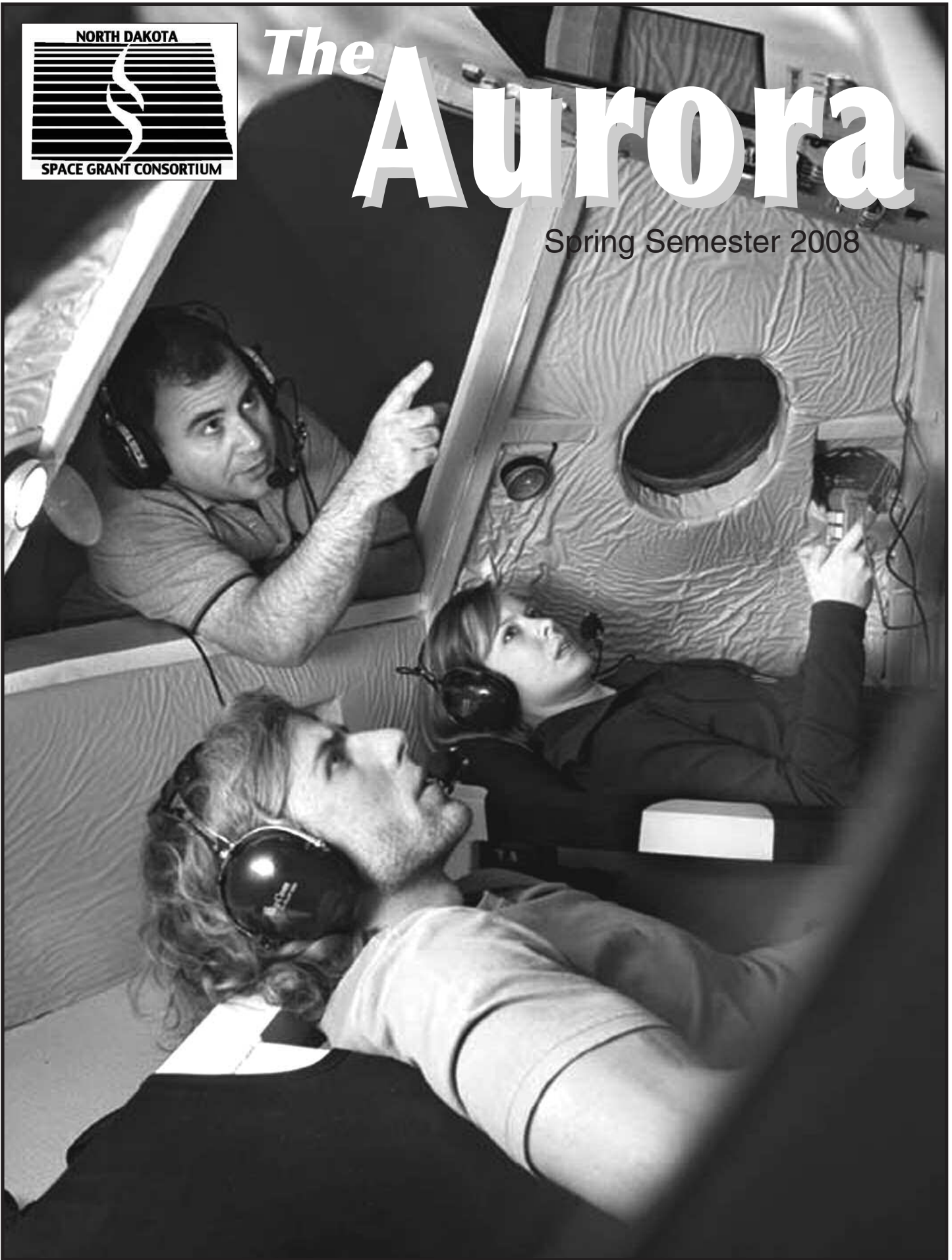




The Aurora

Spring Semester 2008





Letter from the Director

North Dakota Space Grant Consortium

University of North Dakota

North Dakota
State University

Dickinson State University

Mayville State University

Minot State University

Valley City State University

Cankdeska Cikana
Community College

Fort Berthold
Community College

Sitting Bull
Community College

Turtle Mountain
Community College

United Tribes
Technical College

Bismarck State College

Lake Region State College

Minot State University—
Bottineau

North Dakota State
College of Science

Williston State College

Grand Forks Herald

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701-777-4856 701-777-3711 (fax)

Cover Photo: Emily Chwialkowski, graduate student in Space Studies, and John Polansky, undergraduate student in Mechanical Engineering, fly the vertical spacecraft simulator under the direction of Pablo de Leon, research associate, at UND. Design and construction of the simulator was funded by the North Dakota Space Grant Consortium.

Challenges and Opportunities

As North Dakota Space Grant enters the fourth year of its current five-year grant, I think it is time to reassess where we are as an organization, how we can revitalize and expand our future work, and how we can focus on ways to develop a broad-ranging set of space activities that can develop and expand in North Dakota. First, though, I want to express my gratitude to Suzette Bieri and all of our affiliate contacts across North Dakota for their commitment to ND Space Grant and their promotion of space and science education across our state. Without their hard work, NASA would have little, if any, direct presence in North Dakota.

The future of Space Grant as a national organization looks very bright and it is likely that our annual budgets will continue increasing in future years. This offers ND Space Grant the opportunity to expand its current work and develop new projects. The only challenge associated with this prospect is the requirement for match and it will be the responsibility of the ND Space Grant leadership, the University of North Dakota, and the ND Space Grant affiliates to produce enough match for each annual budget. Past assistance from the Governor's Office and North Dakota Legislature in providing cash match for ND Space Grant – which is vital in providing real money for our programs – is very much appreciated. It will be very important that we work together to achieve this match requirement in the future to ensure that ND Space Grant continues its mission in North Dakota.

With that said, what follows is a list of expanding and evolving activities that offer the real potential for radically increasing NASA-related activity in North Dakota – both in terms of scientific research and in the development of a real aerospace industrial capability that could become a new part of the North Dakota economy. It is also important to remember that Space Grant is focusing on workforce development and higher education activities, which is reflected in the following list.

- Small satellite projects that will develop a spacecraft manufacturing capability in North Dakota. Nurturing this effort could lead to the long-term development of an aerospace industry in North Dakota, if given the sufficient support and incentives.

- Expansion of the Space Grant Internet Telescope Network (SGITN), which is headquartered at UND and will eventually become a geographically-distributed network of online observatories for use by faculty and students. For more information, visit <http://sgitn.space.edu> and <http://observatory.space.edu>.

- Increasing the number of scholarship and fellowship awards to North Dakota college students across the state – a fundamental activity of ND Space Grant.



Letter from the Director



- Continuing planetary space suit development by beginning the second phase of the NDX-1 project, which will again involve multiple institutions across the state.
- Support the professional development of North Dakota's K-12 teachers through funding for short- and long-term workshops and courses.
- Continuing and expanding BalloonSat and high-altitude balloon projects, which offer students the chance to build and fly hardware.
- Provide internships to college students to spend a summer at a NASA field center and conduct engineering or scientific research.

This list highlights just some of the Consortium's efforts, but they will be integral in expanding NASA activity in North Dakota. However, there must be a coordinated effort to attract more students and faculty to these programs and this must be a state-wide effort. Some ideas for doing this include:

- More effectively advertise Space Grant in newspapers;
- Partner with local television stations to advertise ND Space Grant as a local community and state-wide service and resource;
- Work directly with high schools and colleges to introduce students to ND Space Grant and its programs;
- Work with NASA-funded scientists to develop education and public outreach activities across the state; and

- Partner with the state to promote a new initiative that highlights the importance of education, critical thinking, and scientific literacy in the general population. It is very important for all North Dakotans to understand the positive consequences of having a broad, well-rounded education that contributes to the health of both the local and state communities.

A final necessity in all these efforts is **leadership**. I believe that the time is now for a direct Space Grant – university – government effort to dramatically expand, advertise, and develop the above initiatives with the explicit goals of diversifying the North Dakota economy with high-value, high-wage jobs and in promoting the value of a strong education. This can – and should – involve all North Dakotans. The time is long overdue to deliver an unambiguous message across North Dakota that education is important for everyone, it is necessary to allow the people to understand our rapidly changing world (and universe!) and in promoting a healthy, prosperous society.

Almost by definition, this leadership must simultaneously come from the Space Grant, university, and state government communities. I welcome your involvement with these efforts!

