

THE AFFILATE

FY2012 Student Fellowships, Scholarships, and Internships

As the link between NASA and the citizens of South Dakota, the Consortium's mission is to instill the spirit of exploration and discovery in students and educators and in the general public, with a special focus on the fields of science, technology, engineering, and mathematics (STEM) that are essential for the development of the nation's workforce. Space Grant also provides fellowship/scholarship funding to college students to conduct STEM-related educational and research projects. So far during the current 2012 program year (which includes the fall 2012 semester and spring and summer 2013), 45 students from the following six universities in South Dakota have received a total of \$112,500 in NASA funding from the SD Space Grant: South Dakota School of Mines & Technology, South Dakota State University, University of South Dakota, Oglala Lakota College,

Northern State University, and Dakota State University. This is a 44% drop in funding from last year (FY2011) due to the fact that none of the 52 Space Grant consortia across the country received an "augmentation" to their base grants, as had been the practice for the past several years. Individual fellowship and stipend amounts range from \$1,000 - \$13,000 this year. Females represent 42% of the funded students, while males represent 58%. Minority students represent 18% of the total. The 45 students funded this year will use their funds to conduct NASA-related research and for various educational purposes associated with completing their STEM degrees. Several of the funded students are applying to NASA for summer 2013 internships at NASA Centers and, if selected, three of them will be fully-funded through their SD Space Grant stipends. Several others may be directly funded by a NASA Center.

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Carly Sandin: NASA Internship At NASA Johnson Space Center

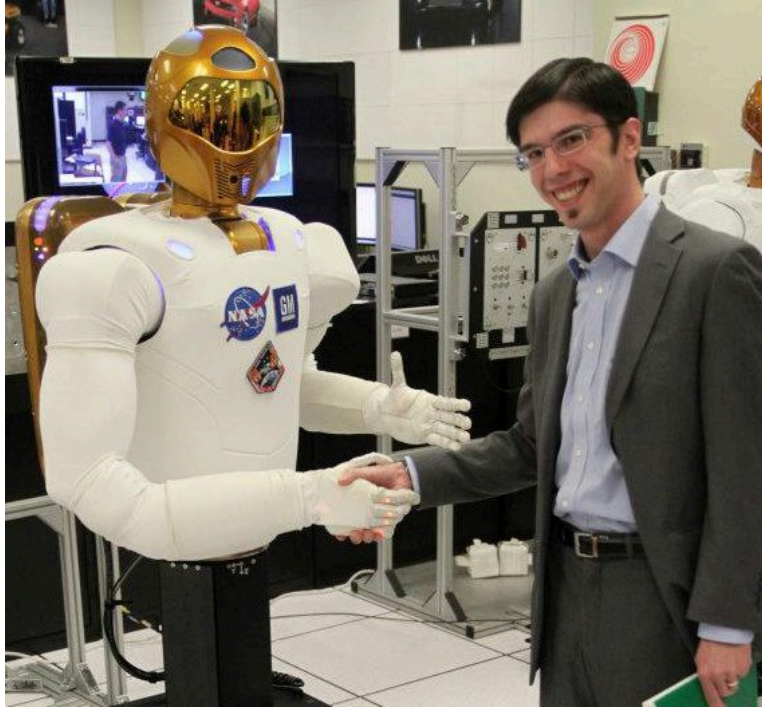
Carly Sandin, a junior at SDSM&T in Mechanical Engineering received Space Grant funding to conduct a 10-week summer 2012 internship at NASA Johnson Space Center (JSC) titled “*Teleoperation Workstation Design and Construction*” within JSC’s Avionics Systems Division Human Interface Branch (EV3).

