

NDSGC

North Dakota
Space Grant Consortium

2020 Edition

Aurora





Notes from the Director

Nurturing Space and STEM in North Dakota

Greetings to all of our North Dakota Space Grant Consortium colleagues. Your support this year has enabled some wonderful achievements.

Last spring, we hosted a **SciGirls @ in Space** after-school STEM camp for 20 middle-school girls at UND. These girls heard from female role models and conducted hands-on STEM activities. With the knowledge that they gained in these sessions, they prepared interview questions for astronaut Christina Koch, who came home from the ISS in February 2020. That interview happened on August 19, 2019 – the second downlink from the ISS to North Dakota.

In May, Angie Bartholomay (Dakota College at Bottineau) and Kerry Hartman (Nueta Hidatsa Sahnish College), along with Caitlin, attended NASA's Commercial Crew **Virtual Reality Workshop** in Nebraska to prepare to use two classroom headsets sent to their respective schools. Additionally, our STEM Ambassadors are trained with the VR headsets as well and can bring NASA experiences to rural schools as well as conduct local outreach.

In June 2019, we hosted **in-service teachers** from across North Dakota at our annual professional development workshop. This was the first time we integrated a Lunar Sample Disk into the workshop, which was borrowed through the ARES program at NASA Johnson Space Center. Additionally, we connected with more than 150 **pre-service teachers** in workshops at UND, MSU, and VCSU.

Of course, this summer was also the **50th anniversary of the Apollo 11 mission**. NDSGC affiliate, the Gateway to Science Center, hosted a full day of activities for families in July 2019. We also funded 3 pre-college teams from Tribal communities to join Washington Space Grant's Apollo Next Giant Leap Student (ANGLeS) Challenge, where they engineered rovers, drones, and landers with 4,000 other students across the country.

We are always impressed with how dedicated and passionate our ND students are. Throughout the year, we were able to support 8 students with internships at various NASA centers. 6 students received travel grants, 11 competition teams were sponsored, 15 students received fellowships, and 117 scholarships were awarded. Congratulations to all!

We owe a great deal to the energy and enthusiasm of our 6 STEM Ambassadors for this year. These undergraduate and graduate students, from SBC, NHSC, UND, NDSU, and MaSU, worked with Caitlin and Marissa to extend our outreach efforts across the state. They also organized their own K-12 school visits and events to inspire kids in STEM. On their own, our **STEM Ambassadors** reached nearly 6,300 North Dakotans, ~5,500 of which were K-12 students. This is a remarkable effort – over 40% of our total outreach.

I'll close by mentioning that this is my last Aurora column. By the time this Aurora goes to press, I will have stepped down and will have been succeeded by Caitlin Nolby. Thanks to all of you who were able to attend the Special Affiliates meeting in November 2019 to endorse her as the new Director. I am certain that you will give her the enthusiastic support that I've enjoyed. While this may be my last letter, it is not goodbye. I've accepted Caitlin and Marissa's invitation to attend the Affiliates meeting in 2020. I'll see you then!

Jim Casler



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Cover Photo:
During the SciGirls@ space camp, team-based challenges allowed students to work together to complete tasks, such as rover design for payload transport along the surface of Mars.

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Tours of the UND Human Space Flight Laboratory inspire the next generation of explorers.



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 950 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, technology, engineering, and mathematics, or STEM, as well as curriculum enhancement and faculty development. Member colleges and universities also administer pre-college and public service education projects in their states.



The NDSGC team visits Capitol Hill.

Space Grant Meetings



ND co-lead a session with SC to promote hands-on accessible STEM education in DC.

In September of 2018, the NDSGC Deputy Director and Coordinator attended the National Council of Space Grant Directors' Meeting in Stowe, Vermont. Here, they learned about NASA's latest goals and initiatives for the future while networking with other Space Grant consortia.

In March of 2019, the NDSGC team attended the National Council of NASA Space Grant Directors' Annual Spring Meeting in Washington, DC. They visited with United States legislators from North Dakota, sharing the successes of the NDSGC programs with Senators Kevin Cramer and John Hoeven and Representative Kelly Armstrong. The NDSGC team also helped facilitate a hands-on breakout session about promoting inclusive and accessible space education for all learners.



ND and MT explore collaborations during the VT meeting.

The 2019 NASA Office of STEM Engagement Mega Principal Investigators' Meeting was held in August at NASA Glenn Research Center in Cleveland, OH. Personnel from NASA Headquarters were in attendance as well as individuals from other STEM offices across the country. The NDSGC team was able to tour facilities at NASA Glenn and collaborate with other Space Grant consortia and EPSCoR jurisdictions on upcoming projects.

