward, but her school was provided with the award.

Annual Performance Objective − Support collaborative proposals for innovations in precollege STEM education. [At least one collaborative proposal]
During FY2012, the following three schools in SD were awarded $2,500 **NASA Summer of Innovation (SoI)** mini grants after the mini grant program was promoted by SDSGC: Mitchell Middle School, Enemy Swim Day School (a reservation Tribal school organization), and Harrisburg Middle School. As part of SDDC's SoI program, 17 middle school girls participated in a three-day, two-night STEM-focused camping trip as part of SDSGC's 2012 SD Space Days at Badlands Astronomy Festival on Aug. 17-19, 2012. The event provided the girls with a unique and memorable experience in space science.

Additionally, SDDC responded to NASA's 2013 "Space Grant Innovative Pilot in STEM Education" CAN by submitting a two-year $480K precollege teacher- training proposal titled *"Rising Star Educator Program."*

Annual Performance Objective − Inspire and motivate women, underrepresented minorities, and persons with disabilities into STEM careers. [Over 1,000 females and

students from underrepresented groups participate each year through Women in Science Conferences, K-12 science fairs, ACE Camp, Flandreau Indian School Success Academy, SD GEAR UP, and related programs.]

Women in Science (WIS) Conferences in FY2012 – Through its partnership and subaward with the SD Discovery Center, SDSGC continued to support six highly successful Women in Science (WIS) conferences held (and yet to be held) throughout the state during FY2012 in Pierre, Sioux Falls, Watertown, Rapid City, Aberdeen, and Yankton, SD. Each conference is organized with volunteers committed to inspiring middle and high school girls to continue with courses in math and science and to consider STEM careers. For example, the Sioux Falls WIS conference held at Southeast Technical Institute reached nearly 600 eighth-grade girls in that single conference, where 30 exhibitors provided them with information on various technical career paths and 27 presenters gave half-hour presentations on science-related occupations. Collectively, after all six FY2012 WIS conferences are held, it is anticipated that a total of 2,017 middle and high school girls will have been reached, an increase of 274 girls over FY2011. Final numbers will be reported via OEPM at the end of the program year. Of the four FY2012 WIS conferences already held, 21% of the girls are minority (11% Native American; 10% other minorities). Additionally, 220 teachers, parents and volunteers participated in the events. Of the anticipated total of 2,017 girls, roughly 93% will be in middle school and 7% in high school. NASA activities and programs were at the forefront of many of the FY2012 conferences. For example, the SD Discovery Center, home of the SD NASA Summer of Innovation (SoI) program, conducted planetarium programs, promoted Women@NASA.com, and shared NASA and SoI recruitment materials during the WIS conferences that they attended.

SURF STEM Programs for Middle School Girls – SDSGC state government affiliate Sanford Underground Research Facility (SURF) began a partnership in FY2012 with Girl Scouts Dakota Horizons (GSDH), which serves 15,000 girls in North Dakota, South Dakota, Minnesota and Iowa. The Girl Scouts are committed to introducing girls of all ages to STEM fields of study.

Annual Performance Objective − Support programs that expose K-12 students to hands-on experiences and to educational and career opportunities in the fields of aerospace, earth science and technology.

During FY2012, the affiliate SD Discovery Center provided 54 StarLab Planetarium programs to 3,103 precollege students and 653 adults (teachers and parents.)

In addition to the precollege programs and student/teacher participant numbers highlighted above, SDSGC headquarters staff provided an additional 11 precollege NASA STEM programs at schools and museums during FY2012 reaching 708 students and 55 teachers as direct participants. Of the students, 0 were elementary (0%), 358 middle school (51%), and 350 high school (49%). Of the total number of 708 students reached by headquarters staff presentations during FY2012, 53% are Native American.

SDSGC Deputy Director Tom Durkin served as judge of Special Awards at 58th High Plains Regional Science and Engineering Fair at SDSM&T on March 22, 2013 with 445

middle and high school student participants. Competition was in the areas of engineering, biological sciences, social sciences, and physical sciences. The Special Awards group also selected the overall winner who advances to the Intel International Science and Engineering fair in Phoenix, AZ in May 2013. Conrad Farnsworth from Newcastle High School won this honor for his project titled "*Does the Einzelenstractorgun Have an Effect on Neutron Rates?"* Mike Ryan of Belle Fourche Middle School won the $100 NASA South Dakota Space Grant Foundation award for his project titled *"Do the Aerodynamics of a Ball Affect Its Flight?"* in which he built a wind tunnel to determine the aerodynamic characteristics of balls used in various sports.

