

NORTH DAKOTA SPACE GRANT CONSORTIUM

The Aurora

Fall Semester 2002

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



Candeksa 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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Friends,

It is my great pleasure to present to you The Aurora, the very first NDSGC newsletter. Call it a coming out party, call it a coming of age, call it what you will...but this is the clarion call from the prairie that cries out "NDGSC is alive, well, and rocking!" We are ready, willing, and primed for action.

NDSGC is in its eleventh year and I have just taken over the helm. Our visionary founder, Chuck Wood, who guided NDSGC through its first decade is now sunning himself in Arizona heading up educational initiatives at Biosphere 2. That we are in good shape following Chuck's departure is largely due to the efforts of Bob Andres who brought a sense of order and direction to NDSGC as he skillfully steered us through some murky waters during the last year. Bob has left to more vigorously pursue his research interests. We thank him and wish him well. Throughout it all has been that epitome of calm, focus, and stability, Suezette Bieri. She has ensured that our programs and initiatives continued without any disturbance to the flow. I am delighted to be working with her.

My aim is very simply to work closely with you, our affiliates, to make NDSGC an exemplary Space Grant consortium that addresses the core NASA mission of space-related education. This newsletter, and we intend to make it an annual one, is one of several initiatives to better communicate the many great programs and activities sponsored by NDSGC. Over the decade of our existence there have been many highlights like the 370 or so Science Teaching Enhancement Grants awarded and the almost 300 scholarships and fellowships awarded to undergraduate and graduate students in North Dakota. Many of these young people have gone on to successful careers and are a testament to the effectiveness of Space Grant. In these pages, we celebrate our history by regaling you with tales of the recent past. You will hear about the ragtag group of record-setting high-altitude ballooners, the success of the Cando High School FIRST robotics team, a CubeSat project called ZAMBONI, a remote-controlled telescope accessible through the internet (the only way to do astronomy in the ND winter!), and last but not least, Suezette's Bert and Ernie story.

This is a great time to be involved with Space Grant. Education has been rediscovered (again) by NASA and hopefully that will mean a stable funding stream for the foreseeable future. We look forward to more competitions like the recent Aerospace Workforce Development Initiative to which NDSGC successfully responded. Initiatives like this will have consortium-wide impact and will be instrumental in building the NDSGC into the coherent unit that it needs to be if we are to make space an educational and economic priority in North Dakota.

I look forward to working with you all in the future and to your continued interest and support.

Bring it on!

Shan



Interim Director Shan de Silva

High Altitude Balloon Group Proves Low Cost, High Science is Possible

After many years of talking about doing high altitude research at the University of North Dakota (UND), a group of highly skilled undergraduate and graduate students (or, depending on your perspective, a rag tag group of hobbyists) finally organized the North Dakota High Altitude Balloon Group (HABG). The HABG has had four successful years of building, launching, recovering and analyzing balloon payloads. Funding for the HABG has come from the North Dakota Space Grant Consortium and other sources.

The HABG was started in 1998 by John Graham, instructor in the Space Studies Department at UND. Working with him were four college students and four members of the FORX amateur radio club. Those club members provided, and continue to provide, communications and tracking assistance for each flight.

Since then, the HABG has partnered with research groups at UND such as the Energy and Environmental Research Center and the Upper Midwest Aerospace Consortium. Science experiments have included geiger counters, temperature and pressure sensors, video and still cameras, meteoritic dust collectors, radio propagation beacons (to study how radio signals behave at high altitudes) and GPS equipment. The current experiment involves measuring the presence of mercury in the upper atmosphere. Altitudes of 115,000 feet have been reached by the balloons.

The HABG has been determined to have a "high science" production goal while at the same time utilizing inexpensive balloons as a means of doing remote sensing. Each mission payload is encased in a home made styrofoam container reinforced with liquid nails and plenty of duct tape! John Nordlie, the current faculty advisor, has developed a unique cut down device that involves a lever controlled by an RC airplane servo and connected to the on-board computer. The descent of the payload is slowed by a nylon parachute that was put together on a home sewing machine.