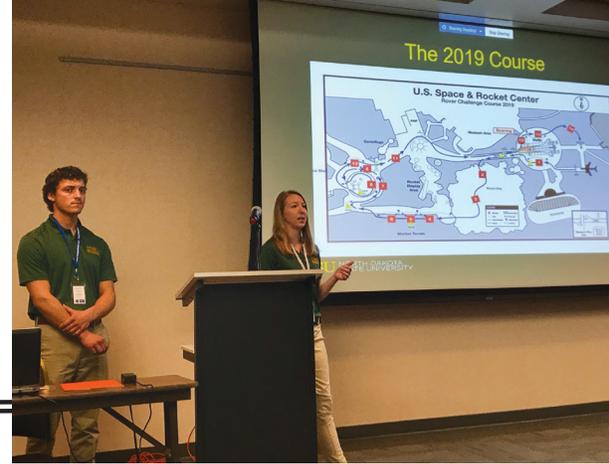
Space Grant National Meeting/Stowe, VT.



Affiliate Involvement

In March 2019, the annual Affiliates Meeting was held at Minot State University, made possible by Dr. John Webster. Presentations included Space Grant funded student research, team projects, faculty research, and funded STEM education projects from across the state. Breakout sessions helped students and affiliate representatives to brainstorm future collaborations, ways to strengthen outreach and retention, and inter-institutional collaborations.” MSU alumna and NASA Goddard Spaceflight Center scientist, Veronica Pinnick, welcomed the NDSGC with an inspiring keynote address.

Throughout the year, the NDSGC team visited affiliate institutions by leading informational booth sessions, pre-service educator workshops, and high altitude balloon collaborations. These institutions included Dakota College at Bottineau, Minot State University, Valley State City University, Mayville State University, and Lake Region State College.



NDSU students, Paige Meskan and Charles Olson, discuss their upcoming competition route at Marshall Space Flight Center for the NASA Human Exploration Rover Challenge.



NDSU STEM Ambassador, Emma Twedt, discusses the importance of equitable STEM outreach in rural communities.



The 2019 Affiliates Meeting was held at Minot State University.



Students participate in a flipped session at the Affiliates Meeting to determine best practices for funding opportunities.



NASA Internships

Jayce Paryzek

Mechanical Engineering,
Business Administration Minor,
North Dakota State University

Ames Research Center
Raptor Wind Tunnel Blast Shield
Analysis and Recommended
Test Section Characterization

"This internship is exactly what I needed to test run my engineering abilities and show me what areas I need to improve on to make myself more marketable before I start applying for jobs this coming spring, and I will be forever grateful for all that my mentors were able to teach me."

Steven Russell

Space Studies,
University of North Dakota

Kennedy Space Center
Culturing Biological
Organisms in Simulated
Microgravity

"ND Space Grant helped tremendously in the securing and funding of this project and was a key role in its success. This internship was an invaluable experience for me that will be a stepping stone for a future career in the space industry."

Russell with Apollo Astronaut,
Harrison Schmitt



Peter Henson

Space Studies,
University of North Dakota

Kennedy Space Center
Mars ISRU Pathfinder -
CO2 Freezer Preliminary
Scale-up Testing Analysis

"Without the ND Space Grant, I would not have had the opportunity to work alongside NASA scientists, engineers, and technicians; watch rockets launch, or spend time with other NASA interns. I feel extremely lucky - thank you NDSGC!"

Justin Germann

Space Studies,
University of North Dakota

Kennedy Space Center
Optimization of a Machine Learning Model for
Identifying Blowing Snow Storms in Antarctica

"Working as a NASA intern taught me more about how scientific work is conducted and managed, then any class could, and taught me many valuable skills I will use for the rest of my life. I'd like to thank the ND Space Grant Consortium and the NASA Education office for providing me with the opportunity."



Jared Peick

Space Studies,
University of North Dakota

Kennedy Space Center Development of a Recirculating, Small-Scale Invertebrate Aquaculture System for Long Duration Spaceflight

"This internship provided the opportunity to directly explore the research side of human factors of spaceflight, specifically habitation and life support systems. As a student focusing on human factors, the experience made possible by Space Grant was incredibly valuable. I gained an irreplaceable understanding of how to address the cutting-edge challenges of human spaceflight as well as a great appreciation for how work is accomplished in the space industry."