NASA Education Outcome 3 Accomplishments

Informal Education Programs (Public Service)

Annual Performance Objective – Partner with informal education affiliates to disseminate NASA content, share NASA educational resources, and host major NASA science education events. [15 informal education providers and 500 students share NASA resources; 150 teachers and 2,200 students participate in NASA science education events such as SD Space Days]

South Dakota Space Days 2012 at Badlands Astronomy Festival was held at Badlands National Park on August 17-19, 2012. The three-day event consisted of presentations, star parties, rocket launching, cosmic ray detection and astrophotography workshops, Lakota Star Knowledge Planetarium shows at the Interior School by SD Discovery Center (SDDC), and Journey into Space Planetarium shows in the Journey Museum's NASA GeoDome. Presentations were given by keynote speaker **NASA Astronaut Dr. Story Musgrave**, SDSGC's **Tom Durkin** *"Journey into Space: The Hubble Space Telescope,"* **Mark Kochte** (Johns Hopkins University Applied Physics Lab, Payload Operations Specialist Mercury MESSENGER Mission) *"The New Face of Mercury: MESSENGER's Exploration of Our Innermost Planet,"* **Dr. Peggy Norris** of SDSGC-affiliate Sanford Underground Research Facility *"Deep Underground Science & Engineering Lab,"* Documentary Filmmaker **Ian Cheney's** screening of *"THE CITY DARK,"* **Dr. Don Teets** of SDSM&T *"The Discovery of Neptune,"* **Derek Demeter** (Director, Seminole State College Planetarium, FL) *"How to Find Your Way Around the Night Sky,"* NPS Ranger **Kevin Poe** *"South Dakota Nocturnal Animals – Coyote,"* time-lapse videographer **Randy Halverson** of DakotaLapse.com providing Milky Way Time-lapse videos, and two panel discussion sessions on *"Endangered Nightscapes: Protecting Our Dark Sky and Milky Way"* and *"Space Science Outreach: Connecting to Underserved Youth,"* Dr. Musgrave spoke to an all-time, record-breaking capacity crowd of 380 people at Badlands National Park's outdoor Cedar Pass Campground Amphitheater on the evening of Aug. 18. Over **1,200 people** attended various components of SD Space Days at Badlands Astronomy Festival over the three-day period. The NPS Rangers at Badlands National Park were so impressed with the event that it will now become an annual summer program at the Park. SDSGC's lead institution **SDSM&T** and the following affiliates assisted Badlands National Park in sponsoring the event: **The Journey Museum, Black Hills Astronomical Society**, and the **SD Discovery Center (SDDC**). Through SDDC's NASA SD Summer of Innovation program, SDDC organized a group of 25 middle and high school girls, parents, and teachers who camped at the three-day event. Two of the girls want to be astronomers

someday, and one in middle school said *"Meeting Story Musgrave has convinced me of this."* Another girl who wants to go into medicine learned that physical therapists are needed by NASA to study how space affects human bodies. Yet another girl who dreams of being a storm chaser met two storm chasers who are Atmospheric Science students at SDSM&T. Kristie Maher, SDDC Executive Director said: *"This trip was about opening the girls' eyes, building their confidence and encouraging their dreams. Some of them had never camped before. Some were so proud to have braved climbing high peaks in the Badlands. One decided that math wouldn't be a stumbling block to an astronomy career. And, they all looked up at some point during the weekend and thought about what they might do with their lives and how they can get there."*

