

The Aurora

Spring Semester 2004

North Dakota Space Grant Consortium

- University of North Dakota
 North Dakota State University
- Dickinson State University
 Mayville State University
 Minot State University
 Valley City University
- Candeska 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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We're Bullish About the Future

Dear Friends of NDSGC,

It is with great pleasure and pride that we invite you once again to join us in this written highlight of NDSGC activities for the past year. We continue to serve our mission and NASA effectively and abundantly. And we are bullish about the future.

A major effort during the last several months has been to continue to build our consortium identify and there is now regular contact with the affiliates. We are committed to increased communication as evidenced by our recent inaugural leg of "Priscilla: Queen of the Prairie" road trip to meet with affiliates. Neither of us can sing or dance but we did a lot of driving in wide open spaces just like was done in "Priscilla: Queen of the Desert." Why did we do this in the middle of February? Well, it just seemed like a good idea at the time. That we are still speaking to each other after nine college visits and four days on rural roads in winter driving conditions, speaks volumes to our collegiality, commitment and endurance. We are delighted at the response to our visits and look forward to completing the tour over the next few months.

In these pages, you will see that our strength continues to be education infrastructure with a focus on human capital—an abundant and high quality North Dakota resource. Our K-12 and higher education programs continue to thrive with record dollars going to our Science Teaching Enhancement Grants, scholarship and fellowship programs. You will read about some of our activities through the experiences of many students and groups that the NDSGC has sponsored; we will leave it to them to speak about those projects.

Of special mention here is that our Aerospace Workforce Development Initiative, North Dakota Space Training and Research (ND STaR 2003), was a major success that deepened the impact of the NDSGC to the pipeline of a well prepared science workforce. The Space on the Prairie conference held in August at UND highlighted ND STaR recipients and many other NDSGC activities. The conference was attended by state and local politicians, community leaders and administrative officials from UND. We were especially pleased at the participation at the conference of Dr. Gregg Buckingham of Kennedy Space Center, Governor John Hoeven and U.S. Senator Byron Dorgan.

We have just been notified that a new project, ND STaR 2004, has been approved by NASA Headquarters for funding; also approved was a multi-state (North Dakota included) consortium proposal, NativeView, to train American Indians in geospatial technologies. We are very proud of our proposals as they were funded on a competitive basis. We look forward to implementing these new programs in the coming year. Watch for further announcements!

There are other pieces of good news. Shan has been elected to the Board of the Space Grant Alliance where he is committed to promoting and defending the interests of the low population states, Suezette has a new orange cat named Komodo Man Cat, Bob Peckyno (our webmaster) has re-designed the NDSGC webpage (www.space.edu/spacegrant) and SPACE.EDU has just graduated it 200th masters student in Space Studies.

We'll keep you posted.

Hot Rocks, Cool Trip 2003

The North Dakota Space Grant Consortium (NDSGC) encourages undergraduate and graduate students to attend national and international conferences that will be of benefit to them both academically and professionally.

Last year the NDSGC provided financial support to Aric Brackel, an undergraduate student in the Department of Geology at the University of North Dakota (UND), to attend the Lunar and Planetary Science Conference in Houston, TX. NDSGC also funded Trygve "Spike" Magelssen, a graduate student in the Department of Space Studies at UND, to attend the Space Technology and Applications Forum 2003 in Albuquerque, NM, where he co-authored a paper entitled "Human Mission from Planet Earth: Assessing the Future of Space" with Dr. Eligar Sadeh, his advisor. Three individuals from UND also attended the Great Plains Super Launch and Ballooning Conference in Boulder, CO, under the sponsorship of NDSGC. They were: John Nordlie, a researcher at the Regional Weather Information Center; Ryan Kramer, a graduate of the Department of Computer Science and webmaster for SPACE.EDU; and Mike Gerszewski, a graduate of the Department of Computer Science and now a graduate student in the Department of Space Studies.

Aloha! This past summer a group of eight UND students left the flat farm lands of eastern North Dakota and headed west for the lush greenery of Hawaii. More than that, though, we left in search of the knowledge and experience of studying volcanology in one of the Earth's most active volcanic regions. After a semester of learning about the in-depth processes associated with volcanology, we were finally able to apply many of the concepts we had learned. Shan de Silva, our professor and chair of UND's Department of Space Studies, headed the field trip and helped guide the daily excursions that we made to some of Hawaii's most famous volcanoes.

The trip started at 5:00 am when we boarded our plane for the first leg of a 12 hour flight to Honolulu. Upon arrival, we were greeted by green-blue seas and palm trees. After a day of fun and excitement, we departed Honolulu for the town of Hilo, home to Kilauea, one of Hawaii's most prominent volcanoes.

On day three of our trip, we visited Kilauea caldera, hiked up to the summit of Mauna Loa, viewed numerous tree molds, steam vents and a classic example of the differences between pahoehoe and aa flow fields. We were also able to travel down the Chain of Craters Road and hike in about two to three miles to see some of the active lava flows. As the Sun set, we were fortunate enough to sit and watch the waves roll in on the black sand beach at West Highcastle Point. As darkness fell, we once again



Yan Lavallée collects real live lava!



The survivors of the trek to the breakouts. From left: Jessie Yelick; Yan Lavallée; Shan de Silva; Scott Backman; Richard Suggs; Ryan Kramer; Dan Knippes. Not present: Brandee Pang and Andri Hanson.



hiked back up to the areas of active flow and observed the pali become red as new breakouts released 1200 degree Centigrade basaltic lava.