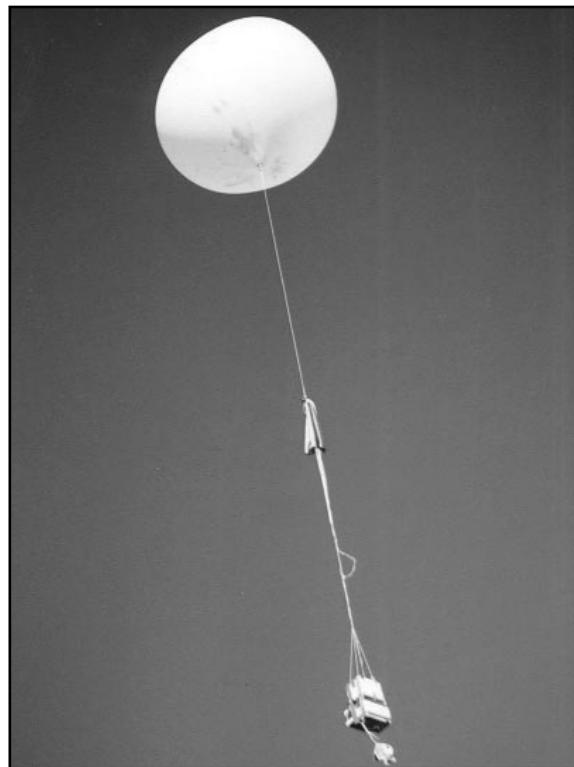
Twenty balloons have been launched in the past four years with the loss of only one payload. An Automatic Position Reporting System coupled with a GPS receiver and 300mW radio transmitter

send the payload's position to chasers with laptops driving in vehicles providing real time tracking of the balloon and aiding in the recovery. The HABP has never had un-repairable damage done to the styrofoam payload container even though the rate of descent of the payload is very rapid.

Students involved in the project include Blaise Mibeck, Dean Smith, Chris Milford, Tricia Johnson, Patricia Langwost, Ryan Kramer and Mike Gerszewski. FORX amateur radio club members who contribute their time and talents to HABG are Mark Rice, Dean Rueudebusch, Charlier Hofferber and Wally Lamb.

Experiments conducted by the HABG:

- *detecting mercury in the upper atmosphere
- *testing hardiness of equipment for future use in satellites
- *taking radiation measurements following solar flares
- *examining behavior of radio signals at high altitudes
- *testing the reliability of GPS equipment above 60,000 feet
- *capturing meteorite dust during the Leonid shower



This High Altitude Balloon Group launch on August 19, 2002 carried instruments to detect mercury in the upper atmosphere. The payload was contained in a homemade styrofoam beer cooler. The balloon is shown here shortly after launch when it was six feet in diameter. At maximum altitude the balloon was 60 feet in diameter.

Image courtesy of Tricia Johnson

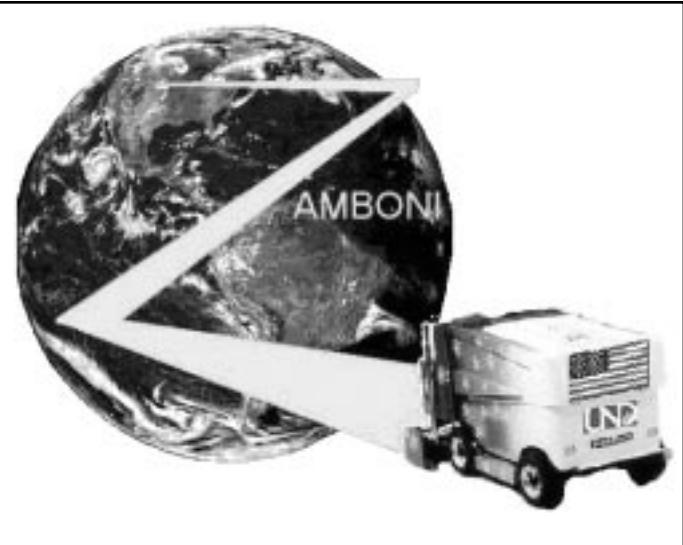
UND CubeSat Project: ZAMBONI

Zippy Aerospace Module Broadcasting Observed Not-so-bad Images

During the past several years, the University of North Dakota School of Engineering & Mines has been focusing on spacecraft design, particularly in the areas of sensor data acquisition and telecommunications. The school has been collaborating with the Upper Midwest Aerospace Consortium (UMAC), also headquartered at UND in the John D. Odegard School of Aerospace Sciences, in taking an incremental approach towards reaching their goal of launching an orbiting, Earth-observing, remote sensing satellite by the end of the decade.

Before UND tackles the more complex task of designing, building, testing, and launching its own fully-operational remote sensing satellite, it needs to start with a relatively risk-free and inexpensive orbiting spacecraft. ZAMBONI, the Zippy Aerospace Module Broadcasting Observed Not-so-bad Images, will contain many of the same components as a commercial satellite, but it will be developed at a much lower cost (under \$10,000) and with a significantly lower risk than its larger counterparts.