SDSGC headquarters staff provided an additional four NASA space-related informal education programs to 195 members of the general public during FY2012. Presentations were given: A) at the annual conference of the American Association of Professional Geologists in Rapid City, SD; B) to the Herbert Weiss Philosophy Society at SDSM&T; and C) at the Black Hills Astronomical Society's January 2013 meeting at the Journey Museum. Additionally, SDSGC Deputy Director was interviewed on SD Public Radio on Dec. 21, 2012, about NASA's response to the end of the long-period Mayan calendar and associated doomsday claims. He was also interviewed twice by KEVN TV Black Hills Fox News on the February 2013 Russian meteorite impact and asteroid near-miss, as well as on the March 2013 orbit of Comet PanSTARRS through the inner solar system.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- Student Data and Longitudinal Tracking:
  Total NASA Fellowship/Scholarship awards under SDSGC's FY2012 base grant = 46; 9 of the total awards were made to underrepresented minority students. During the FY2012 program year, a separate suite of 45 students who were significantly supported from FY2006-FY2012 funds took their next step; 22 students are pursuing advanced degrees in STEM disciplines, 1 accepted a STEM position at a NASA contractor, 10 accepted STEM positions in industry, 3 accepted STEM positions in academia, and 9 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.

- Minority-Serving Institutions: Two Consortium members are MSI Tribal Colleges: Sinte Gleska University (SGU) and Oglala Lakota College (OLC). One of SDSGC's previous Native American Space Grant fellows and two-time NASA intern James Sanovia, an MS graduate of SDSM&T, who now teaches at OLC became the official Space Grant representative at OLC during FY2012. Because of his involvement with, and interest in, Space Grant, Mr. Sanovia is currently considering an invitation to fill a two-year rotating position on the consortium's Management Team which could lead to permanent membership and institutional member status after the two year period. Additionally, SDSGC's Management Team works closely with the SD NASA EPSCoR Steering Committee to enhance research collaborations with the Consortium's TCU's.

- **NASA Education Priority Accomplishments:**
  - **Hands-on student experiences in NASA-related STEM disciplines** that incorporate real-life problem-solving needs were provided to the following four multi-disciplinary university student teams at SDSM&T that participated in national competitions during FY2012 with Space Grant support, several of which are summarized above under Outcome 1 Higher Education: 1) Robotics Team, 2) *Moonrockers* Lunabotics lunar regolith excavator team, 3) Unmanned Aerial Vehicle Team, and 4) Autonomous Underwater Vehicle Team. Similarly, authentic experiences were provided to precollege students through significant direct support from Space Grant as detailed elsewhere in this report, including: 1) students from 41 middle school SD FIRST LEGO® League (SD FLL) teams who benefited from participating in the 4th Annual SD FLL Robotics Tournament in February 2013, 2) 2,017 middle and high school girls who attended six Women in Science Conferences in South Dakota during FY2012, 3) 11 high school student participants of SDSU's 2012 Aerospace in Engineering (ACE) Camp, 4) 10 Native American high school seniors who enrolled in the 2012 SDSU-Flandreau Indian School (FIS) Success Academy, and 5) 12 high school juniors and seniors who participated in the 2012 SOLAR Institute (aka, SDSGC Honors Program) at SDSM&T.

    SDSGC supported 11 hands-on STEM-focused student internships and co-ops at NASA Centers and aerospace industries during FY2012 that were funded with FY2011 funds, seven of which were fully funded by Space Grant. Two examples follow.

    In January 2012, **Travis Davis**, currently a Mechanical Engineering senior at SDSM&T and Space Grant fellow, was offered a **co-op position as a full-time civil servant at Marshall Space Flight Center** in the Valves, Actuators, and Ducts department at Marshall. Travis interned at Marshall during the spring 2011 summer prior to being accepted into the co-op program. He then co-op'ed during the summer and fall 2012 and will return again during summer 2013 prior to graduating from SDSM&T in December 2013 when he will hopefully gain full-time employment at Marshall. During his most recent 2012 co-op job, Travis worked with a group of young engineering co-op students to disassemble and refurbish parts of a Saturn V F-1 engine in the center's Propulsion Research Development Laboratory.