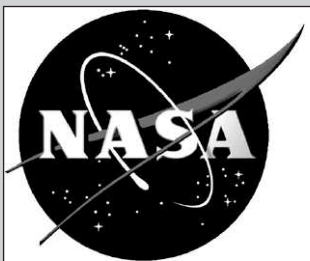
I am very happy to receive your comments, suggestions, and thoughts about the above efforts and hope that you will become actively involved in these initiatives. My phone number is (701) 777-4896 and my email is Hardersen@space.edu.

Ad astra,

A handwritten signature in black ink, appearing to read 'Paul J. Hardersen'.

Dr. Paul Hardersen

Background of the National Space Grant College and Fellowship Program



NASA initiated the National Space Grant College and Fellowship Program, also known as Space Grant, in 1989. Space Grant is a national network of colleges and universities. These institutions are working to expand opportunities for Americans to understand and participate in NASA's aeronautics and space projects by supporting and enhancing science and engineering education, research and public outreach efforts. The Space Grant national network includes over 850 affiliates from universities, colleges, industry, museums, science centers and state and local agencies. These affiliates belong to one of 52 consortia in all 50 states, the District of Columbia and the Commonwealth of Puerto Rico.

The 52 consortia fund fellowships and scholarships for students pursuing careers in science, mathematics, engineering and technology, or STEM, as well as curriculum enhancements and faculty development. Member colleges and universities also administer pre-college and public service education projects in their respective states.



NDSGC Scholarships

Fall 2007 and Spring 2008

NDSGC scholarships are given annually to students at each of the four-year, two-year and tribal colleges in North Dakota. These scholarships are given to those students who have displayed a particular interest or ability in an area of science or mathematics, who have at least a 3.00 grade average and who are American citizens.



Sitting Bull College
Allyson Two Bears
Marla Striped Face-Collins
Dylan Jones



Lake Region State College
Melissa Gunn
Jacinda Kostecki
Danica Belanus
Alisha Eng



Bismarck State College
Emily Schlosser
Heather Patch
Kimberly Zins



Mayville State University
Erika Anderson
Miriam Devere
Jordan Karlstad
Josh Berge
Jake McLain



Minot State University
Jack M. Carraher
Danielle Marie Ramos
Paul Loree



Minot State University-Bottineau
Mary Keller
Steven Fasching



North Dakota State College of Science
Kristin Eberhardt
Levi Moxness
Jasmine Wieser



Cankdeska Cikana Community College (Little Hoop Community College)
Challsey Lawrence
Samantha Bear
Jeremy Nelson



Valley City State University
Mariah Westerhausen
Trent Douglas
Andrew Hager



Turtle Mountain Community College
Harold Albert Counts
Valerie L. Malaterre
Myron LaFontaine
Joseph R. Malaterre
Thomasina Stevens
Anthony Esquibel
James Helpfrey



Dickinson State University
Allison Gunderson
Aaron Meyer
Tyler Opitz
Shayla Schmitz



Williston State University
Samantha Klein
Josh Melius
McHale Maristuen

North Dakota Student Rocket Initiative (STRIFE)



The North Dakota Student Rocket Initiative Project (STRIFE) has had three large rocket launches over the time period May 1, 2007 to May 8, 2008. The inaugural launch of STRIFE was on May 8, 2007. The rocket was in a test flight configuration with its smallest weight of 62 lbs. The flight was launched with a commercial motor M1297 to a successful flight reaching 2,700 feet. The second launch was on October 1, 2007 at a farm near Harwood, ND with the same M1297 motor. We tested the wireless ignition (successful) and telemetry (unsuccessful). STRIFE reached a height of 2,600 feet. The third launch required a larger

motor, N2000, because the payload now carried a video camera with added weight totaling 85 lbs. We launched again near Fargo. The flight was successful, reaching 7,500 feet; however, a couple minor things did not go as planned. The main parachute was deployed at apogee causing the rocket to drift about a mile. The telemetry still did not work. In an unlucky series of events the rocket fin can landed on the video camera rocket tube, cracking the airframe. No on-board film was retrieved. The STRIFE rocket, now repaired, remains in excellent flying condition and ready for student payload flights.



Left to right: Matthew Voigt; Tricia Johnson; Pablo de Leon; Tim Young; Will Swearson; John McClure; Arjay Eve; Meagan Schaal; and John Nordlie.

Wind Tunnel



The North Dakota Space Grant Consortium provided partial funding for a senior design project at UND in the Department of Mechanical Engineering. Team members Dan Asplund, Fabrice Kunzi, Josh Moulds and John Polansky spent two semesters designing "A Compressible Fluid Flow Wind Tunnel for Research on Gas Turbine Blades." The faculty advisor was Dr. Forrest Ames. Pictured are Kunzi and Asplund.

Dark Skies

The Dark Skies Initiative is a program designed to provide North Dakota Space Grant affiliate colleges/universities with basic astronomical equipment for use in teaching undergraduate astronomy classes at their institutions. Space Grant provides funds for the colleges to purchase portable 10" or 12" telescopes with accessories. In addition, the program aims to increase the knowledge of faculty who acquire and use this equipment, and to build the foundation necessary to establish a research capability at these colleges and universities. The program was initiated to improve astronomy expertise across the state as North Dakota has a very limited history in astronomical infrastructure

and research. Space Grant also encourages the affiliate recipients to use the telescopes for community star parties and informal educational activities for Girl Scouts, 4-H, etc.

Four North Dakota Space Grant affiliates are now participating in this program: Williston State College; Dickinson State University; North Dakota State College of Science; and Cankdeska Cikana Community College (Little Hoop Community College). Our goal is to encourage this program among the remaining affiliates. Efforts will also be made to work directly with the astronomy faculty across the state to involve them in this effort.

Space Grant Internship at the Jet Propulsion Laboratory Summer 2007



The Jet Propulsion Laboratory is located in Pasadena, California.

Shane Weigel
Mechanical Engineering
North Dakota State University

"At JPL I was the power systems engineer for a student-led concept design team. The goal of our team was to research and design a concept for self-sustaining payloads to take seismic readings on the surface of Mars. As the power systems engineer, I modeled the solar energy available on the surface of Mars, the battery cycle of the payload, and the concept of operations.

I will never forget my experience at JPL. It was enlightening and influential. I saw and learned about things I never thought were possible. This internship has guided my plans for what I wish to do in the future and has been a huge motivational factor in my life."

Pearl I. Young Scholarship Spring 2008

Pearl I. Young graduated from UND in 1919 as a Phi Beta Kappa with a triple major in Physics, Mathematics and Chemistry.

After graduation she taught physics at UND for two years. She then accepted an appointment at the Langley Memorial Aeronautical Laboratory in Hampton, Virginia. She was the first woman hired as a scientist (physicist) by the National Advisory Committee for Aeronautics (NACA); that agency later became the National Aeronautics and Space Administration (NASA).

"Although I was interested in chemistry, I didn't want to go for a straight chemistry major. I had a natural inclination for mathematics and physics; I excelled in those classes. I wanted a major that tied all these disciplines together. Although I am a practical person who tends to think in a very logical and analytical way, I have always enjoyed thinking creatively and coming up with innovative solutions to everyday problems. Chemical engineering seemed to be the perfect combination of science and innovation that I wanted from my professional career."



Heather Jacobson
Chemical Engineering
University of North Dakota



2007 ESMD Internships



NASA has embarked on a robust space exploration program that will advance the nation's scientific, security and economic interests. This is the fundamental goal of the Vision for Space

Exploration and therefore the central objective of the Exploration Systems Mission Directorate (ESMD). ESMD aims to develop a constellation of new capabilities, supporting technologies and foundational research that enables sustained and affordable human and robotic exploration of outer space.

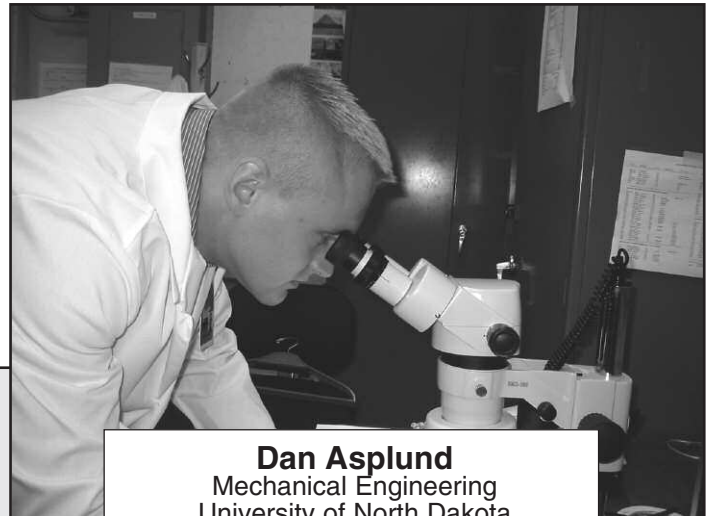
In order to help accomplish these goals, the North Dakota Space Grant Consortium was awarded a grant in 2007 to provide funding for summer internships for college students at NASA Space Centers and for senior design projects. These programs provided a rich portfolio of ESMD higher education opportunities and encouraged relevant hands-on training in systems engineering for the college and university students from North Dakota.