Although size and weight must be carefully conserved on a CubeSat mission, important experiments are possible with this picosatellite spacecraft bus. The ZAMBONI package will be double the size and mass of a standard CubeSat, with a mass of two kilograms and



dimensions of 10x10x20 cm. The UND CubeSat will contain two payloads.

First there will be two commercial-off-the-shelf (COTS) cameras. Two cameras are being used, mounted on opposite faces, as this greatly increases the probability of obtaining useful images.

Second there is space reserved (approximately 30 percent) for a NASA, Department of Defense, or industry-sponsored scientific payload.

The NDSGC is pleased to be a sponsor of ZAMBONI.

ZAMBONI Co-Investigators

Dr. David L Heckmann
Assistant Professor of
Electrical Engineering

Mr. Christopher J. Schmidt
Graduate Student in
Electrical Engineering

Dr. Richard R. Schultz
Associate Professor of
Electrical Engineering

Dr. William H. Semke
Assistant Professor of
Mechanical Engineering

The Pearl I. Young Scholarship

This award, given by the North Dakota Space Grant Consortium, honors the ideals of scholarship exemplified by Pearl I. Young, a North Dakotan and a 1919 graduate of the University of North Dakota.

Young grew up near Rugby, North Dakota and attended school there. At age 11 she left home to work as a domestic in order to attend high school. After attending Jamestown College for two years, she transferred to UND. She graduated as a Phi Beta Kappa with a triple major in physics, mathematics and chemistry.

Despite her heavy course load financial necessity dictated that Young work while pursuing her studies. She served as a laboratory assistant in the Physics Department and worked for the U.S. Weather Service. 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 technical employee--a physicist--of the National Advisory Committee for Aeronautics (NACA); that agency later became the National Aeronautics and Space Administration (NASA). She was the second woman hired as a physicist by the federal government. When Young died in 1968, her obituary noted that she had been a scientist, university professor, journalist, lecturer, author and world traveler.



Pearl I. Young

Image courtesy of NASA

The scholarship is awarded each Spring Semester. Nominees must be female and be from North Dakota with at least a 3.50 grade point average. They should be majoring in science, mathematics or engineering at UND and ideally be involved in a research project that would be of interest to NASA. Women are nominated for the scholarship by faculty.

Moore Awarded Pearl I. Young Scholarship

April Moore, a junior majoring in chemical engineering and psychology at the University of North Dakota, was awarded the Pearl I. Young Scholarship for 2002.

Born in Minot, N.D. Moore graduated from Devils Lake (N.D.) High School. She enrolled at UND to pursue a major in psychology. After taking a break from school, Moore re-enrolled in the fall of 2000, this time in chemical engineering and to finish her BA in psychology. She plans to graduate with both degrees in 2003. Last summer, under the supervision of Wayne Seames, assistant professor of chemical engineering, and Evgenii Kozliak, associate professor of chemistry, Moore worked to develop a process to remove sulfur dioxide from coal combustion flue gas using bacteria in a biofilter.



April Moore, recipient of the Pearl I. Young Scholarship, is shown with Dr. John Watson, Dean of UND's School of Engineering and Mines.

Image courtesy of University Relations



Science Teaching Enhancement Grants

The North Dakota Space Grant Consortium (NDSGC), in an attempt to improve science awareness, each year offers Science Teaching Enhancement Grants (STEG) of \$250 to encourage K-12 teachers in North Dakota's private and public schools to upgrade demonstration or laboratory equipment, buy science software or books, build a telescope, take students on scientific field trips, or do any special science project that will be exciting for students.

The goal of this project is to allow teachers to try projects that are beyond the scope of current budgets. The grants can not be used for salaries or administrative costs. The money must be used by the teachers for students in their classrooms. The opportunity is specifically for teachers, not entire schools or school districts.

Since 1992, 370 Science Teaching Education Grants have been funded for a total of \$92,500.

This is a story of Bert and Ernie

The North Dakota Space Grant Consortium awarded a Science Teaching Enhancement Grant to a second grade teacher in a small town in the eastern part of the state. She used the money to buy an incubator and two dozen fertile chicken eggs so that her students could study the development of embryos.

Shortly before the chicks were to hatch, there was a horrid wind storm in the area which resulted in an overnight power outage. The second graders were very concerned about the eggs and filled balloons with the hot water that was still in the tap and placed the balloons around the eggs. They then covered the eggs and balloons with sweaters and jackets to try to retain the heat. That was on a Thursday.