    Carly Sandin, a Space Grant fellow and junior at SDSM&T in Mechanical Engineering and current President of SDSM&T's chapter of Students for the Exploration and Development of Space (SEDS), conducted a summer 2012 internship at NASA Johnson Space Center (JSC) titled *"Teleoperation Workstation Design and Construction"* within JSC's Avionics Systems Division Human Interface Branch (EV3). Carly wrote the following about her internship experience: "*My internship was a full process from design to complete model. It was very beneficial to work on a project from beginning to*

end. I learned about each part of the process: requirements, design, analysis, design reviews, ordering parts, machining, and construction. The classes I've taken have helped show me how to apply what I know to actual engineering. Because of this internship, I will apply to future internships and I am considering a co-op in order to learn more about how to apply my education to engineering. I plan to continue in the space field as I complete my degree(s). After I complete my undergraduate in mechanical engineering, I hope to go to graduate school for aerospace engineering. I am an aspiring astronaut, so I also hope to get my pilot's license in the near future as well."

- **Diversity of institutions, faculty, and student participants** – Two of the nine Higher Education affiliates are Tribal Colleges and Universities (TCU's.) Four of SDSGC's six precollege teacher awards went to females. For Outcome 1 higher education programs, 20% percent of the base grant fellowship/scholarship awards went to minority students (doubling SDSGC's goal of 10%) and 43% went to females (52% in terms of the total dollar amount). When considering the total number of precollege students for Outcome 2 precollege programs supported by SDSGC, 1,327 (or 19.7%) of 6,724 direct student participants were minority students and well over half were female (exact numbers to be reported at the end of the FY2012 program year in the Performance Data Request document when released by NASA). Diversity and gender statistics were not tracked for Outcome 3 public service programs.

  During FY2012, SDSGC established a $1,000 Space Grant student scholarship in match of the Herrington Crazy Horse Scholarship (named for Native American Astronaut Commander John Herrington) for a Native American student attending SDSM&T. Cmdr. Herrington, with his own personal funds, established this $950 scholarship at SDSM&T in support of a Native American who is in the Tiospaye Scholars Program. The student supported by the Herrington Crazy Horse Scholarship was Raina Campbell, a Freshman Chemistry major at SDSM&T; and the Space Grant matching award recipient for FY2012 was Maria Teachout, a Native American freshman in Chemical Engineering.

- **Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise** – Through annual SD Space Grant funding, the SD Discovery Center (SDDC) continued their training relationships with several organization across the state, thereby helping to institutionalize NASA and STEM resources as part of the curriculum in these locations/organizations. In FY 2012, the following organizations participated in the training: A) Inspiring Students with NASA Resources - Sinte Gleska University pre-service teachers, B) SD Talented & Gifted Teachers Association and librarians, C) educators from 21st Century Community Learning Centers serving Title I schools, and D) teachers attending the February 2013 SD science and math teachers' conference in

Huron, SD. Exact numbers of teacher participants for these SDDC training programs will be reported in OEPM at the end of the FY2012 program year.

The Journey Museum provided two three-day *"Journey into Space"* teacher workshops to a total of 26 precollege teachers devoted solely to NASA STEM curriculum in July 2012.

- **Summer 2012 opportunities for secondary students on college campuses** with the objective of increased enrollment in STEM disciplines and interest in STEM careers included the following five camps fully or partially supported by Space Grant. Each are described individually below: 1) the week-long **2012 Aerospace Career and Education (ACE) Camp** held on the campus of SDSU with 11 high school students, 2) the two-week **2012 NASA SOLAR "Space Observation, Learning, and Research" Institute (aka, "SDSGC Honors Program")** held on the campus of SDSM&T with 12 high school students, 3) the six-week **2012 South Dakota GEAR-UP** residential college preparatory program held on the campus of SDSM&T with 315 high school students from 24 Tribal schools, 4) the two-week **2012 Space Adventures! Camps** at SDSM&T, and 5) the **2012 SDSU-Flandreau Indian School (FIS) Success Academy** STEM-focused, college-preparatory program held on the campus of SDSU for 250 Native American high school students, 10 of whom received direct support from Space Grant. These five programs fulfilled one of SDSGC's Annual Precollege Performance Objectives to *"Support summer STEM programs for precollege students on college campuses with emphasis on Native American students. [At least four summer STEM precollege programs.]"*

  21st Annual Aerospace Career and Education (ACE) Camp 2012 – Hosted at SDSU) every July, this four-day camp provides high school-aged students the opportunity to get an early start on aviation and aerospace careers. At the camp, students received two hours of flight training, got behind the controls of an aircraft, launched a space shuttle using a computer generated flight simulator program, built and launched air rockets, mapped orbits of planets, graphed sun spots, visited with pilots, and rode in a hot air balloon. ACE Camp enables students to make informed decisions as they consider college and career options. Having completed the program, students are more knowledgeable about the importance and diversity of aviation and aerospace careers. They learn how the aviation and aerospace industries have developed and grown to what they are today, and the students become aware of future career opportunities in these sectors. The summer 2012 camp hosted 11 students (6 males and 5 females) from a wide variety of locations and backgrounds.