Day four consisted of time with the USGS (United States Geological Survey), sitting in on a meeting, touring the area with Don Swanson, head of the Hawaii Volcano Observatory (HVO), and even doing some surveying work of a very prominent rift zone in the region. We were able to get an “insiders” look at some of the research they had conducted on Kilauea, as well as a very in-depth explanation of the processes that took, and are taking, place on the volcano.

Our fifth day was spent hiking about two miles in to a green sand beach, visiting the city of Kona and then traveling back to Volcano. There, we had the opportunity to listen to Rick Hoblitt of the HVO give a presentation about the Mother’s Day flow progression at Pu’u O’o. Our next two days were a little less hectic, but still very interesting.

A lava tube tour and visit to a local museum took up most of one day and then, on day seven, we drove up 13,300 feet to the summit of Mauna Kea. An extensive tour of the IRTF (Infrared Telescope Facility), as well as the Gemini and Keck Telescopes, rounded off the day. After a quick drive to Hilo, we boarded the plane, headed back to Honolulu, relaxed and then made the final stretch home on a non-stop flight to Minneapolis.

Overall, the trip was one that none of us will ever forget. We had the opportunity to apply ourselves, expand our knowledge of volcanology, build closer relationships with our classmates and, in the midst of it all, have the time of our lives!

by Jessica Yelick
undecided major, minor in Space Studies
undergraduate, UND



The *Nautilus* mission of the North Dakota High Altitude Balloon Group (NDHABG) successfully reached an altitude of more than 85,000 feet. This image was taken by *Nautilus* of the farm land in the Upper Red River Valley on the North Dakota/Minnesota border.

Up, Up and Away...

The North Dakota High Altitude Balloon Group

The North Dakota High Altitude Balloon Group (NDHABG) had another successful summer of balloon flights. By the end of August we flew four flights and tested new tracking technologies. With help from North Dakota Space Grant Consortium, three of our members also attended the Great Plains Super Launch (GPSL) 2003 in Boulder, CO.

The primary purpose of the first of our summer flights in April was to test a new tracking payload using a Byonics TinyTrack III position encoder, a Motorola M12 GPS engine, and a Yaesu VX-1R Amateur Radio transmitter, all funded out of pocket by various members. This flight was sponsored by the University of North Dakota Electrical Engineering (UNDEE)

ZAMBONI microsatellite project. The NDHABG provided our tracking payload and chasers in exchange for the ZAMBONI project funding our flight. This flight was a successful test for both our new tracking payload and the ZAMBONI system. Our August flight and one of our June flights were also funded by UNDEE’s ZAMBONI and CubeSat projects. The Dakota Science Center’s “Science and the Circle of Life” summer camp funded our other June flight.

The North Dakota Space Grant Consortium funded trip to the GPSL was an enlightening experience for the three members who attended. This meeting of scientific ballooning groups met from June 12-14 at the University of Colorado in Boulder, CO. The GPSL was held in Boulder to facilitate the University of Colorado Space Grant College BalloonSat Workshop. The workshop attendees provided the scientific payloads (cameras, temperature sensors, pressure sensors, etc.), balloons and helium while the GPSL provided the tracking payloads, balloon filling experience, and chasing experience. We had informative discussions with a couple of Denver International flight controllers from the Federal

Aviation Administration (FAA). Talks from other balloon groups included information on radio propagation, the history of manned ballooning, and information on new methods to keep the FAA informed of the position of scientific balloon payloads during flight. At the launch on Saturday we compared our filling systems and methods to those of the other groups and learned a few new tricks along the way. The launch was very successful with six balloon trains being launched simultaneously, most flying BalloonSat payloads.

This winter and next summer we plan on working with the University of North Dakota’s Energy and Environmental Research Center. This collaboration will be to evaluate the effectiveness of particulate sampling in the lower atmosphere with balloon flights.

by Michael Gerszewski
graduate student in Space Studies
UND



Moonbuggy Races to First Place

A team of NDSU students overcame a grueling, obstacle-strewn course and claimed victory in the college division of NASA's 10th annual "Great Moonbuggy Race" held April 12, 2003 in Huntsville, Ala.

The NDSU team topped 23 college and university teams from 10 states and Puerto Rico. In addition to the first place honor, the team earned a trip to NASA's Kennedy Space Center, to view a Space Shuttle launch. Team members received a \$3,500 cash award, a plaque, medallions and duffel bags bearing the Great Moonbuggy Race logo.

Vehicles powered by two team members--one male and one female--raced one at a time over a half-mile obstacle course of simulated moon-scape terrain at Huntsville's U.S. Space and Rocket Center.

Troy Redlinger and teammate Danielle Baumann, both seniors majoring in mechanical engineering, piloted the winning vehicle, which was designed and built as a class project. The other members of the team were seniors Sebastian Ertelt and Justin Pavlish.

"The students performed in record time, and it was a really tough course they had," said team adviser Mohammad Mahinfalah, Associate Professor of Mechanical Engineering. "I am very proud of our students. I'm proud that they can go anywhere; they can compete and come out on top. That's an amazing feeling to have."

According to Mahinfalah, this was the sixth time NDSU students have participated in the event, each time building on previous experience. "This was the work of not just this year's team, but every team we have had in the past," he said. "This is an ongoing process where we design every year something unique for our buggy. You just pick up on the best parts of the designs of the past, put them together and you have an amazing machine."

The competition is inspired by the actual lunar roving vehicle project, which was accomplished at NASA's Marshall Space Flight Center during the 1960s and 1970s. The race challenges students to design and build a human-powered vehicle so they will learn how to deal with real-world engineering problems, such as those faced by the actual NASA lunar rover team.