Carly wrote the following about her internship experience. *“On the first day my internship at NASA, my mentor gave me the requirements of my project. I was to design and build a Teleoperation Workstation, a structure that would hold a 40-inch touch-display, various monitors, hand controllers, 3-D scanners, and speakers. An astronaut would sit or stand at this workstation on a flight deck to control different systems of a space craft. I started with rough designs and went through two design reviews to choose one that fit the requirements. I then modeled the design in Pro-E, a CAD (Computer Aided Design) program. Pro-E is a similar program to Solidworks, which I learned during my freshman year at SDSM&T and this made learning the program much easier. From the 3-D CAD model, I ordered parts, mostly aluminum profiles. I also performed analysis on the model; I had just learned about stress the semester before and it was beneficial to apply that knowledge to an actual structure. When the materials arrived, I began to construct the mock-up. I had to machine a lot of the parts to make them compatible with each other. I took three shop safety courses in order to use the drill press, saws, and hand tools at NASA. Fortunately, I already had experience on some of the machines through the shop training at SDSM&T while on the [NASA Lunabotics] Moonrockers team. I finished constructing the full mock-up structure of the workstation on the last day of my internship. It was to be used in testing the following month in the Flight Deck of the Future (FDotF).”*



Carly is pictured above sitting in the Shuttle Avionics Integration Laboratory (SAIL) facility where she toured a full-scale mock-up of a NASA Shuttle flight deck.

Carly went on to say: *“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 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.”* Carly serves as the current President of SDSM&T’s chapter of Students for the Exploration and Development of Space (SEDS.)



Daniel Nehlich: Internship At NASA Johnson Space Center

Daniel Nehlich, a junior at SD State University (SDSU) majoring in Physics, conducted a 15-week spring 2012 semester internship with NASA Johnson Space Center's Advanced Physics Propulsion Lab under Space Grant funding. Daniel plans to pursue a Masters in Astronautical Engineering with an emphasis in propulsion in order to contribute to the U.S. space program through the design of new propulsion technologies.

In February 2012 after the first month of his internship, Daniel wrote: *"It's been just over one month and I can say with conviction that this has already been one of the greatest experiences of my life. The people I've met have been awesome. The projects I've been able to see have been amazing. The value of this experience is incalculable. I have never loved a job more than this. I'm excited to go to work in the morning, and I'm satisfied when I leave work at night. And when I stop to think about where I am and what I'm doing, I feel like the luckiest guy in the world. Don't get me wrong,*

the job is tough ... some days are really frustrating, but the satisfaction of progress is wonderful. ..."

After his 15-week internship was over, Dan wrote the following: *"My work centered on advanced propulsion of both the theoretical and experimental nature on devices dubbed the Quantum Vacuum Plasma Thruster and the White-Juday Warp-Field interferometer. Both experiments focused on new methods for deep space propulsion. Primarily, my role in these experiments was setup, calibration, and verification of functionality of the experimental apparatus. Additionally, work was performed in launch vehicle assessment, trajectory analysis, and vector flight analysis for a proposed human spaceflight mission to trans-lunar space. The Quantum Vacuum Plasma Thruster is an ion thruster platform built on the idea that a property of the vacuum, known as Quantum Vacuum Fluctuations, wherein particle and anti-particle pairs representing the ground state energy of the*

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(Daniel Nehlich Continued)

vacuum, pop into existence, collide, annihilate and are gone, can be used as a suitable reaction mass accelerated through an electromagnetic field to provide a high specific impulse method of deep-space propulsion, enabling much faster transit times and much higher efficiency for all mission lengths. The White Juday warp-field interferometer dealt more with the theoretical work of Dr. White, but in an attempt to bring that work to the experimental [stage]. By using interferometry to measure the possible production of a perturbation in space-time, it may be shown that a simple device such as a toroidal capacitor may produce such an effect. The result of this work would be the enabling of very high apparent velocities which bring interstellar travel within reach. This work and others of a more conceptual nature provided a challenging and rewarding experience as well as a continued opportunity to collaborate and grow as a physicist.

The internship was remarkably rich in both challenge and opportunity. Not only was I pushed to excel through the duration of my time at NASA, learning a great deal within my field as a consequence, but I am still continually pushed by the prospect of returning to Johnson Space Center to continue work in the field of Advanced Propulsion. I'm still in regular contact with my mentor, who has stated a desire for me to return, and I am working hard to ensure that my educational path leads me to a career path with NASA. I intend on pursuing employment with Johnson Space Center, as a civil servant, contractor, or CO-OP, in Dr. White's Eagleworks Lab while concurrently pursuing my Masters in Astronautical Engineering. My internship was so phenomenal, I cannot find fault in any portion of the experience, save only that it had to come to an end."