Paul Selid (left) with Eugene Krantz, retired NASA Flight Director. Krantz is best known for directing the Mission Control efforts that successfully saved the crew of Apollo 13. It was during that time he declared, "Failure is not an option."

Paul Selid
Chemical Engineering
University of North Dakota
Internship at Johnson Space Center
in Houston, Texas

"I had an individual project that I worked on with the help of my mentor and a collaborative project that I worked on with other interns. The individual project was focused on carbon dioxide and moisture removal for the International Space Station (ISS) and the Crew Exploration Vehicle (CEV). The group project focused on developing an oxygen compression system for the ISS. With these two projects, I learned a great deal about science and engineering, and helped NASA to make strides towards its new Vision for Space Exploration.



Dan Asplund
Mechanical Engineering
University of North Dakota
Internship at Glenn Research Center
near Cleveland, Ohio

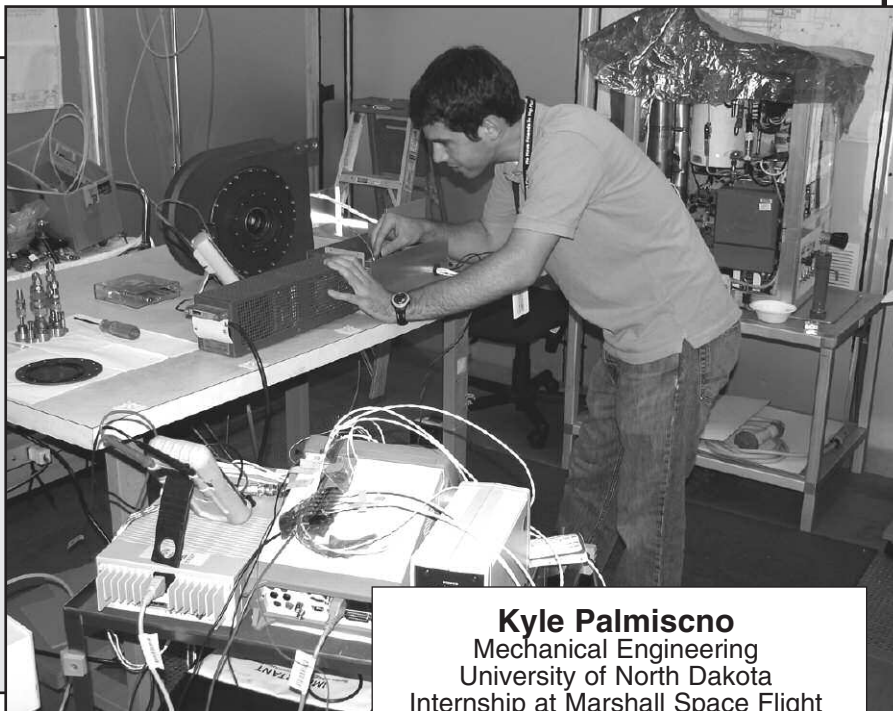
I was assigned to a chemical sensors project which was outside my field of study, so I read a lot and studied chemistry to get into the mindset required for my job. I worked on sensors that were microns thick and could detect toxic gasses at concentrations around 10 parts per million.

The specific sensor that I spent most of my time on was a hydrogen sensor in the form of a Schottky diode. It was made on a wafer of atomically flat silicon-carbide (SiC) with tungsten-oxide and platinum sputtered on top of it and it sensed hydrogen, up to 600 degrees Celsius. I worked to try and determine manufacturing methods to improve the stability and repeatability of the sensor so it could be released to industry and possibly used on the CEV, CLV, ISS and Return to the Moon.

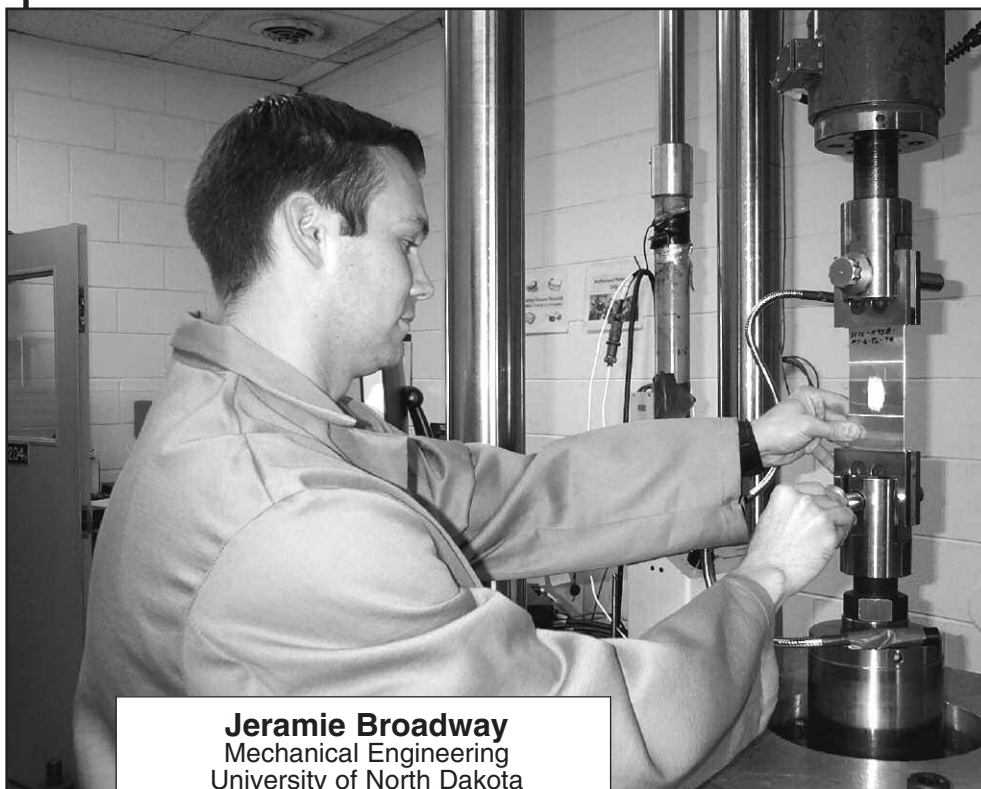
2007 ESMD Internships



"My internship was with the Environmental Control and Life Support Systems branch. I worked in the testing division on the Exploration Water Recovery System (EWRS). The EWRS is a system designed for use on a space vehicle or habitat to recycle water. This system recycles water from showers, hand washing, urine and water condensed out of the air from perspiration and respiration. While I was there, the group was preparing for a 30-day test of the entire system. I had to repair certain pieces of hardware, plumb different parts of the system together, do some electrical wiring, as well as many other tasks to prepare the system for the test."



Kyle Palmiscno
Mechanical Engineering
University of North Dakota
Internship at Marshall Space Flight
Center at Huntsville, Alabama



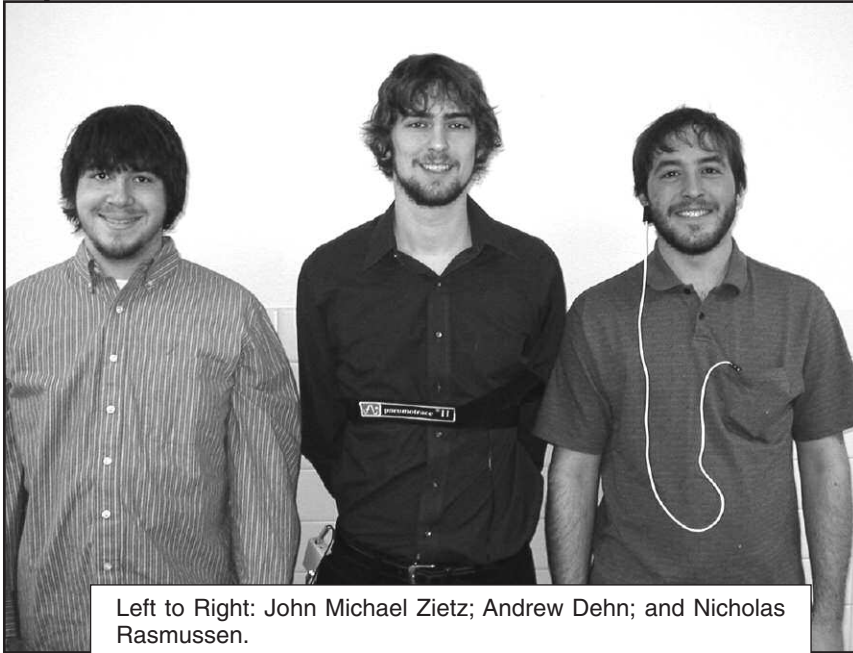
Jeramie Broadway
Mechanical Engineering
University of North Dakota
Internship at Marshall Space Flight
Center at Huntsville, Alabama

Broadway worked in the Metallurgy Mechanical Test Facility. The main focus of his research was material testing for the Ares Launch Vehicle.