The North Dakota Space Grant Consortium provided partial funding for this project.

courtesy of NDSU University Relations

The NDSU 2003 Moonbuggy Experience

Both of NDSU teams enjoyed the great Moonbuggy race even though one of the teams had technical difficulties on the first run. I was the team leader of the team that had difficulties and the help from the NASA staff was greatly appreciated. Without the mechanics and materials provided by the Space Center, our team would not have been able to complete the second run. The mechanics were very willing to help students and they provided a great selection of tools. Our team had a steering pivot break free from the frame; the mechanics provided us with drills, bolts, an experienced welder and some metal supports to help connect the steering to the buggy for the second run. Personally I was very impressed with all of their help.

Aside for the difficulties and the help from the mechanics, the Marshall Space Flight Center was very accommodating. The facilities provided good information about the space program. The provided lunch and ice cold water was very enjoyable on a warm day; it felt very good to sit down inside of an air conditioned building for a few minutes to get away from fixing the buggy. The racing layout worked very well; there were no major time delays or confusion at the starting line. The race course had a good design, but some improvements could have been made. If I had a say in the course design I would change some of the obstacles.

Over all I would rate the NASA Great Moonbuggy Race a 9.99 on a scale of 1-10, with 10 being excellent.

by Eric Schwingler
major in Mechanical Engineering
NDSU

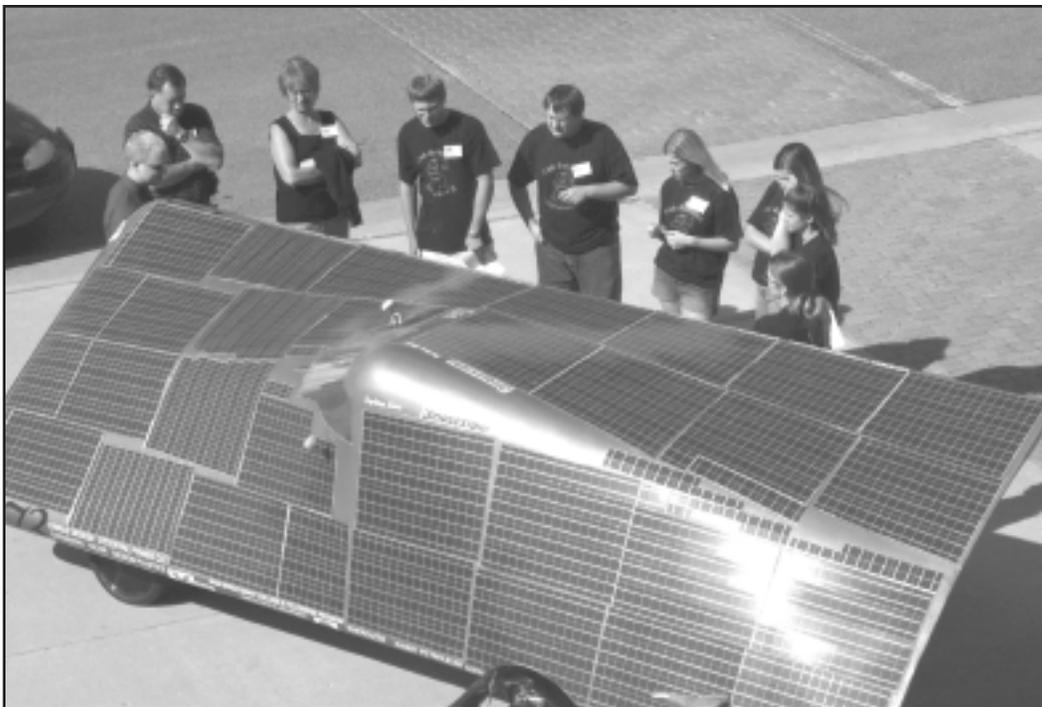


NDSU Moonbuggy team #1 takes first. Left to right: Dr. Mohammad Mahinfalah, Danielle Bauman, Sebastian Ertelt and Troy Redlinger. Not pictured is Dr. Reza Nakhaie Jazar and Justin Pavlish.



NDSU Moonbuggy team #2 takes seventh. Left to right: Tim Swenson, Natalie Halstensgaard, Kurt Lehner, Eric Schwingler, Dr. Mohammad Mahinfalah and Jason Berg. Not pictured is Dr. Reza Nakhaie Jazar.

UND Solar Car Morphs into Fuel Cell Car



UND's Solar Car research has been phased out; in its place is exciting new research for a Fuel Cell Car. The Society for Energy Alternatives (SEA) at UND has spent the past year in transition as students began designing the new vehicle and did fund raising. Plans are to have the Fuel Cell Car ready to race in the spring of 2004. Student leaders in the project are Keith Severson of the Department of Industrial Technology and Anna Vosgerau of the Department of Accounting. The advisor for SEA is Scott Tolbert, Assistant Professor of the Department of Mechanical Engineering. The North Dakota Space Grant Consortium is pleased to have provided funding for both past and present projects

UND's Solar Car was on display at the Space on the Prairie Conference held in August in Grand Forks. The conference was sponsored by the NDSGC.

K-12 Education

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 provide space science materials to teachers around the state. Some of those materials were distributed through inservice workshops while others were provided via the mail.

ND Space Grant worked very hard to develop relationships with the Departments of Education at the four year universities in the state. Preservice workshops were held each semester at the University of North Dakota, North Dakota State University, Mayville State University and Valley City State University. NASA space science materials were also offered to science education classes at Dickinson State University and the University of Mary.