Friday was supposed to be the day the chicks hatched from the eggs. But nothing happened to the eggs all that day and the children left for the weekend very discouraged thinking that all the chicks

NDSPC Scholarships Spring 2002

North Dakota State College of Science	Minot State University - Bottineau Campus
Joshua Dozak	Amanda Armstrong
Nicole Keller	Derek Aus
Brad Kohoutek	Lauren Lamb
Minot State University	Bismarck State College
Karew Schumaker	Jason Strand
Lori Ihli	Zach Flechner
Clare Jacobson	Mindy Rath
Dickinson State University	Lake Region State College
Brad Dennis	Matt Lange
Jen Banister	Andrew Wilhelm
Casey Kadrmas	Christopher Doebler
Mayville State University	Cankdeska Cikana Community College
Tracy D'Augustino	Erica Renee Gourneau
Danielle Garrett	Melina Hunt
Kristeen Hoffman	James J. Green

had died.

On Saturday the teacher returned to the school to check the incubator and found only the unhatched eggs.

On Sunday, she again returned to the school and found that two of the chicks had hatched! She quickly drove around town picking up as many of her students as possible so that they could see the new born chicks which they promptly named Bert and Ernie.

On Monday, the teacher and her students sponsored an open house for parents, siblings, grandparents, aunts, uncles, cousins, other students and friends in the community so that they could meet the two chicks.

On that day, NASA and the North Dakota Space Grant Consortium got more than their money's worth in that small town.

Bert and Ernie, now fully grown, are retired to a farm in the country where their claim to fame is that they are the "NASA chickens."

PSO/ACIT - The Planetary Science Observatory and the Asteroid and Comet Internet Telescope

The Planetary Science Observatory (PSO) at the University of North Dakota (UND) was built in the mid 1990s with financial support provided by the North Dakota Space Grant Consortium (NDSGC) and the Space Studies Department. Designed by Dr. Charles Wood, then director of the NDSGC, and Space Studies graduate student Paul Abell, the facility has been used for both research and public outreach.

research projects such as "An Attempt to Deduce the Photometric Lightcurve of the Near-Earth Asteroid, 1994 AH2" and "Initial Methodology for Supernovae Discovery at the University of North Dakota." The faculty is also used by the Northern Skies Astronomical Society, a campus club, to host star parties to which members of the community are invited. As many as 300 people attend these star parties.



UND's Planetary Science Observatory (left) is located 10 miles west of campus. A recent addition to the site is the Asteroid and Comet Internet Telescope (right) that is located in an underground bunker and is fully operational over the Internet.

Image courtesy of Michael Gerszewski

The PSO 18-inch JMI NGT Newtonian Telescope is housed in a 30-foot dome (actually the top of a grain silo) about ten miles west of campus. Adjacent to the dome is an unattached, heated trailer which is used by students and faculty as a warming house when winter arrives with its bitter cold temperatures and raw winds.

Graduate and undergraduate students in the Space Studies Department have used the PSO for

A recent addition to the PSO is the Asteroid and Comet Internet Telescope (ACIT), a 16-inch MEADE LX-200 telescope that is operated by remote control. It is housed on the grounds of the PSO in a unique underground bunker with a flat roof that rolls back on command. Dr. Wood, Space Studies undergraduate (now graduate) student Michael Gerszewski and several students from the Electrical Engineering Department designed and built the ACIT. It is fully operable over the Internet. It facilitates teaching and research in the Observational Astronomy class in the long-distance graduate program (SPACE.EDU) of the Space Studies Department and provides safe observing conditions for on-campus students during the harsh North Dakota winters.

The NDSGC has provided funding for faculty and students to present the ACIT at the Lunar and Planetary Science Conference in Houston in 1999 and 2002 and the Distance Learning and Teaching Conference in Madison Wisconsin in 2000.

Two 10-inch MEADE LX-200s and one 8-inch MEADE LX-200 have been added to the PSO for student use. Continued enhancement of the PSO/ACIT is planned.



Chris Knudson

Image courtesy of Ryan Kramer

Fellowship Influences Career Change by Chris Knudson 2002 Fellowship Recipient

Life has unusual twists and turns, and the minute you feel you have a grasp on your future plans, another path is opened to you. As long as I can remember I dreamed of going to medical school. When I started at the University of North Dakota as an undergraduate, I planned out my curriculum aimed at making myself a very good candidate for medical school applications in the future. In my junior year I began to look for job opportunities. I was informed that there were possible jobs in the biomedical research division of the UND Medical School. I applied and was hired. What I found there was something I felt just as passionate about as attending medical school.