ESMD SENIOR DESIGN PROJECTS

The North Dakota Space Grant Consortium was able to fund two senior design projects through the Exploration Systems Mission Directorate (ESMD) grant.

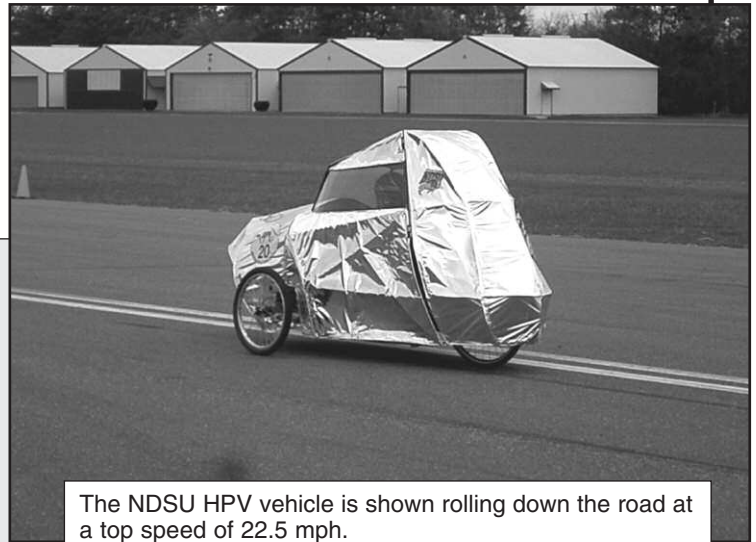


Left to Right: John Michael Zietz; Andrew Dehn; and Nicholas Rasmussen.

“Physiological Sensors for an Extra-Planetary Exploration Space Suit”
Advisor: Dr. Dan Ewert
Department: Electrical Engineering
North Dakota State University



Kim Kramer is shown driving the Human Powered Vehicle (HPV). The basket on the back was there due to competition rules. The HPV had to be used as a utility vehicle that could transport a bag of groceries or a similar sized cargo.



The NDSU HPV vehicle is shown rolling down the road at a top speed of 22.5 mph.

“Human Powered Vehicle”

Advisor: Dr. Ghodrat Karami
Department: Mechanical Engineering
North Dakota State University

Student participants were: Adam Goldade; Mike Hourgard; Jory Skalsky; Peter Barfknecht; Matt Stegmiller; and Kim Kramer.

Summer Faculty Fellowships



The NDSGC Summer Faculty Fellowship Program is designed to provide NASA-related research or curriculum development opportunities for faculty who teach at any of the non-doctoral degree granting colleges/universities in North Dakota and are affiliate members of Space Grant. The fellowships are worth \$5000 each and may be used to support research activities that are related to the NASA mission or to develop a new course or re-design an existing course that includes relevant NASA material. The fellowship is available to science, mathematics, technology or engineering faculty at the appropriate institutions.

Recipients of the Summer Faculty Fellowships in 2007

Michael Collins--United Tribes Technical College

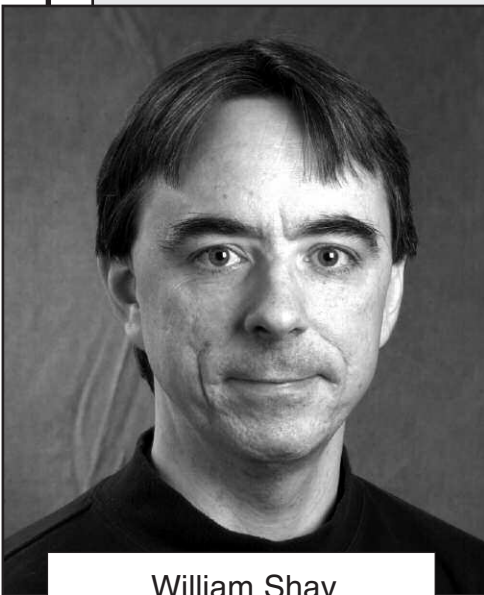
Corinne Krauss-Dickinson State University

John Webster--Minot State University

William Shay--North Dakota State College of Science

Don Hoff--Valley City State University

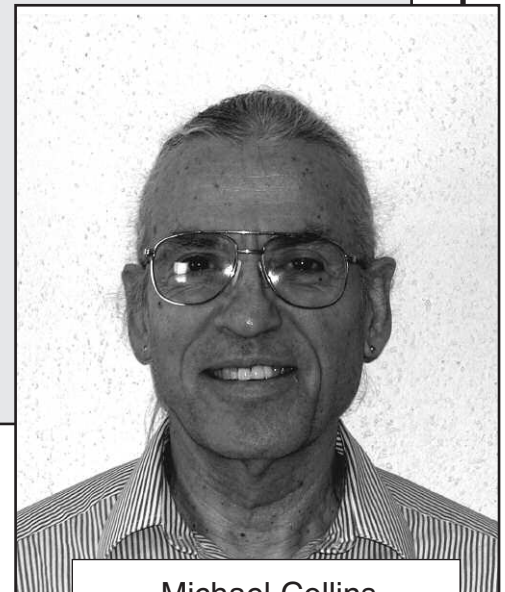
Laurie Berry/Jeff Sieg---Mayville State University



William Shay



Corinne Krauss



Michael Collins

Briefs

Soudan State Park Field Trip

Thirty-five students in a physics class from Red River High School in Grand Forks had the opportunity to tour the underground physics laboratory at Soudan State Park in Minnesota in the spring of 2007. Dave Nowatzki was the instructor for that physics class. Space Grant provided partial funding for the field trip.

Team America Rocketry Challenge

A team from Century High School won the state title for Team American Rocketry Challenge (TARC). That qualified them to go to the national competition held in the state of Virginia in the spring of 2007. Mike Walz was the advisor of that rocket team. Space Grant provided partial funding for that trip to nationals.



UND Observatory

From the Plains to the Stars The UND Observatory and SGITN in FY 2008

Building, dreaming, and learning have been the keywords for North Dakota's blossoming astronomy enterprise in the past year with tangible progress and tantalizing signs of things to come. The UND Observatory continues to see infrastructure improvements and student use while the vision of a national network of Internet telescopes has become a tentative reality. These combined efforts are working to simultaneously establish a capable astronomical infrastructure in North Dakota while also expanding the scope and quality of professional astronomical research. Both items are new in North Dakota and their expansion offers research and education opportunities for students, research facilities for faculty, and new sources of sponsored program research funds from NASA and the National Science Foundation (NSF) that are of general benefit to the state.

The UND Observatory, located ~10 miles west of Grand Forks, continues to evolve and is in its fourth year of renovations and expansion. The progress has been steady:

2005: The original Internet observatory, built in 1996/7, was renovated and made operational.

2006: A Small Radio Telescope (SRT) was built.