Presentations on space science were made in K-12 classrooms in the state using both the staff of ND Space Grant and the faculty and graduate students of the Department of Space Studies at UND. Space Grant provided speakers for Aviation Career Days, Centennial of Flight Days and the Mars Millennium Project. In each of those cases, Space Grant "piggy backed" or partnered with a school that was already planning a special space project. Space Grant provided speakers on a regular basis

to classrooms requesting a speaker on topics such as astronomy, living in space or the Space Shuttle.

Last year ND Space Grant provided 38 Science Teaching Enhancement Grants to K-12 educators in the state. Given on a competitive basis, the \$250 grants were given to those teachers who proposed an innovative way to teach mathematics or science. The awards could not be used for administrative costs or salary but had to be used in a manner that would directly benefit the students in the classroom. Space Grant was conscientious about giving as many of those grants as possible to schools with students that have been traditionally under represented or to those schools whose science budgets were woefully inadequate.

I have found Ms. Bieri and the Space Grant outreach that she has provided me and my students to be an invaluable resource. The materials and information which are provided as a result of her visits to our campus not only give our students resources for future lessons in space science, but the presentations serve to stimulate an interest in and an appreciation for space science and NASA.

Jeffrey R. Sieg,
Mayville State University
Assistant Professor of Elementary Education



North Dakota Space Training and Research (ND STaR)

A NASA Workforce Development Initiative

The North Dakota Space Grant Consortium (NDSGC) was awarded a \$95,000 workforce development grant for 2003 from NASA Headquarters to provide summer research fellowships to undergraduate students from the two year, four year and tribal colleges in the state. The research itself was conducted at North Dakota's two doctoral granting institutions of higher education, UND and NDSU. Ten students from four different colleges participated. As part of the grant, a conference entitled Space on the Prairie was held to showcase the human capital of North Dakota. At the conference, high school students, undergraduate students, graduate students and faculty presented poster demonstrations on research and technology projects that have been funded by NASA Space Grant and NASA EPSCoR. John Hoeven, Governor of North Dakota, was the keynote speaker, and Byron Dorgan, U.S. Senator from North Dakota, was the distinguished guest. Approximately 140 persons attended the conference in August in Grand Forks.

My summer research dealt with using a 1-D video disdrometer, developed by Dr. Larry Bliven of NASA at Wallops Island, to try and obtain snowfall rates and water equivalence leading to the ultimate goal of a Z-R relationship for the Grand Forks, ND area. This research gave me the opportunity to travel twice to the Wallops Island facility and discuss problems and improvements with Dr. Bliven himself. Not only was I very impressed with the research there, but I felt the atmosphere felt very conducive for research.

During the summer we found those goals to be somewhat lofty at this juncture because we had never dealt with this instrument and it had never seen snow before. However, we still learned the characteristics of the instrument when imaging snowfall and we have software changes and lab experiments planned to overcome the issues we discovered this past summer. This is part of the reason I am continuing this research throughout the school year.

The larger reason is the great potential of this instrument combined with the resources we have here at UND. UND currently has an observation site that will be equipped with rain gauges, radiometers, two upgraded disdrometers and a dual-polarimetric radar with a 915 MHz wind profiler coming this spring. This will give us the ability to have many different observations for validating the disdrometer results along with developing polarimetric snowfall relationships and many other things still being considered.

by Andrew Newman
atmospheric sciences major
*Analysis of Radar and In Situ
Measurements of Snowfall*

This summer I assisted in verification of a new cardiac visco-elastic model for the left ventricle at NDSU, using calf and swine data from the University of Louisville. Viscoelastic properties broadly refer to frictional and deformational properties of cardiac muscle tissue; elastic properties indicate how easily a material deforms, while viscous properties indicate how much friction is created when the material deforms. The cardiac visco-elastic model may have applications in tracking changes in the heart's performance due to prolonged microgravity exposure and even bed rest on Earth.

During this research I applied engineering principles from my coursework to this complex physiological problem. An exciting part of this work is that it could someday make a significant impact in someone's life. I also learned about the diverse disciplines and perspectives of researchers approaching similar problems, which has opened my eyes to many different career paths.

by Nathan Grenz
electrical engineering major
*Estimating Cardiac
Viscoelastic Properties*



Kevin Zimmerman, ND STaR recipient, is shown in a laboratory at the Energy and Environmental Research Center at UND in the summer of 2003



"NASA. Wow, that sounds intriguing," I said to my friend. He had just proposed a summer grant research internship sponsored by ND STaR, which was funded by NASA. I had been looking for a job and this, by far, was the best thing yet. So I applied. I worked and still am working on a project that utilizes anaerobic degradation of potato waste to convert into methane gas, a combustible energy fuel. The focus of the summer was to construct a two-stage reactor for the process. It was just completed when the internship came to an end. It was a disappointment to not see the reactor in action, so I gladly accepted an extension into the next semester to work on the project. I am pleased that I took this opportunity to immerse myself in the process and nature of research. Not only is this fellowship educational, but also is a great stepping stone into the professional world.

by Kevin Zimmerman
undecided regarding major
*Anaerobic Waste
Treatment System*

This summer I was given the opportunity to gain some real world experience by participating in the North Dakota Space Training and Research (ND STaR) project. The project I chose was to address the integration issues involved between the structures and life support systems to be used for a greenhouse on Mars or the Moon, and to propose a design for a greenhouse test pod to examine new innovative technologies. The components of the project consisted of performing research, interacting with professionals in the field by means of telephone conferences, e-mail, a site visit to a NASA center, also writing a technical paper on my research and modeling my design for the greenhouse on an engineering modeling program. I chose to visit Kennedy Space Center for my site visit. Before I made the trip to balmy Florida, I corresponded with my mentors at Kennedy Space Center on multiple occasions gaining feedback and asking them questions pertaining to my research. I also went prepared to perform a power point presentation on my design ideas in order to gain insightful feedback and criticism. I had no idea when I started this project what the road ahead had in store for me. I was, as a result of this project, offered the opportunity to go beyond just sharing my research with my mentors and a group of professionals at Kennedy Space Center, to presenting my research at a the Space Habitation 2004 conference in Orlando in January of this year.