Thirteen South Dakota Undergraduates Visit NASA Johnson Space Center

With \$3,000 in FY2012 support from SDSGC, state matching funds, and John Deere Future of Engineering Foundation funds, the 13 SDSM&T undergraduate students and several faculty members pictured here at NASA's historic Mission Control spent a day visiting Johnson Space Center (JSC) on Nov. 9, 2012 while attending the annual ASME and Society of Women Engineer's meetings in Houston. The students are pursuing degrees in Mechanical Engineering, Industrial Engineering, and Metallurgy.

NASA's Betsy Kluksdahl organized an amazing tour of JSC including the historical and current mission controls, robonauts, Saturn V rocket, and many other facets of JSC including a meeting with NASA's Diego Rodriguez about JSC's women's mentoring program and internship/co-op opportunities. At the Society of Women Engineers conference, the 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 tour of NASA JSC was the highlight for many of the female students, and many of them have decided they'd like to attend next year and have already begun fundraising initiatives.



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, visited with pilots, and visited various aerospace and aviation related facilities to learn about careers in these areas.

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. Tuition for each student was \$300, due in large part to contributions from SDSGC, the South Dakota Aeronautics Commission, South Dakota's NASA Summer of Innovation, SDSU Aviation Program, SD Pilots Association, Yankton Regional Aviation Association, Pierre/Ft. Pierre Zonta, and Quest Aviation. The tuition covered lodging, transportation, meals, and all activities for the group, including a flight in a Cessna 172.



Heidi and Jessie get a first hand look at the cockpit of a Boeing 727 at Lake Area Tech



South Dakota Space Days 2012

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, 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.

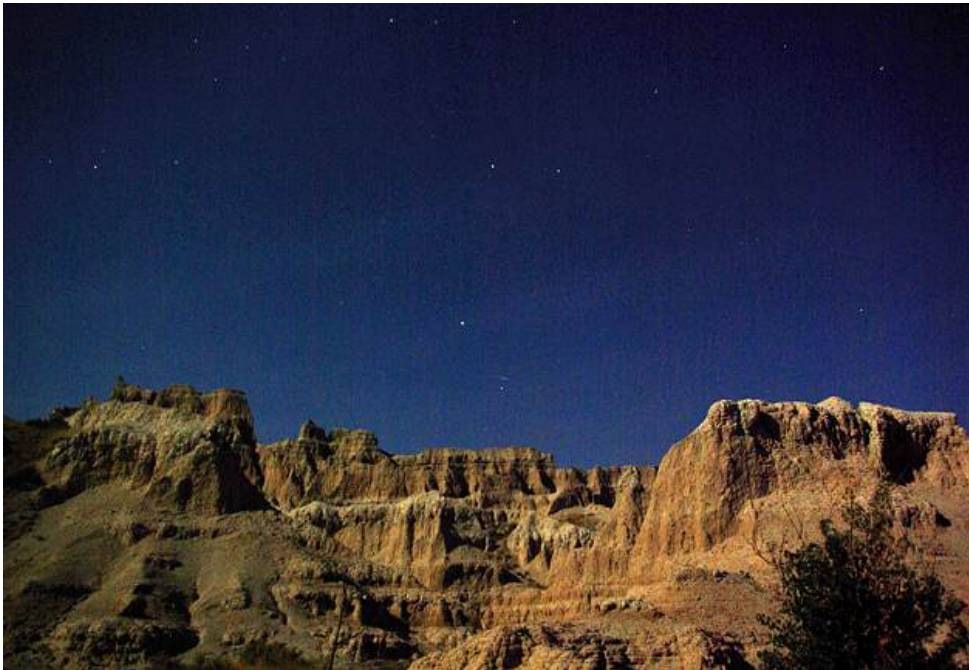


The Civil Air Patrol Color Guard is pictured above preparing to present the Colors prior to Dr. Musgrave's presentation.