  Because the three-year NASA INSPIRE grant for the SOLAR Institute expired after the summer 2011 program, SDSGC committed $20,000 from its FY2011 augmentation funding to continue the **SOLAR Institute during**

summer 2012. The summer 2012 SOLAR Institute (renamed "South Dakota Space Grant Consortium Honors Program") hosted 12 high school juniors and seniors from South Dakota who were competitively selected. As in the previous three SOLAR Institutes, the 2012 students participated in a two-week, precollege, residential experience at SDSM&T while learning about space, earth systems science, engineering, physics, and mathematics. They also learned what college life is like including study skills, test taking, and balancing work and social life. SDSGC's Tom Durkin provided the 12 students with Uniview Planetarium programming at the Journey Museum on July 31, 2012, as well as information on NASA's Mars missions and how to apply for Space Grant funding in college. The $20,000 in NASA Space Grant funding for the summer SOLAR Institute covered 12 student scholarships at $1,150 each $13,800 total) to attend the two-week institute, plus related expenses for rocket kits and other educational supplies and expenses.

South Dakota GEAR UP 2012 Program – "South Dakota Gaining Early Awareness and Readiness for Undergraduate Program" (SD GEAR UP) www.sdgearup.org, a six-week residential college preparatory honors program held annually on the campus of SDSM&T, celebrated its 20th Anniversary during summer 2012. This program began as the "NASA Honors" or "Scientific Knowledge for Indian Learning and Leadership" (SKILL) program 20 years ago. It is now mainly funded by the US Department of Education. Stacy Phelps, a Native American SDSM&T alumnus and NASA intern, once again coordinated SD GEAR UP with the assistance of SDSM&T's Dr. Carter Kerk and others. 315 students (85% of whom are Native American) came from 24 Tribal schools within South Dakota. Curriculum includes Math (Algebra, Trigonometry, Pre-Calculus, and College Algebra), Science (Physical Science, Biology, Chemistry, and Physics, including laboratories), English, Computers, and Life Skills (goal setting, leadership, study skills, personal finance, and college preparation). The curriculum also includes special initiatives including a Science Fair, Academic Olympics, "Science, Engineering, Mathematics, and Aerospace Academy" (SEEMAA), and a daily career seminar from SDSM&T faculty and researchers. The curriculum is further enriched with field trips, recreation and sports, college visitation, and cultural activities. On June 25, 2012, the 315 7th – 12th grade GEAR UP students also attended a science and career exploration day called "Science and Engineering in South Dakota" at SDSM&T. Dr. Sam Gingerich, South Dakota Board of Regents system vice president for academic affairs visited with the students. SD Space Grant student fellow and May 2012 graduate of SDSM&T Doug Colbert provided several StarLab Planetarium programs to the GEAR UP students in June 2012. On June 5, 2012, SDSGC also hosted a Transit of Venus viewing event where telescopic images from SDSGC affiliate Badlands Observatory were transmitted live over the Internet to SDSM&T's Surbeck Center ballroom for the GEAR UP students to view.

2012 Space Adventures! Camps – The week-long July 2012 middle school Space Adventures class held at SDSM&T had 23 middle school students from

SD's American Indian reservation towns of Pine Ridge, Porcupine, Oglala, and Kyle, as well as students from IA, NE, and WY. The July 2012 high school Space Adventures class had 8 students. The students learn about the birth of the universe, the life cycle of stars, black holes, relativity and time travel, star mythology, satellites and GPS. Field trips are provided to the Air & Space Museum at Ellsworth Air Force Base and SDSGC affiliate Black Hills Astronomical Society's Hidden Valley Observatory for an evening star party. Students also build and launch rockets at an event at which their families and the campus community are invited.