Being able to participate in a program such as the ND STaR program has provided for me a platform on which to stand in this world of competitive job markets.

by Sarah Kavli
mechanical engineering major
with aerospace emphasis
*Deployable Greenhouse
Integration Issues*

ND STaR Summer Fellowships

Nathan Grenz at NDSU
electrical engineering major
Advisor: Dr. Dan Ewert
*Estimating Cardiac
Viscoelastic Properties*

Sarah Kavli at UND
mechanical engineering major
with aerospace emphasis
Advisor: Dr. Eligar Sadeh
*Deployable Greenhouse
Integration Issues*

Scott Backman at UND
physics major
Advisor: Dr. Paul Hardersen
*The New UND Observatory:
Plans for a 1-meter Class
Telescope for Research and
State-Wide Educational
Outreach*

Andrew Newman at UND
atmospheric sciences major
Advisor: Dr. Paul Kucera
*Analysis of Radar and
In Situ Measurements
of Snowfall*

Aric Brackel at UND
geology major
Advisor: Dr. Jeff Byrnes
*Morphologic Analysis of
Amphitrites, Peneus, Malea
and Pityusa Paterae, Mars*

Ben Beiber at UND
mechanical
engineering major
Advisor: Dr. William Semke
CubeSat Spacecraft Bus

Jonathan Renner at UND
chemical engineering major
Advisor: Dr. John Hurley
*Silicon Carbide Armor
Applications*

**Eric Hanson
(from Bismarck State College)
at UND**
biotechnology major
Advisor: Dr. Michael Holmes
*Reforming Fuel Cells that
Require Hydrogen for Opposition*

**Michael Kindel
(from Williston State College)
at UND**
mechanical
engineering major
Advisor: Dr. Brad Stevens
*Regional Wing
Variability Study*

Kevin Zimmerman at UND
undecided regarding major
Advisor: Dr. Dan Stepan
*Anaerobic Waste
Treatment System*

The ND STaR research that I was involved with was silicon carbide armor applications. The purpose of the research was to research possible applications of silicon carbide in protecting space structures from micrometeoroids. The research was also geared towards possible body armor applications. The research was performed at the Energy and Environmental Research Center (EERC) in Grand Forks, ND.

Silicon carbide is a very hard material that is resistive to high temperatures. The EERC casts silicon carbide as slurry which allows near net shape production. Furthermore, the reaction bonded production that is performed eliminates continuous channels of silicon which can weaken the silicon carbide at temperatures above 1200° C. Other current industrial production methods are plagued with these continuous silicon channels. The EERC and ND STaR sponsored silicon carbide research provides significant advantages over current industrially made silicon carbide.

by Jonathan Renner
chemical engineering major
*Silicon Carbide Armor
Applications*



NDSGC Research Fellowships

The NDSGC research fellowships are given on a competitive basis to undergraduate and graduate students at UND and NDSU who are interested in doing serious supervised science research in a variety of disciplines. Fellowships are also given to graduate and undergraduate students who are involved in research projects that are of particular interest to NASA such as the NDSU Moon Buggy, the KC-135 Project, UND Solar/Fuel Car, CubeSat and the High Altitude Balloon Group. Each student is allowed a maximum of two semesters worth of fellowship money. Emphasis is given to those students at the undergraduate level who want a research experience. We hope in this way to get those students in the STEM pipeline.

Over the years I have had many students participate in our Space Grant program. Two of my students went on to obtain their Ph.D.'s in Biomedical Engineering, one at Johns Hopkins and the other at University of Texas--Austin. Still others went on to industrial jobs--space power systems at Lockheed Martin and IBM to name a few. These life-changing opportunities were realized, in part, by the opportunities afforded them by the Space Grant program.

Dr. Dan Ewert
North Dakota State University
Chair of Electrical Engineering

My graduate and undergraduate students have received several fellowships from NASA in the past ten years. These fellowships have provided the support that we needed in our program to do research and innovative design. As a result, I have had students who graduated from our program with a much broader education and interest in research and design. Many of the undergraduates have chosen to go to graduate schools. My Moonbuggy design groups have been supported by the fellowships also, and last year they were able to win this prestigious NASA sponsored event at Huntsville.

Dr. Mohammad Mahinfalah
North Dakota State University
Associate Professor of
Mechanical Engineering

The North Dakota Space Grant Consortium has been a true asset for Mayville State University Science and Math. The scholarships have allowed us to assist a number of deserving students over the years. Of the nine recipients in just the past three years, four are working in the health field or pursuing degrees in this area (MD, DDS, etc.), three are teaching science or mathematics in public schools across the nation, and the remaining two are pursuing graduate degrees in science and biotechnology. The scholarships have encouraged these young people to pursue their dreams.

The MaSU Science and Mathematics faculty feels that the program has been run very well. We hope that the program can be expanded to allow us to further participate. For example, we have students who are interested in doing research and would like to participate. Unfortunately, MSU has limited research capabilities to offer them. This would be an excellent opportunity for them to be involved in a meaningful project.