Dr. Musgrave with several Native American participants.

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(South Dakota Space Days Continued)

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 South Dakota Summers 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 the human body. 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."

South Dakota Space Days is an annual public service event sponsored by Space Grant and held at different locations throughout the state. It typically draws thousands of students and teachers from throughout South Dakota who then participate in "hands-on" STEM educational activities. Students visit with experts in aerospace, aeronautics, earth science, engineering, computer science, physics, and other STEM fields about their careers. Guest speakers with nationally recognized credentials such as NASA astronauts, scientists, and managers present programs and meet with the students. Numerous exhibits on space and earth science and technology are provided by members of the SDSGC and other organizations.

SDSM&T *Moonrockers* Team Competes at NASA Kennedy Space Center (KSC) Lunabotics Mining Competition

At the 3rd annual NASA Lunabotics competition held at KSC from May 21-26, 2012, the 10-member *Moonrockers* team from SDSM&T had redesigned their lunar excavator as pictured here. The goal was to develop an autonomous or telerobotic vehicle to collect as much lunar regolith simulant as possible in a 10-minute time period. NASA modified the competition rules in 2012 by reducing the height limit of the vehicle by half, assessing penalties for both mass and bandwidth usage, and giving bonuses for autonomy and dust-tolerant features.

With the new constraints, the *Moonrockers* opted to develop a new 4-wheel drive system over the tank track chassis that had been used the past two years, in order to reduce mass by 25% from last year (76 kg to 56 kg.) After a challenging 1st run and several quick modifications, the team's 2nd run navigated the obstacle course with rocks and craters, and collected regolith in the bucket. Only 13 of the 55 teams from around the world were able to deliver in excess of 10 kg with the new NASA rules. Along with the mining portion of the competition, the team was actively engaged in K-12 outreach. Final overall placement will be released by NASA later this year.

The team expressed thanks to those that provided funding for material expenses and travel that include the SDSGC, NASA Foundation, Caterpillar, Rockwell Collins, Pacific Steel and Recycling, Buffalo Wild Wings, and several SDSM&T departments and individuals. 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.



Welcome Paul Turman to the Consortium's Management Team!



Paul Turman: System Vice President For Research & Economic Development for the South Dakota Board of Regents

Space Observation, Learning, and Research (SOLAR) Institute 2012

Because the three-year NASA INSPIRE grant for the SOLAR (Space Observation, Learning, and Research) Institute expired after the summer 2011 program, SDSGC committed \$20,000 from its FY2011 augmentation funding to continue the two-week SOLAR Institute held on the campus of SDSM&T from July 29 – August 12, 2012. The summer 2012 SOLAR Institute (aka “South Dakota Space Grant Consortium Honors Program”) hosted 12 high school juniors and seniors (seven boys and five girls) from South Dakota who had applied and 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 science systems, engineering, physics, and

mathematics. They also learned what college life is like including study skills, test taking, and balancing work and social life. The students were from Kadoka, White, Hot Springs, Dell Rapids, Belle Fourche, Sioux Falls, Yankton, Pierre, Piedmont, and Harrison. SDSGC’s Tom Durkin provided the 12 students with Uniview Planetarium programming at the Journey Museum, 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 to attend the two-week institute, plus related expenses for rocket kits and other educational supplies and expenses.

The vision of the South Dakota Space Grant Consortium (SDSGC) is to expand opportunities for all South Dakotans through education, research, and public service in the fields of aerospace, earth, and space science. As the link between NASA and the citizens of South Dakota, SDSGC's mission is to instill the spirit of exploration and discovery in students and educators and in the general public, with a special focus on the fields of science, technology, engineering, and mathematics that are essential for the development of the nation's workforce.

SOUTH DAKOTA SPACE GRANT CONSORTIUM

Headquarters Office
501 E. Saint Joseph Street
Rapid City, SD57701

<http://sd.spacegrant.org>
(606) 394-1975