I began working in a laboratory in the Anatomy and Cell Biology Department doing

NDSGC Fellowships Fall 2001 & Spring 2002

Nathan Silvernail -- NDSU

Undergraduate -- Chemistry with Biology option

"Encapsulated Enzymes and Their Use in Water Reclamation Systems"

Alison Johnson -- UND

Undergraduate -- Chemistry/German/Honors

"Syntheses and Structural Characterizations of the 1, 3, 2, 4-Diazaphosphasiletidines: Polyolefin Catalyst Design"

Kadon Hintz -- UND

Undergraduate -- Biology

"Influence of Phytoestrogen Therapy on High-Glucose Induced Contractile Response in Isolated Rat Ventricular Myocytes"

Jill Pogemiller -- NDSU

Undergraduate -- Biotechnology

"Expression of Angiogenic Factors and Gap Junctional proteins During Wound Healing in Skin"

Jon Meduna--NDSU

Undergraduate--Electrical Engineering

"A Novel Implementation of a PSK31 Wireless Communication Receiver"

Patrick James Griggin--NDSU

Undergraduate--Chemistry

"Synthesis of Various Functionalized Polysiloxylene-thienylenes"

Henry Von Bank--NDSU

Undergraduate--Electrical Engineering

"A Novel Implementation of a PSK31 Wireless Communication Transmitter"

Christopher Knudson--UND

Undergraduate--Honors/Pre-Health

"Glutamate Receptor Profile of Immunohistochemically-Identified Renshaw Cells"

research on the spinal cords of rats for about a year. I then applied for and received a NASA Space Grant Fellowship. That fellowship allowed me to pursue my research in greater depth and helped to influence a career change.

After doing neurological research for two years as a undergraduate, I was accepted into the graduate program of the Anatomy and Cell Biology Department at UND where I am working towards a Ph.D. in neuroscience. The NASA fellowship was very influential in my life for it resulted in my recognizing that laboratory research was the career I wanted to follow.

NGSGC logo courtesy of Dustin Helm.

The Aurora design and layout courtesy of Kris Johnson and Kathy Borgen.

Kryptobot Leads Cubs to Rookie Award

The North Dakota Space Grant Consortium supported nine teams from the state in last spring's FIRST (For Inspiration and Recognition of Science and Technology) Robotic Regional Competition. One of those teams, the Cando Cubs, placed third overall and was named "top rookie" in the Midwest competition of 53 teams.

Cando, located in the northeastern part of North Dakota, has a population of 1342. The economy of the region is based on agriculture. The high school has 111 students in grades 9-12 with a very dynamic science teacher named David Krack.

The Cando Cubs credit their success to the fact that they received incredible community support in building their robot which was named Kryptobot 877. Although no professional engineers were available to assist the students, parents and other talented adults in town stepped forward to help with the project. They donated time, knowledge, equipment, facilities and encouragement.

When the Cando Cubs returned home in triumph, the headline in the Towner County Record-Herald read: "Cando Robotics team wins 'top rookie' award at FIRST regional competition; finishes 3rd overall." The newspaper also ran a half page ad congratulating the team. The ad was signed by 61 local businesses.

The Cando Area Chamber of Commerce also sponsored a "welcome home and congratulations" luncheon to honor Mr. Krack, the students on the team and Kryptobot 877.

At spring graduation, Kryptobot 877 (who was present and came across and stage to receive a diploma) and each member of the team were presented with medallions from NASA by Cando school superintendent Wayne Lingen. Said Lingen, "Cub Robotics brought the students together in a working relationship that taught teamwork and the necessary skills to achieve a goal with an intensity that lasted all the way through the project and will long be remembered and appreciated."

Participant High Schools from North Dakota for FIRST 2002

- Alexander High School
- Fairmount High School
- Cando High School
- Hatton High School
- Century High School at Bismarck
- New Town High School
- Dickinson High School
- Northwood High School
- Rugby High School



Back from left: Josh Knutt, John Rader, Loren Howard, Tyler Olsen, Bryce Urness, Aaron Peyerl, Dan Mohs, Kyle Dunnigan (team manager). Front: Advisor David Krack, Lyndsie Kennedy, Vanessa Lewallen and Shari Elsperger (holding first-place rookie trophy) and Megan Brager.

Image courtesy of Towner County Record-Herald

Contributors to the Cando Cub's Kryptobot 877 Project

- Frank Peyerl
- Wilson's Auto Body
- L&L Machine
- Dan Olson
- Mark Paulson
- Mark Brehm
- D&M Electric
- Integra Casings USA
- Belzer Brothers Irrigated Certified Seed Potatoes
- Chuck and Faye Dunigan
- Cando City Sales Tax Fund
- The Cando School
- The Drug Task Force
- The Crop Improvement Board
- North Dakota Telephone Company
- Cando-Parent-Teacher-Student Group
- Jeff and Cathy Miller
- Vulcan Iron
- FedEx
- and several others