SDSU-Flandreau Indian School (FIS) Success Academy was again supported by SDSGC in the form of direct funding for ten (10) FIS high school seniors to take a three-credit Basic Algebra course at SDSU during the 2011-12 school year. The specifics of the 2012 FIS Success Academy are discussed above on pages 2-3 under the APD report section titled "Program/Project Benefit to Outcome" regarding SDSGC programs in support of NASA Education Outcome 2.

With SDSGC support, SDSU's annual **Girls: Engineering, Mathematics and Science (GEMS)** one-day workshop for 8th grade girls was held on the campus of SDSU on March 23, 2013, and provided 44 girls an opportunity to explore interests in engineering, science and technology. Similarly, SDSU's Space Grant-supported **Ready SET (Science, Engineering & Technology) Go!** camp is a one-day, annual workshop for high school girls held on November 3, 2012, on the SDSU campus, with 83 girls. It is modeled after the 8th grade GEMS camp with activities more suited to high school age students.

- **Community Colleges** – The area of developing new, and strengthening existing, relationships with community colleges has not shown improvement this past year, but it is not due to a lack of interest or attempts to strengthen relationships. After careful consideration in late FY2012, and in accordance with Appendix 1 *(Policies for Adding and Removing Members)* of SDSGC's Roles and Responsibilities of Members document, the Consortium's Management Team decided to drop formal affiliation with its minority-focused Tribal College affiliate Lower Brule Community College (LBCC) due to continued lack of participation in Space Grant programs. The consortium Management Team explored ways in which to affiliate with this community college, but it was decided that because LBCC doesn't offer STEM degrees, there weren't any significant opportunities for Space Grant-related collaborations. After consulting with the President of LBCC about the lack of participation and offering the institution an opportunity to express any wishes to remain affiliated, both parties agreed that formal affiliation should be dropped for the time being. This action, however, would not preclude infrequent collaborations on any mutually beneficial opportunities that may arise in the future. SDSGC did not have significant collaboration during the FY2012 program year with its community college affiliate Lake Area Technical Institute (LATI), although the relationship with LATI has been

productive in previous years through programs such as SD Space Days and Program Innovation Grants for high altitude balloon programs.

- **Aeronautics research** – South Dakota NASA EPSCoR researchers, along with SDSGC affiliate Raven Industries and other industry partners continued to collaborate with NASA Ames during FY2012 in the second of a three-year project titled *"Cyanofactory Platform to Photosynthetically Produce Advanced Fuels and Chemicals, while Providing Bioregenerative Life Support Services."* This project assists NASA's Aeronautics Research Mission Directorate address the goal of providing renewable, energy-dense biofuels in a sustainable manner while sequestering CO_2.

- **Environmental Science and Global Climate Change –** As part of SDSGC's institutional member The Journey Museum's partnership with Worldviews Network, a NOAA-funded collaboration of museums, science centers, planetariums, and institutions across the U.S., the Journey Museum provided the public with a program on March 26, 2013, titled *"Resilient Landscapes: The History and Future of Black Hills Floods."* The program used interactive software to show digital maps of the Universe and Earth. The Journey Museum's NASA-funded Uniview Planetarium facilities made this interactive network possible. The immersive program makes use of scientific data to visualize the 1972 Black Hills flood, historic "mega" floods, and more recent flooding from extreme weather. Audiences were "flown" from the surface of the earth while learning about floods from extreme weather events. A public forum followed the program with a panel of experts from the USGS, NWS, SDSM&T, and local government. David McConville, the creative director of Worldviews Network and current president of the Buckminster Fuller Institute, moderated the panel.

- **Support of innovative research infrastructure activities to enable early career faculty to focus research toward NASA priorities** – Because the call for proposals for the FY2012-funded Project Innovation Grant projects is still in the application and competitive review phase as explained earlier in this report, the details of the winning proposals will be reported in OEPM at the end of the program year. Those are the grants that would support early career faculty in NASA-focused research.

IMPROVEMENTS MADE IN THE PAST YEAR

Strategic Plan Objective B.3.2 − Enhance faculty and undergraduate/graduate student development through planning visits, internships, and fellowships at NASA Centers and EROS. [At least two faculty or students from SDSGC affiliates will participate in NASA educational programs each year.]