Dr. Bob Miess
Mayville State University
Chair of Division of
Science and Mathematics

NDSGC Fellowships for Summer 2002-Fall 2003

(Some of these students received a fellowship for one semester; others received fellowships for two consecutive semesters.)

Paul Frank

Atmospheric Sciences
at UND

*"An Analysis of Colliding
Outflow Boundaries as
Observed from
NASA's Polarimetric Radar"*

Ryan David Nord

Agricultural and Biosystems
Engineering at NDSU

*"Micro Environmental Control
System for Electronic
Nose Applications"*

Joan Denise Beckman

Zoology and Biotechnology
at NDSU

*"Interaction of Endothelial Cells
and Pericytes During
Angiogenesis"*

Jake Zimmerman

Organic Chemistry at NDSU

*"Enantioselective Conjugate
Radical Addition of B-Alkoxy
Acrylate Acceptors:
A Radical Strategy Leading to
Aldol-type Products"*

Jeremy John Gustin

Mechanical Engineering at
NDSU

*"Low Velocity Impact of
Sandwich Composites"*

Sandy Siegel

Anatomy and Cell Biology
at UND

*"Plasticity of
SSEcks-Immunolabeling in
Rat Primary Sensory Neurons"*

Christopher Knudson

Anatomy and Cell Biology
at UND

*"Glutamate Receptor Profile of
Immunohistochemically
Identified Renshaw Cells"*

Corrine Kvamme

Chemistry at UND

*"A Modified Synthesis
of Exo-glucal from
Methyl-D-Glucopyranoside"*

Brian Helmowski

Atmospheric Sciences at UND

*"Incorporation of Laps
Meteorological Data into the
Calpull Dispersion Model"*

Thomas Johnson

Civil Engineering at NDSU

*"Remote Sensing Data and
Measurement Technologies"*

Kimberly Petry

Biotechnology and Microbiology
at NDSU

*"Evaluation of the Rate
of Proliferation of Cells
in Mammalian Ovaries"*

Kenneth Grigsby, Jr.

Computer Science at NDSU

*"Mixed Integer Linear
Programming Formulation for
Enforcing Rigid
Task Timing Constraints"*

Christopher Schmidt

Electrical Engineering at UND

"CubeSat Project"

Aaron Ryan

Mechanical Engineering
at NDSU

*"Foam Filled Aluminum
Honeycomb Sandwich
Composites"*

Brian Freeman

Mechanical Engineering
at NDSU

*"Fatigue Life of Impacted
Composites"*

Wayne Spier

Mechanical Engineering
at NDSU

*"Foam Filled Aluminum
Honeycomb Sandwich
Composites"*

John Totenhagen

Electrical and Computer
Engineering at NDSU

*"Impact of Microgravity on
the Cardiovascular System"*

3...2...1...We Have Lift-off...



Wilton High School Rocket Team

What started as a challenge from Governor Hoeven, turned into an excellent learning tool and real life experience for Wilton students: to send two raw eggs and an altimeter as close to 1500 feet as possible on a two stage rocket and get them safely back to Earth. It sounds less complicated than it is.

Our biggest unexpected challenge came at the time of the first test flight--to get both of the booster engines lit at the same time. We failed miserably four times. Each time ended in an unbalanced force which toppled our rocket into the ground. We figured we could maybe get one more "flight" out of the rocket before it would fall apart. It had been named the *Drag King* since it had couplers on the outside of the body tube, duct tape holding the launch lugs, packing tape covering a big hole on its side, a nose cone with holes in it from rocks and wheat stubble, and patched fins. We tried a new igniting technique and it went to 1315 feet and floated back down, landing perfectly. Out of almost 900 teams and over 9,000 students nationwide, Team #1064 from Wilton, ND was qualified for the largest-ever rocket contest!

At nationals we had our best flight ever--straight, smooth, and high, ending with a perfect landing of both stages. High spirals and anticipation turned to disgust and frustration as the students listened to the beeping altimeter. Instead of beeping the registered height achieved by the rocket and all their sweat and hard work, the altimeter was beeping a cadence stating, "I'm ready for takeoff. I'm ready for takeoff. I'm ready for takeoff."

The Wilton team, Mike Gregoryk (rocket designer), Brandon Dusek (spokesman/negotiator), Carissa Bergquist, Casey Krush, and teacher Mike L. Walz, are very thankful for all of the support they received, but especially thankful for the support received from Dr. Tim Young, Dr. Shan de Silva, Suezette Bieri (all from UND) and the North Dakota Space Grant Consortium (NDSGC).



Wilton High School Rocket Team. Left to right: Casey Krush; Mike Gregoryk; Brandon Dusek; and Carisa Bergquist.

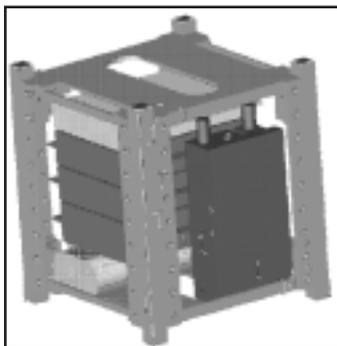
In the late stages of fund raising Dr. Tim Young of UND gave me contact information for Suezette Bieri. Not only did we get to meet people like Homer Hickam (author of the *Rocket Boys*), Jay Apt (four Shuttle flights totaling 35 days in space), Governor Hoeven, U.S. Senator Byron Dorgan and N.D. State Senator Ray Holmberg, we also got to visit our nation's capital and the Smithsonian! To top it all off, at the Space on the Prairie conference, Suezette Bieri also set up a special tour of the UND Aerospace facility which included the students sitting in actual flight simulators. Without a doubt, Dr. Shan de Silva, Suezette Bieri, and the NDSGC have made an everlasting impact on Team #1064 from Wilton and we thank you!!

by Mike L. Walz,
physics instructor and rocket team advisor
Wilton High School

Project CubeSat It's a Small World After All

During the past several years, the University of North Dakota School of Engineering & Mines (UND Engineering) has been developing a focus on picosatellite design, particularly in the areas of sensor data acquisition. The North Dakota Space Grant Consortium provided partial funding for this project in 2003.