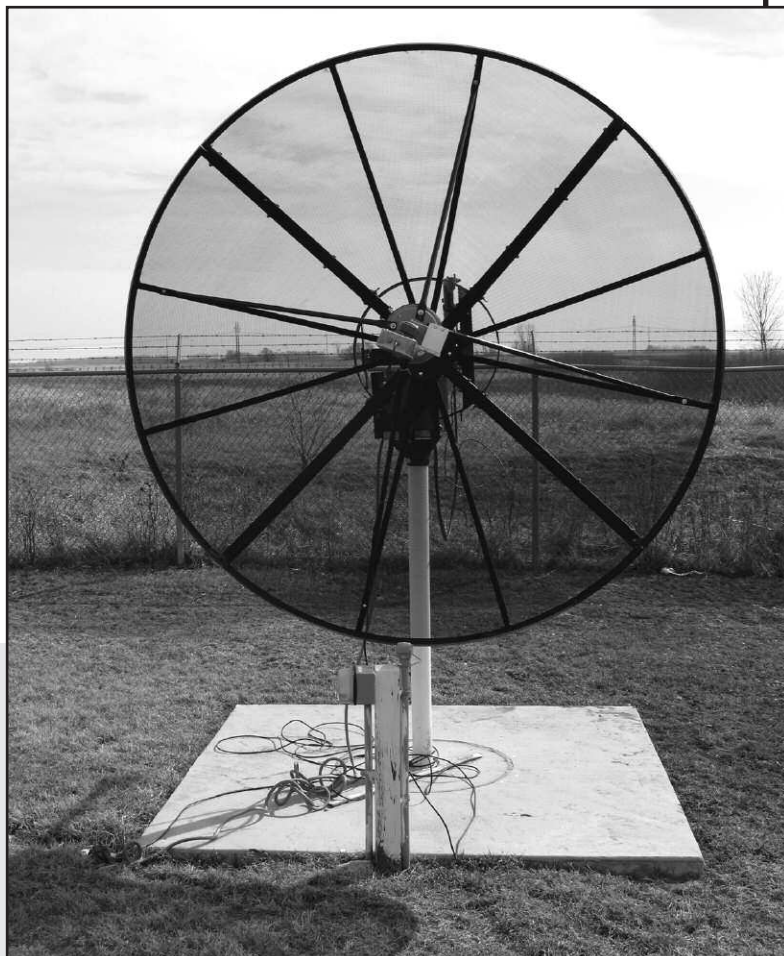
Summer 2007: Construction began for the second Internet observatory, which uses a 10-inch aperture telescope.

Fall 2007: The Planetary Sciences Observatory (PSO) was demolished and its telescope was donated to the Northern Skies Astronomical Society (NSAS).

May 2008: The roll-off roof for the third Internet observatory, with 16-inch-aperture telescope, was built.

Summer 2008: Complete construction and bring all four observatories online and operational.

By making all of the observatories operational, the UND Observatory will be ready to increase its user-load and will be able to accommodate observing requests from faculty and students from across North Dakota. Although located at UND, these observatories are a state-wide resource and offer an important avenue to introduce undergraduate and graduate students to astronomical hardware, different types of research instrumen-



The Small Ratio Telescope (SRT), installed during summer 2006, is undergoing testing in spring 2008 and is being used in a UND introductory radio astronomy course. Photo courtesy of Paul S. Hardersen

tion, and a variety of projects that these facilities enable. As in the United States as a whole, it is increasingly important to show North Dakota students the excitement of research, the value of the scientific method, and show students that they can successfully perform quality research (and not be afraid of the equipment!).

Research and education projects that can be conducted include broadband (*BVR*) photometric observations of asteroids and variable stars; astrometric searches for new asteroids, comets, and supernovae; and visible-wavelength stellar spectroscopy. The SRT conducts L-band observations at 1.42 GHz (hydrogen) and can conduct time-series observations of the Sun, which will be especially valuable in tracking solar outbursts during times of significant solar activity.

UND Observatory



The Planetary Sciences Observatory dome was demolished and removed in October 2007 to make way for a new internet-controllable observatory. By late summer 2008, UND Space Studies and the Space Grant Internet Telescope Network (SGITN) will be able to use four internet-accessible facilities for research and education.

Photo courtesy of Paul S. Hardersen

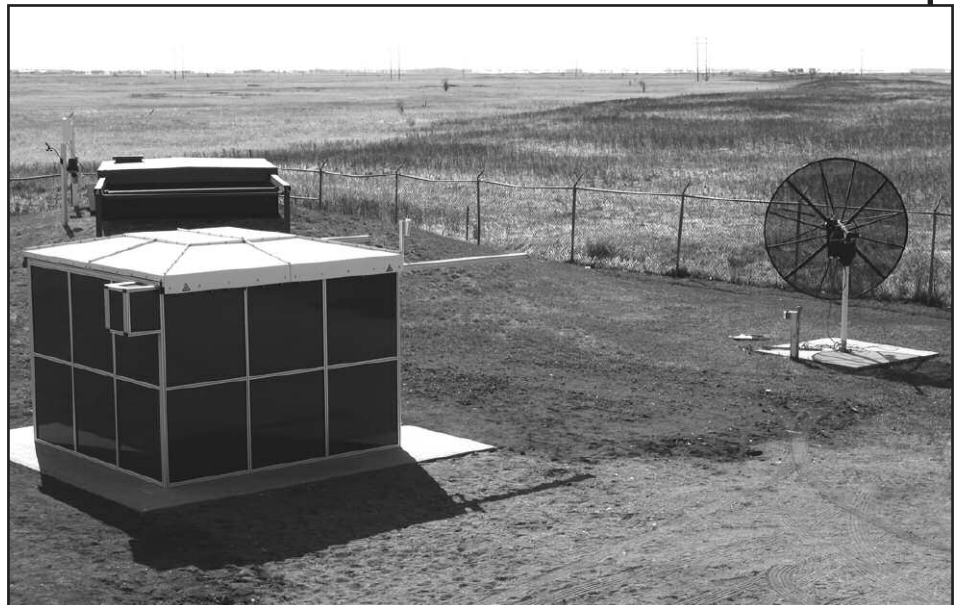
The past year has also witnessed the beginning of the Space Grant Internet Telescope Network (SGITN), which is envisioned as a geographically-distributed network of Internet-controllable observatories. The Network began operations in August 2007 and currently includes observatories in North Dakota (UND Observatory) and South Dakota (Badlands Observatory). Via remote observing, UND Space Studies distance M.S. students from Los Angeles, Pittsburgh, and Minneapolis have successfully used the Network's observatories for asteroid and variable star research projects. Also, a group from Puerto Rico has begun using the Network for binary star observations.

Observatories in other states have expressed an interest in joining the Network and an observatory from Utah State is expected to become the next member later in 2008. Interest has also been expressed at universities in Alabama and California. A tantalizing opportunity also exists in Australia – the Perth Observatory has offered to host an observatory for the Network, if we can find the funds, transport the equipment, and give Perth a share of the observing time!

The primary challenges in truly expanding astronomy research in North Dakota include attracting more students to the UND Observatory, to both learn the hardware and conduct rigorous research projects; increasing faculty funded research in the astronomy and planetary science fields; and in attract-

ing North Dakota faculty to use these facilities.

For the next year, expect more activity from the UND Observatory and a developing plan to offer an outreach program coordinated with the 2009 International Year of Astronomy. The 2009 IYA is a major public outreach and educational opportunity and initial plans are underway to develop a series of events and activities to bring astronomy to the public, show the excitement of our solar system and universe, and help people realize that astronomy and science are for everyone!



The newest roll-off roof, courtesy of Pier-Tech Inc., was built in spring 2008 and will house a 16-inch telescope and be primarily used for visible-wavelength spectroscopy of stars.

Photo courtesy of Paul S. Hardersen



Space Grant Activities

Affiliate Meeting

The third annual affiliate meeting of the North Dakota Space Grant Consortium (NDSGC) was held at the Best Western Seven Seas in Mandan, North Dakota, on Monday, May 7, 2007.

In attendance were: Suzette Rene Bieri, deputy director, UND; Kristi Black, Cankdeska Cikana Community College (Little Hoop Community College); Diane Christenson, Minot State University at Bottineau; Mike Collins, United Tribes Technical College; Shannon Dullea, North Dakota State College of Science; Juan Gomez, Bismarck State College; Gary Halvorson, Sitting Bull College; Paul Hardersen, interim director, UND; Don Hoff, Valley City State University; Corinne Krauss, Dickinson State University; Wanda Laducer, Turtle Mountain Community College; Virginia Makepeace, Space Grant Fellow, UND; Bob Miess, Mayville State University; Shaun Prince, Lake Region State College; Donna Seaboy, Sitting Bull College; John Webster, Minot State University; and Susan Zimmerman, Williston State College.

Agenda items included: scholarships; fellowships; internships; NDX-1 Space Suit; BalloonSat; FIRST Robotics; Student Rocket Initiative Project; Exploration Systems Mission Directorate; North Dakota Dark Skies; UND Observatory; Summer Faculty Fellowships; and the Space Grant Internet Telescope Network.

Discussion was held regarding the \$300,000 appropriation Space Grant received from the 2007 North Dakota Legislature.

Flyers were distributed to the affiliate members to publicize the scholarship and fellowship opportunities available through Space Grant. Methods to increase participation of women and minorities were suggested.

Paul Hardersen had been serving as interim director of Space Grant in North Dakota since fall of 2006. At this affiliate meeting he was unanimously elected director of the NDSGC.