Although SDSGC succeeded in placing 11 student interns at NASA Centers and aerospace industries during spring/summer 2012 with FY2011 Space Grant augmentation funds, none of them were funded with base budget fellowship funds. Because there was

no augmentation during FY2012 and there isn't one planned for FY2013, another improvement made by the Consortium's Management Team during FY2012 was to include internship stipends within the base budget fellowship funds. That way, rather than having no internships during FY2012, it appears that SDSGC will be able to place three to four interns during summer 2013 at NASA Centers and aerospace industry. SDSGC also established a mechanism to fund future interns with non-federal match from SDSM&T funding sources. To assist with the Consortium's internship program, SDSGC's Program Evaluator conducted a special survey of spring/summer 2012 NASA and aerospace industry interns supported by Space Grant. The resulting detailed report is on file at SDSGC headquarters. Overall, the students enjoyed their internship experiences. Of the ten participants who responded to the survey, all of them expressed that the program had positive impacts on their education and career plans, and would recommend the internship program to other students.

For the first time, for SDSGC's FY2012 student fellowship solicitation, the Consortium established a high-quality web-based, paperless fellowship application and review system. Additionally, in late FY2012, SDSGC's management began a website redesign/overhaul of the Consortium's entire website with assistance from the National Space Grant Foundation staff.

To improve the Consortium's relationship with the SD Board of Regents (BoR), during FY2012, SDSGC welcomed SD BoR Vice President of Research Paul Turman as a non-voting, ex-officio member of the Consortium's Management Team.

SDSGC management and SDSM&T's career placement office worked with NASA JSC's Education Office to bring Diego Rodriguez to SDSM&T's Fall 2012 career fair where he met with over 325 students. This visit included a presentation by Mr. Rodriguez to Native American and other minority student organizations and at least 15 individual interviews with students interested in NASA careers. This is the first time a NASA booth had been offered at SDSM&T's Career Fair, and it attracted the longest line of any booth. NASA's attendance at SDSM&T's Career Fair is now planned as an annual event. This partnership stemmed from SDSM&T student Ryan Brown's internship, and later co-op, at JSC and the relationships that he fostered with personnel from JSC and SDSM&T.

After completing a two-year rotating position on SDSGC's Management Team, affiliate USD was elevated to institutional membership status during FY2012, which provides permanent membership on the Consortium's Management Team. USD was also elevated to the SD NASA EPSCoR Steering Committee.

Due to the success of the Journey Museum's 2010 three-year "Competitive Program for Science Museums and Planetariums" (CP4SMP) grant *"Journey Into Space"* discussed on page 3 of this report, SDSGC institutional members Journey Museum and SDDC teamed up to respond to NASA's 2013 "Competitive Program for Science Museums, Planetariums and NASA Visitor Centers Plus Other Opportunities+" (CP4SMP+) solicitation and submitted a four-year $1.2M proposal titled *"Journey Into Space: Discoveries in STEM."* Similarly, affiliate SURF and institutional member SDDC

responded to NASA's 2013 "Space Grant Innovative Pilot in STEM Education" CAN by submitting two proposals. The SURF proposal is a two-year $497K student research/higher education proposal titled *"South Dakota CERES (Confidence, Equity, and Research Skills."* The SDDC proposal is a two-year $480K precollege teacher-training proposal titled *"Rising Star Educator Program."*

Northern State University (NSU) formally re-affiliated with SDSGC during FY2012. It is a state university offering BS-MS degrees in business, education, and several STEM disciplines through their college of arts and sciences. NSU represents a feeder school to SDSGC's universities that offer more advanced STEM degrees.

The following additional improvements are discussed in separate sections earlier in this report, but are briefly mentioned again here as improvements made during FY2012:

- During FY2012, SDSGC established a $1,000 Space Grant student scholarship in match of the Herrington Crazy Horse Scholarship, named for Native American Astronaut Cmdr. John Herrington, for a Native American SDSM&T student.

- Oglala Lakota College instructor James Sanovia, a Native American SDSGC Fellow and NASA intern multiple times while he was a student, was appointed the official Space Grant representative at OLC during FY2012.