CubeSat to Accept Any Payload (CTAAP) will be a standard size CubeSat with a mass of 1 kg and dimensions of 10 cm x 10 cm x 10 cm. This picosatellite will be a vehicle to accept various payloads using industry standard transfer protocols. It will be designed with a fully functional communications system, budgeted power, mass and volume for a funded payload. The primary goal with the completion of this project is to obtain an industry partner to assist with launch costs.



Artist's rendition of CTAAP

Faculty advisors for Project CubeSat were Dr. Arnold Johnson, Dr. Richard Schultz, Dr. William Semke and Dr. Chaing-Hee Won all of the UND Department of Mechanical Engineering. Students involved in CubeSat research during 2003 were Ben Bieber, Eero Bodiin, Bobbie Crater, Christopher Durbin, Jane Misialek, James Paredo, Jason Senti (student program manager), Guy Smith, and Chheang Yang.



FIRST Robotics Teams

NASA Headquarters has provided the North Dakota Space Grant Consortium with monies to fund nine FIRST robotics high school teams in the state for the past two years. Funding is also available for 2004. FIRST has proven to be one of the most successful technology programs that the NDSGC has been involved with at the high school level.



Cando High School robotics team. Front row, left to right: Cari Peyerl; Katie Wolsky; and Callie Urness. Middle row, left to right: Kami Olsen; Amanda Lewallen; and David Krack, coach. Back row, left to right: Dan Buresh, co-captain; Nathan Gibbons; Collin Dunningan, co-captain; Aaron Anfinson; Jared Johnson, operator; and Chad Weippert, pit chief.



Surrey High School

This was the first “intellectual” team Surrey has had that completed in a national format. The students and staff who directly participated were challenged beyond their expectations. Each day much was learned and applied to our robot. The level of learning began at “no clue” (our motto) and ended at understanding PBasic programming, understanding of pneumatics, drive trains, electronics and many other engineering skills. Our team began as a lark and gelled into a hardcore robotics unit.



One of our most rewarding experiences with the robot team was when we were invited to display our project at the SRT (Souris River Telephone) Tech Expo, in Minot. This expo featured 100 technology oriented companies and schools. Our team created one of the best visual displays outlining our progress from parts to final product. We had our first chance to demonstrate our robot to the public. The highlight of the day was when Governor Hoeven visited our display and spent a lot of time learning, from our students, what it took to build our robot.

As principal of Surrey High School, and technical advisor to the team, one of the most rewarding insights of this event came at the competition in St. Louis. Our robot needed a design overhaul to better compete. Within one half hour our entire team of students (11 in all), circled the robot and worked as a unit to remove a major part of the robot and to reassemble it so it would pass inspection. At this point it was evident that all our students knew more about our robot than most other students knew about their robots. Many other teams relied heavily on adult or expert help to keep their robots competitive. At Surrey, we had no outside mentors participate (even though we tried to encourage mentorships). Our robot was built on the skills and the wills of our students, and when push came to shove at competition, those students were the ones to keep the robot running. We are proud of the accomplishments of our students and the knowledge gained is the ultimate reward for this kind of competition!

by Byron Borgen, advisor
Surrey High School, Surrey, ND

N.D. FIRST Robotics Teams

Alexander High School

grades 9-12 enrollment: 44 students
Advisor: Cassandra Gentry

Hatton High School

grades 9-12 enrollment: 79 students
Advisor: Dave Hedland

Northwood High School

grades 9-12 enrollment: 116 students
Advisor: Mide Voglewede

Cando High School

grades 9-12 enrollment: 108 students
advisor: David Krack

Rugby High School

grades 9-12 enrollment: 235 students
advisor: Jan Hagen

New Town High School

grades 9-12 enrollment: 208 students
advisor: Trudy Ruland

Fairmount High School

grades 9-12 enrollment: 45 students
advisor: Yolanda Luick

May-Port CG High School

grades 9-12 enrollment: 220 students
advisor: Bill Bohnsack

Surrey High School

grades 9-12 enrollment: 150 students
advisor: Byron Borgen

Northwood High School

We ended up with 35 regular robot club members, 25 of which traveled to St. Louis. Of the 35, 22 were female, 20 were underclassmen, two were students on a modified curriculum and 13 were not involved in sports. The robotics team contained a real cross section of the student body. We were very flexible with our hours, allowing students in many activities to also become a part of this project.



We ended up using many branches of science and math, plus industrial technology. We found that we used a branch of physics called pneumatics quite a bit. Electronics and computer language basics were learned by students and adults. Students were using cordless drills and wrenches along side of calculators.

New computer programs were utilized by students and adults alike.

The students were exposed to many real life role models who dedicated many, many hours to this project. They saw that the adults would actually enjoy volunteering their time to help the students learn an area of technology that they themselves were excited about. One of our senior female students decided that she would switch her college major to mechanical engineering. Others are already going into a technology related field but now their decision is reinforced by this experience. Another senior wants to come back on his free time next year and help the new students, much like our adult mentors did this year. Our mentors had a great time and I really felt that their effort with the team had a very positive effect.