Other Space Grant Meetings

The Western Regional Meeting of Space Grant was held in Oklahoma City on September 27-29, 2007. Attending from North Dakota were: Paul Hardersen, director; Suzette Rene Bieri, deputy director; and Mike Voglewede, science instructor at Northwood High School and co-advisor for the FIRST Robotics and BalloonSat teams at Northwood/Hatton High Schools. Dave Hedland, science instructor at Hatton High School and co-advisor for FIRST Robotics and BalloonSat teams at Northwood/Hatton High Schools, was also scheduled to attend but was unable to do so due to medical problems.

The National Space Grant Meeting was held in D.C. on February 28-March 1, 2008. Attending were: Hardersen; Bieri; and Don Hoff, affiliate representative from Valley City State University, advisor for that college's BalloonSat program, a 2007 recipient of a Summer Faculty Fellowship and North Dakota's Teacher in Space.*



*As North Dakota's Teacher in Space, Don Hoff worked with both educator Christa McAuliffe (Payload Specialist), who died in the explosion of STS-51L in January 1986, and with educator Barbara Morgan (Backup Payload Specialist) for that flight. Space Grant provided partial financial support so that Hoff could attend the launch of STS-118 in August 2007 on which Morgan was a Mission Specialist and became America's first teacher in space. Hoff is shown here moments after the launch of STS-118 from Kennedy Space Center with the contrail of the Space Shuttle visible in the background.

Photo courtesy of Don Hoff

Other Space Grant Activities



Student Research/Travel

The North Dakota Space Grant Consortium provided travel funds for three of its fellowship recipients to travel to national conferences to present posters/papers on their research.

Darci Block

Graduate Student at NDSU in Chemistry
Graduate Research Seminar on
Bioinorganic
Chemistry at the Gordon Research
Conference on Metals in Biology
January 31-February 3, 2008
Ventura, California

*"Elucidation of the Heme Transfer
Mechanism of PhuS—PaHo: Paradigm
for Iron Assimilation in
Gram-Negative Bacteria"*

John Polansky

Undergraduate Student at UND in
Mechanical Engineering
37th International Conference on
Environmental Systems
July 9-12, 2007
Chicago, Illinois
"Development of a Liquid Cooling Garment
for the NDX-1 Space Suit"
(Received second place in the
student poster session.)

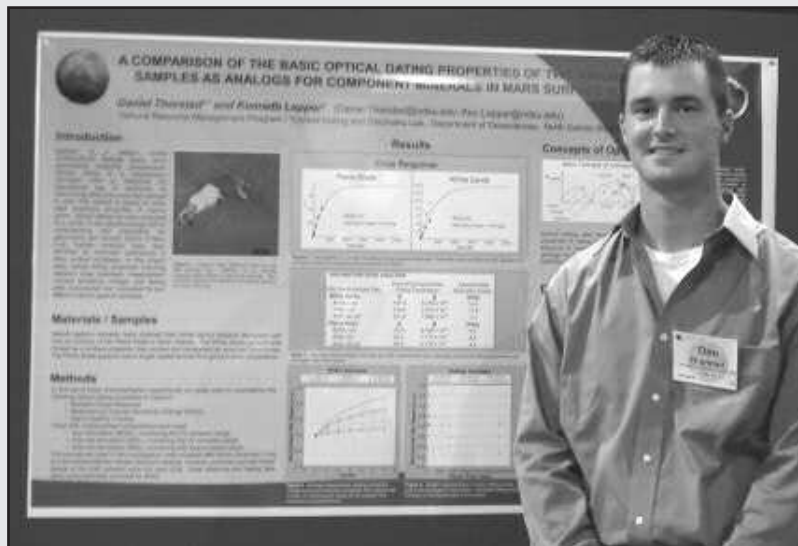


Photo courtesy of Daniel Thorstad

Daniel Thorstad

Undergraduate Student at NDSU in Natural
Resource Management/Geology
119th Annual Meeting of the Geological
Society of America
October 27-31, 2007
Denver, Colorado
"A Comparison of the Basic Optical Dating
Properties of Two Natural Gypsum
Samples as Analogs for Component
Minerals in
Mars Surface Sediments"

The North Dakota Space Grant Consortium (NDSGC) has a newly designed website. The address is
<http://www.ND.SpaceGrant.org>

Check this site for information about various programs and projects, including fellowships, scholarships, the UND internet observatory, BalloonSat, senior design projects and a variety of Space Grant funded college/university research.

BalloonSat

Wind Gust Slams Balloon to the Ground
Launch is a "No Go"

The BalloonSat Program in North Dakota has steadily grown over the years. So many payloads were built that a two balloon launch was planned in the fall of 2007. One balloon with its payloads was successfully launched. But, while being filled with helium, the second balloon was the victim of rapidly increasing winds. A sudden gust of wind slammed the balloon to the ground causing it to explode. Lack of additional helium prevented the last set of payloads from being launched.

The payloads from the first balloon launched were retrieved and the data later analyzed by the students.

Shortly after the attempted two balloon launch a decision was made to have two one-balloon launches rather than one two-balloon launch. Two complete new sets of

navigation equipment have been purchased by Space Grant and will be tested in the summer of 2008. One set will be taken to the western part of the state for launches under the direction of Dr. Corinne Krauss at Dickinson State University and the second set will remain at the University of North Dakota under the direction of Dr. Ron Fevig and John Nordlie.

The following schools and universities are involved with BalloonSat in North Dakota:

UND;
Northwood/Hatton High School;
Northwood/Hatton Middle School;
Valley City State University;
Century High School--Bismarck;
Horizon Middle School--Bismarck;
Dickinson State University; and
Hagen Junior High School--Dickinson.



FIRST Robotics

The North Dakota Space Grant Consortium provided financial support for five teams to compete in FIRST Robotics in the spring of 2008. The teams were from Northwood/Hatton High Schools, MayPort-Clifford-Galesburg High School, Cando High School, Rugby High School and the Boy Scouts Northern Lights Adventure Crew from Minot. All teams competed in the regionals in Minneapolis. Three teams from our state competed in the final round: Northwood/Hatton; Minot Boy Scouts; and Cando.

NORTHWOOD/HATTON ROBOTICS TEAM

Standing Left to right: Myles Leschied; Casey Kemp; Jenna Engen; Kari Jodock; Marin Aamold; Callie Berg; Matt Bahr; Mark Aamold; Justin Nygaard; Mike Voller; William Littlefield; Ben Thorsgard; Dani Gorres; Mike Todd; Russell Hoge; Ray Aamold. Sitting or kneeling: Mike Voglewede; Allison Aaland; Naomi Bumgardner; Jozette Hillebrand; Sophie Hoge; David Carpenter.

Northwood/Hatton High Schools have fielded very successful FIRST Robotics teams the past several years. In the spring of 2007, the team qualified for the national competition in Atlanta, Georgia by winning the prestigious Chairman's Award at the regional competition. That award honors the team that best represents a model for other teams to emulate and best embodies the purpose and goals of FIRST. The award helps keep the central focus of FIRST Robotics on inspiring greater levels of respect and honor for science and technology. The team again qualified for nationals in the spring of 2008.



CANDO CUBS ROBOTICS TEAM

Front Row: Danielle Miller; Whitney Schaefer; Tia Klein; Amy Swenson.

Second Row: Kayla Haugen; Nicole Larson; Adam Jorde.

Third Row: Jordan Sifuentes; Lucas Holien; Josh Haugen; Falan Johnson; Randy Hunt; Bruce Gibbens (mentor).

Fourth Row: Greg Westlind (mentor); Dave Wolsky (mentor); Jill Laturnus; Doug Lee.

Fifth Row: Tom Belzer (advisor); McKenzie Beck; Bobby Wolsky; Travis Westlind (mentor); Sarah Pederson; Derek Klein.

Not pictured: Faye Dunnigan and Marie Wolsky (mentors).

Science Teaching Enhancement Grants



Each year the North Dakota Space Grant Consortium (NDSGC) offers Science Teaching Enhancement Grants (STEG) to encourage North Dakota teachers to: upgrade demonstration or lab equipment; buy science software or books; build telescopes; take students on scientific field trips; or do any special science project that will be exciting for students. The goal of this program is to allow teachers in grades K-12 to try projects that are beyond the scope of current budgets. The STEG can not be used for salaries or administrative costs. The money must be used by teachers for the students in their classrooms. Due to an appropriation from the North Dakota Legislature in 2007, Space Grant was able to increase each STEG to \$750.



The Northwood Public School was totally destroyed on August 26, 2007 after being hit by an EF4 tornado. Photo courtesy of the Grand Forks Herald



Paul Hardersen presented a special STEG to Mike Vogelwede, high school science instructor at Northwood, during the Western Regional Space Grant Meeting in Oklahoma City in September 2007. Funds from the grant were used to replace science supplies and materials that were damaged/destroyed in the tornado.