- In an effort to expose more students to NASA Center opportunities, SDSGC supported 13 South Dakota undergraduates (12 females and one male) and two faculty members from SDSM&T in a visit to Johnson Space Center in November 2012 as explained in more detail on page 7 of this report. Based on the success of this visit, as well as that of another large group of undergraduate students who visited Goddard Space Flight Center the previous year, the Consortium management decided to make NASA Center visits an annual event in the future.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

SDSGC is a statewide network of 20 organizations from education, industry and government. The Consortium's eight-member Management Team consists of representatives of a cross section of the membership including SD School of Mines & Technology (the Lead organization), SD State University, Augustana College, University of South Dakota, USGS Earth Resources Observation and Science (EROS) Center, South Dakota Discovery Center, the Journey Museum, and an ex-officio member who is Vice President of Research for the South Dakota Board of Regents. The full membership consists of the following list of educational, industrial, and government affiliates including the type of institution and the affiliate's role in SDSGC project execution.

Educational Affiliates

- South Dakota School of Mines and Technology (Lead Institution, state university BS-PhD, science and engineering; administration of Consortium's involvement in all Outcome 1, 2 and 3 programs)

- South Dakota State University (state university BS-PhD, agricultural and STEM institution; management in Outcome 1 higher education/research and Outcome 2 precollege robotics and other STEM programs)
- Augustana College (four-year private liberal arts and professional college; management in Outcome 1 higher education/research and Outcome 2 precollege robotics and other STEM programs)
- University of South Dakota (state university BS-PhD, medicine, law, fine arts, business; management in Outcome 1 higher education/research programs)
- Black Hills State University and Center for the Advancement of Mathematics and Science Education (four-year, state liberal arts institution; Outcome 2 pre-service education)
- Dakota State University (state university, Associates-PhD, computer management; limited involvement in Outcome 2 higher education)
- Northern State University (state university, BS-MS, business, education, arts and science; new affiliate with anticipated involvement in Outcome 2 higher education)
- Oglala Lakota College (Tribal College, AA-MS with STEM majors; Outcome 1 higher education/research)
- Sinte Gleska University (Tribal College, four-year institution; Outcome 1 higher education/research and Outcome 2 precollege STEM programs)
- Lake Area Technical Institute (technical institute, Associate of Applied Science degrees, robotics and aviation maintenance; Outcome 1 higher education)
- South Dakota Discovery Center and Aquarium (science center; management in Outcome 2 teacher-training and precollege robotics and other STEM programs including management of 2011 Summer of Innovation Grant)
- The Journey Museum (museum; management in Outcome 2 precollege planetarium, robotics, and other STEM programs and Outcome 3 public service astronomy and earth system science programs)
- Badlands Observatory (private observatory, astronomical research/education; Outcome 1 higher education and astronomical research)
- Black Hills Astronomical Society (astronomical society; Outcome 3 public service astronomy programs)
- Kirby Science Discovery Center (science center and museum; Outcome 2 precollege and Outcome 3 public service STEM programs)

State and Federal Government Affiliates

- Sanford Underground Research Facility at Homestake (a state organization under the management of the SD Science & Technology Authority; Outcome 1 physics research and higher education internships, Outcome 2 precollege STEM programs)
- USGS Earth Resources Observation and Science (EROS) Center (data management, systems development, and research field center; Land Processes Distributed Active Archive Center for NASA's Earth Observing System; operation of new Landsat 8 mission; management of Outcome 1 higher education and research programs in remote sensing)

Industrial Affiliates

- Raven Industries (engineered films, high-altitude balloons, GPS products; NASA contractor and partner in SD NASA EPSCoR research project; Outcome 1 research and development in aerospace, higher education student internships)
- RESPEC (consulting & services: engineering, IT, water & natural resources; Outcome 1 research in remote sensing and higher education student internships)
- Science Applications International Corporation (SAIC) (scientific, engineering, and technology applications company; NASA contractor; management in Outcome 1 research in remote sensing and higher education student internships)

* L-3 Communications West, Salt Lake City, UT – a non-affiliate industry sponsor of SDSGC (aerospace, communications, and electronic systems government contractor; Outcome 1 research and development, and higher education student internships)

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.