We had college students and a retired professor from UND that traveled to Northwood and spent many hours helping our youth on the robot. At the competitions, we met many other kids and adults from other teams and found out that many other students in the United States are fired up about technology and learning. Many underclassmen are excited about next year already.

Northwood encouraged and helped Mayville to start their own team by applying for the NASA grant. We then mentored and helped them get going and prepared them for their Chicago Regional.

Our robotic project would have been very difficult if it weren't for the money that we received from NASA. We were able to purchase equipment and parts that enabled us to compete with other teams. The funding allowed us to access new technology and to share it between mentors and stu-

dents. This was one of the most significant experiences our students, teachers, and mentors have ever had. We chose to provide our students with the opportunity to use their minds to accomplish an incredible task; and in completing that task, they found that they had learned much more than they had expected.

by Mike Voglewede, advisor
Northwood High School, Northwood ND

Alexander High School

"The FIRST Robotics Competition has been an excellent experience for the students of Alexander Public School because it is a hands-on project, which is uncommon in the normal high school curriculum. This program is also great for our community in that it promotes awareness in science and technology.

by Kelly Mrachek, student team leader
Alexander High School, Alexander, ND



The Alexander High School robotics team at the Grand Canyon in March 2003. Top, left to right: Amanda Bieber; Cameron Wahlstrom; Louis Hermanson; Casey Haystad; Bo James; Ben Novak; Jeff Evanson; Sheldon Wahlstrom; Jerry Sorrells; Kelly Mrachek; and Josh Fixen. Bottom, left to right: Elliott Fiesler; Chris Mrachek; Caydee Haystad; Tyler Fixen; Tate Mrachek; Scott Anderson; and Aaron Weber.



NDSGC Scholarships

Three NDSGC scholarships are given annually to 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, who have at least a 3.00 grade average and who are American citizens. By recognizing the students' potential in science, it is hoped that they will be encouraged to continue to take science classes in their final two years of college.

NDSGC Scholarships for 2003

Dickinson State University Ryan Clark Cody Lawrence Kristen Kiemele	Lake Region State College Jake Hager Amanda Homann Katie Kincaid
Minot State University -- Bottineau William Dallman Steven Mayhair Conrad Bulltail Lori Sabastian	Mayville State University Kelly Cota Joseph Mehus Tasha Ziegler
Bismarck State College Joe Oakland Lisa Ann Schmidt	Turtle Mountain Community College Ryan LaFontaine Sherry Beston
Sitting Bull College Bobbi Yellow Fat Dereck Stonefish	North Dakota State College of Science Marlene Frey Bret Enderson Wyatt Hanson
Minot State University Karew Schumaker Robin Gonzalez Sheri Nelson	Williston State College Allison Anderson Nicole Lunzman Chad Norpel Matthew Peterson Bryce Picard Patrick Septon
Valley City State University Mindy Anderson Tracy Engquist Keri Lang Tom Milbrandt Melissa Rasmusson Darin Walters	Fort Berthold Community College Tanya Driver Adele American Horse Vicki Alberts

Lake Region State College is a small two-year comprehensive community college located in rural North Dakota. Each year three students from our campus have been awarded a \$500 scholarship to assist them in pursuit of their goal to achieve a degree in the areas of science/math and technology. These scholarships are greatly appreciated by our students and staff. Not only does the Space Grant Consortium provide funds for our students, it also provides support and recognition for those pursuing their dreams.

Katie Nettel, Director of Financial Aid
Lake Region State College

The North Dakota Space Grant Consortium has assisted 22 of our students throughout the last eight years. This program has been of tremendous value to our students. Having access to a scholarship of this nature for the areas of science, mathematics or engineering is very beneficial to Williston State College and its students.

Lynn Hagen Aaberg, Director of Financial Aid
Williston State College

Needless to say, the Space Grant scholarships are assisting many students with their cost of education. The students that apply for the scholarships are, for the most part, economically disadvantaged so the funds are very much appreciated. The students that are applying for the scholarships are also very interested in science related areas and also appreciate being recognized for their efforts.

Diane Christenson, Director of Financial Aid
Minot State University -- Bottineau

Quest Highlights Academic Year 02-03

Quest: The History of Spaceflight Quarterly, partially funded by the NDSGC, began its tenth year of publication in 2003, and its fifth year being edited by UND Space Studies. Perhaps the highlights of the last year's articles were an interview with the first person to walk on the Moon, Neil Armstrong (issue 10:1, winter 2003), and excerpts of the translated memoirs of Valentina Tereshkova (issue 10:2, spring 2003), who was the first woman to fly in space. Both of these famous veterans are very cautious about publicity, highlighting the importance of these rare insights into their lives. Another important and timely article was a history of the many problems with the Shuttle's thermal tiles (issue 10:3, summer 2003) that provided insights into the causes of the *Columbia's* tragic flight in February 2003.

Of interest to the general public was a two part series on collecting space literature by renowned historian Frederick Ordway. *Quest* also highlighted important military space issues with a two part series on the Soviet Union and Russia's strategic defenses, and the United States' initial efforts to defend against ballistic missiles such as the V-2 and its descendants during the 1950s. The human flight program remained a popular topic, with studies of the potential effects of a Saturn V explosion on the launch pad at Kennedy Space Center, what American astronauts were to do if a spacewalk turned into a tragic death and astronauts' impressions of seeing the Earth from space.