2008 STEG Recipients

**Kay Brandenburger,
Sharon Terferh,
Marsha DeVine,
Deb Blaufuss,
Lori Matejcek and
Connie Madsen**
St. John's School
in Wahpeton

Sister Dannel Wedemeyer
Saint Bernard Mission School
In Fort Yates

Eileen Walker
Tappen Public School

JoAnn Schapp
Bishop Ryan High School
in Minot

**Sally Brovold,
Tammy Strobel and
Jami Kramlich**
Kulm Public School

Terri Greenwood
Westhope Public School

Darcy Blegen
Larimore Elementary
School

Eugene Kostelecky
Shiloh Christian School
in Bismarck

Ryan Bleth
Bismarck Public School

Mary Roth
Lisbon Public School

Richard Danielson
Dakota Prairie High School
in Petersburg

Janice Kanwischer
Fessenden Bowden School

Cheryl Kunda
Montefiore School District
in Wilton

Lisa Foulkes
West Fargo Community
High School

Dirk Smutzler
Hagen Junior High School
in Dickinson

**Pat Stroller and
Velma Yatskis**
St. John's Academy
in Jamestown

Nikki Wixo
Central Case School District
in Casselton

William Langer
Wolford High School

Lee Weisgarber
Underwood Public School

Reed Weisenburger
New Rockford Sheyenne
School

Jeni Peterson
Hope Page Public School
in Page

Amy Bergquist
Bowman County School

Tamara McNeiley
Kenmare Elementary
School

Everett Nelson
Central High School
in Grand Forks

Anjanette M. Elk
Dunseith Public School

Carissa Stafslin
Sterling School District

Dale Udem
Barnes County North
High School in Rogers

Pam Hintz
Grant County High School
in Elgin



Space Grant Fellowships

The NDSGC research fellowships are given on a competitive basis to undergraduate and graduate students at UND and NDSU who are doing research that is of particular interest to NASA.



Michael Dennis Sisk
Environmental Engineering
Graduate student
University of North Dakota
"Design Requirements for a Sustainable Habitation for Off Grid Operations"



Carrie Amiot
Analytical Chemistry
Graduate student
University of North Dakota
"Near-Infrared Tracers for the Evaluation of Pollutant Risk when an Environment is Exposed to Nano Materials"



Darci Block
Chemistry
Graduate student
North Dakota State University
"Elucidation of the Heme Transfer Mechanism of PhuS—PaHo: Paradigm for Iron Assimilation in Gram-Negative Bacteria"



Korby Heinsen
Mechanical Engineering
Undergraduate student
University of North Dakota
"Diffusion of Bonding of Iron-Based Alloys for High Temperature Applications"

Eric Kerr-Anderson
Mechanical Engineering
Undergraduate student
North Dakota State University
"Nano-Epoxy Resin for Improving Adhesion in High-Performance Composite Materials for Aerospace Applications"



Kendall Davis
Mechanical Engineering
Graduate student
North Dakota State University
"Optimization of Numerical Modeling of Plasma Flow Control"

Megan Minten
Animal and Range Science
Undergraduate student
North Dakota State University
"Angiogenesis During Tissue Remodeling"

Space Grant Fellowships



Emily Chwialkowski
Space Studies
Graduate student
University of North Dakota
"Human Space Flight Technologies"

Phillip Reindl
Computer Science
Undergraduate student
North Dakota State University
"Designing Effective Security Schemes for NASA Sensor Webs"



Aaron Kennedy
Meteorology
Graduate student
University of North Dakota
"Evaluation of the NASA GISS SCM Simulations Using Combined Surface and Satellite Observations"



John Polansky
Mechanical Engineering
Undergraduate student
University of North Dakota
"NDX-1 Space Suit Project"



Jordan Grassor
Chemical Engineering
Graduate student
University of North Dakota
"Optimization of Novel TiO_2 Nanotube Photocatalyst using High-Throughput Experimentation for Use in Indoor Air Purification"

Lisa Evans
Chemistry
Undergraduate student
North Dakota State University
"Continued Studies of NASA Supplied Coatings Under Acidic Conditions"



David Dvorak
Mechanical Engineering
Undergraduate student
University of North Dakota
"Utilizing Low-Cost Multi-Spectral UAV Imagery for Precision Agriculture"



Space Suit Laboratory

NDX-1

In the summer of 2007 the Mars Society and NASA Ames Research Center invited the North Dakota Space Grant Consortium to bring its planetary space suit (NDX-1) to the Mars Desert Research Station in Utah for additional testing.

Pablo de Leon, principal investigator for the NDX-1, and Fabio Sau, graduate student in the Department of Space Studies at UND, put the suit through extensive testing in the harsh desert environment that is quite similar to Mars. A "walk back" test was successfully completed. That test simulates a breakdown of a Mars rover which requires the astronaut(s) to "walk back" to the safety of the habitation module. Sau, wearing the NDX-1, was able to hike 3.5 kilometers.



Liquid Cooling Ventilation Garment (LCVG)

John Polansky, a student in the Department of Mechanical Engineering at UND, successfully designed, constructed and tested a liquid cooled underwear-like garment to be worn under the NDX-1 or other planetary space suits. Such inner garments with cooling mechanisms are needed to pull away the astronaut's body heat while wearing the space suit. This research project resulted in Polansky having two papers accepted at national conferences.



Spacecraft Simulator



This vertical spacecraft simulator was designed and constructed by students from UND in the Departments of Space Studies, Mechanical Engineering and Electrical Engineering. Pablo de Leon was the principal investigator for the project. The spacecraft simulates launch, orbital operations and landings of Vostok, Mercury, Gemini, Apollo, Soyuz and Orion, NASA's newly designed Crew Exploration Vehicle. The spacecraft simulator is used for academic and research purposes by students enrolled in life science, aviation, orbital mechanics and engineering classes. It is available on a limited basis to visitors to the UND campus.

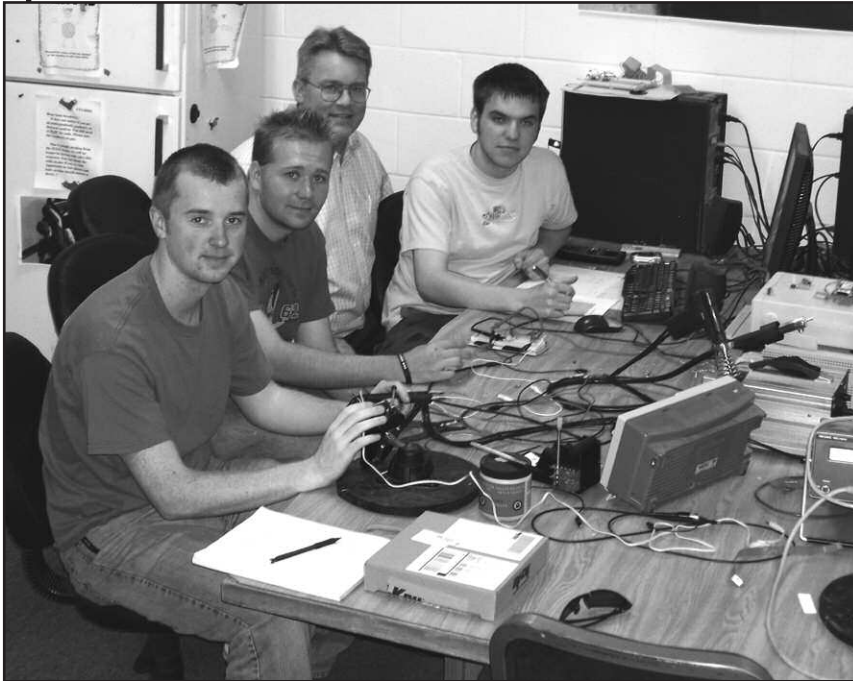
The simulator is the approximate size of the original Apollo Command Module that took the American astronauts to the Moon in the 1960s and early 1970s. It can accommodate three people at a time. The simulator is housed in Ryan Hall at the J. D. Odegard School of Aerospace Sciences at UND.

A horizontal spacecraft simulator is currently being designed at UND which will be used to simulate the flights of Spaceship One which was the first privately built spacecraft to reach space in 2004.





Space Grant Flies High



Left to right: Kyle Anderson; Nathan Ambler; Ron Fevig; and James Jemtrude.

High Altitude Student Platform (HASP)

The North Dakota Space Grant Consortium, the School of Engineering and Mines, the Department of Space Studies at the University of North Dakota, and the University of North Florida recently formed a research partnership actively participating in the High-Altitude Student Platform (HASP) program. HASP, managed by Louisiana State University and NASA's Wallops Flight Facility, provides space on a high-altitude balloon for student-built payloads. HASP carries up to twelve student payloads to an altitude of 36 kilometers (~120,000 ft) with flight durations between 15 and 20 hours using a small volume, zero pressure balloon. The University of North Dakota payload tests an experimental solid state sensor that detects ozone. Such a sensor demonstrates great promise in more accurately detecting ozone over existing sensor designs. Validation of this cutting-edge sensor technology stands to revolutionize the design of sensors used both on Earth and in space. Highly accurate sensor measurements are critical for understanding both terrestrial and extraterrestrial environments. This research effort stands to fulfill critical needs identified by NASA in the fulfillment of the Vision for Space Exploration, the future of spaceflight and space habitations.

University Student Launch Initiative (USLI)

Frozen Fury Rocketry Team

UND's Frozen Fury rocketry team participated and placed second out of 11 teams in the University Student Launch Initiative (USLI) in the spring of 2008. This program is administered by NASA's Marshall Space Flight Center in Huntsville, AL. The goals of the competition are to launch a rocket containing an original scientific payload closest to one mile, safely retrieve the rocket payload, collect and analyze the scientific data, write four scientific reports posted on the team's website and develop a public outreach program. Throughout the 2007-2008 academic year, the rocket team participated in the following: designed a Geiger counter detector and recording apparatus; designed and fabricated a rocket to fly the Geiger counter; tested the payload and the rocket in both a scaled test launch and a full scale test launch; and on April 19, 2008 launched the rocket at the national competition in Huntsville, Alabama.



Left to right: Matthew Voigt; Kyle Anderson; Meagan Schaal; John McClure; Will Swearson; Arjay Eve; Lindsay Anderson; Tim Young; and Tricia Johnson.

Other Space Grant Projects



Left to right: Jesi Ehrhorn; Phil Siemieniewsky; Nick Philippi; Brandon Steinhauer; and Jeremy Reed.

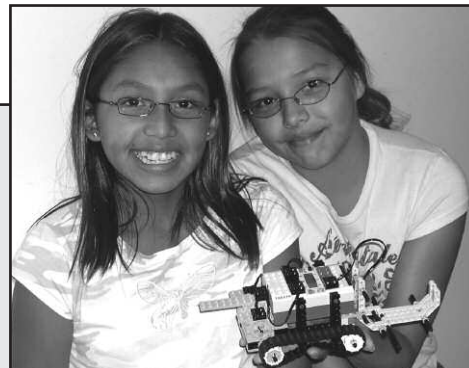
Human Powered Still

Space Grant provided partial travel funds for a team from UND to participate in the 2007 ASME International Convention in Seattle, Washington. The team qualified for that competition after winning the student design contest in District C at West Lafayette, Indiana. Students from the Department of Mechanical Engineering made a human-powered still for the purpose of heating water to reach boiling temperatures after which the steam could be condensed to generate potable water. The advisor for the project was Dr. Will Semke.



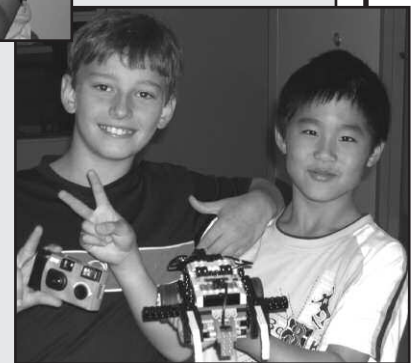
Robotics Workshop

In the summer of 2007 the North Dakota Space Grant Consortium and Fort Berthold Community College co-sponsored a Robotics Workshop on the Fort Berthold Indian Reservation for area faculty, teachers and students. The workshop was conducted in two sessions held several weeks apart. Twenty-five participants attended the first session. The word spread that this was a most interesting and exciting workshop; 45 participants showed up for the second session. Facilitators for the workshop were Mike Voglewede and Dave Hedland, long time advisors of the FIRST Robotics team at Northwood-Hatton High Schools.



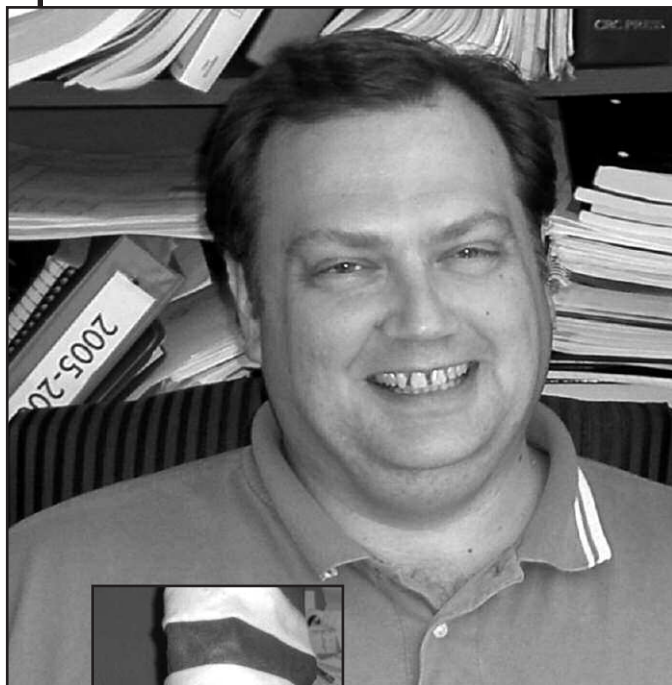
cScibot Experience

The Department of Computer Science at UND and the NDSGC co-sponsored two introductory robotics camps, cScibot Experience, for area young people ages 10-14 in the summer of 2007. A total of 44 youngsters participated. Tom Stokke, instructor in the Department of Computer Science, said, "The camp was a lot of fun. It was great to see the kids so fired-up to work with the robots; at times they actually ran from the computer room to the classroom where they would test their projects." The response from participants was so positive that plans are to add an advanced cSciBot Experience in the summer of 2008.





NDSGC Briefs



Dr. Bob Miess, Associate Professor, in his campus office (above). Bob Miess, Comet Radio personality, in his Comet hat which he wears while he is on-air and at athletic events (left).

Meet an Affiliate Bob Miess

Bob Miess is an Associate Professor and the Chair of the Division of Science & Mathematics at Mayville State University (MaSU) where he has been teaching chemistry, biology, and mathematics for 15 years. He has a Ph. D. in organic chemistry from Texas A & M University and completed his undergraduate work at Viterbo College in La Crosse, WI. A native of Wisconsin, Miess joined the MaSU staff right out of graduate school. He has been recognized by the North Dakota Public Employees Association for his service to MaSU and to North Dakota as the "Outstanding Public Employee of the Year" in 1998 and by the MaSU Student Senate for his service to MaSU as the "Teacher of the Year" in 2007.

When not in the classroom, Bob is busy elsewhere on campus. He has appeared in almost twenty theatre productions at MaSU through the years. Last year he was part of the barber-shop quartet in Meredith Wilson's "The Music Man" and played Ranger Tom in Jeff Daniels' "Escanaba in da Moonlight." His most recent extracurricular adventure has been into Comet Radio, the MaSU student radio initiative. He and Jeff Sieg, MaSU Assistant Professor, host a weekly broadcast called "In The Lab" which highlights rock music, classic to alternative. Away from campus, Bob likes to garden and play with his cats.

Regional Educator Resource Center

The NDSGC worked closely this past year with the NASA Regional Educator Resource Center which is located in the Department of Space Studies at UND. Space Grant provided support in terms of logistics and finances. That made it possible for the NDSGC to give space science materials to teachers around the state. Some of those materials were distributed through in-service workshops while others were provided via the mail.

Pre-Service Workshops

Space Grant worked very hard to develop relationships with the Departments of Education at six of the universities in the state. Pre-service workshops were held at the University of North Dakota, North Dakota State University, Mayville State University, Valley City State University, Jamestown College and Dickinson State University.

StarDate™

The North Dakota Space Grant Consortium (NDSGC) is currently underwriting the StarDate programs on the North Dakota Public Radio Network (NDPR) as part of its public outreach goals. StarDate is broadcast each morning, Monday through Friday, shortly after the 7:30am (CT) newscast. That is when the woman with the lovely voice says, "This broadcast is made possible by the North Dakota Space Grant Consortium, a NASA sponsored program whose mission is the enhancement of the NASA-related research and education infrastructure in North Dakota. See our web site at www.space.edu/spacegrant"

NDPR has eight full power transmitter stations and eleven translator stations which combine to reach more than 250,000 listeners each week. The underwriting by NDSGC covers the acquisition, production and distribution fees for the StarDate programs to all 20 stations involved.