Ashley Balzer

Space Studies,
University of North Dakota

Goddard Space Flight Center Astrophysics Communication

"I've always been extremely interested in bringing astrophysics down to Earth and helping people feel more connected with the exciting things that are going on in the cosmos. Not only did this internship allow me to do that for 10 weeks — it led to a full-time position at Goddard as a science writer, so I'll get to do it every day for years and years to come!"

Nick Thomas

Mechanical Engineering,
North Dakota State University

Goddard Space Flight Center Kodiak Assembly and Test Support

"This internship was an invaluable opportunity that has allowed me to gain real experience and insight into the space mission process. I was able to observe and work on the test preparation process first hand alongside highly skilled NASA engineers of many different disciplines."



Stefan Tomović

Space Studies,
University of North Dakota

Kennedy Space Center Radiation Monitoring Passive Surface Acoustic Wave Sensors (RaMSAWs)

"Take advantage of the opportunity in the lifetime of the opportunity."





National Student Competitions

NDSU High Power Rocketry Team

Our High Power Rocketry Team, known as the Ballistic Bison, is the first rocketry team in NDSU's history, which was founded in 2018. We are the primary project of the NDSU chapter of AIAA. After a year of diving head first into rocketry, we experienced both "highs" and "lows" as a team. We learned from obstacles along the way, such as when designs were rejected, deadlines were missed, and when our rocket was "energetically disassembled" two weeks before competition. Our "highs" have made everything worth it, including submitting all reports, launching NDSU's first high power rocket, having a member get NAR certified, and "energetically assembling" a better rocket to make it to our competition in time. We look forward to continuing rocketry at NDSU with support from the NDSGC.



NDSU NASA Human Exploration Rover Challenge

With the help of the North Dakota Space Grant Consortium, North Dakota State University sent a team to Huntsville, Alabama in April 2019 to compete in the 25th Annual NASA Human Exploration Rover Challenge. The NASA Human Exploration Rover Challenge is an international student competition that challenges teams to design and build a human powered rover. At the competition, teams traverse extraterrestrial terrain on their rovers, receiving points for course completion time and obstacles attempted on the course. With the competition in the Spring, the NDSU team began designing their rover in September of 2018. Keeping the competition rules and requirements in mind, the team came up a project plan, schedule, and budget. With the ability to use up to 50% of the previous year's rover, the primary design focus included replacing the wheels, drive train, and seat restraints with some additional changes made to the steering. The goal was to create an innovative design while still shedding weight off the rover. After coming up with conceptual designs, a decision matrix was used to selection a design. After many hours of design and redesign, the team got to work building their rover. Many manufacturing techniques and skills were used to manufacture the parts of the rover. In order to prepare for the competition, the team spent many hours testing and modifying the rover. With a finished rover, the team made the trip to Huntsville for the competition. Unfortunately, the rover experienced failure on both days of competition, with one of the chains breaking on Day 1 and failure in the drive shaft and wheel on Day 2. Despite the mechanical failures, the team did successfully complete a couple of the obstacles and crossed the finish line on both days of the competition. Overall, the team learned and implemented the design process as well how design, redesign, manufacturability, testing, and teamwork play an important role in the success of project.



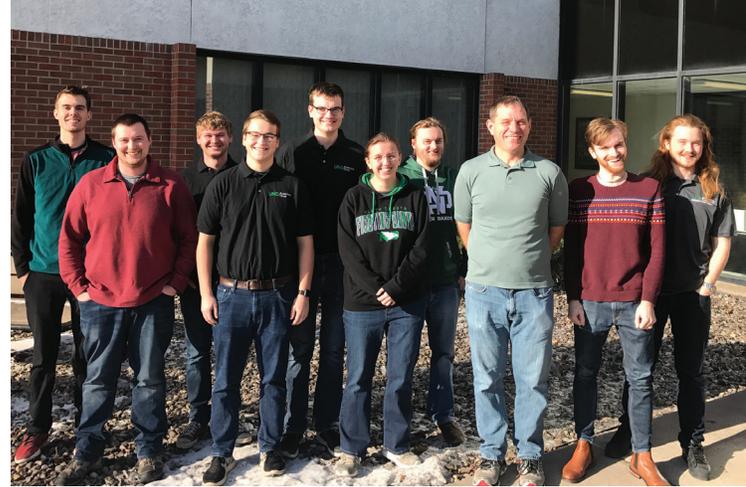
UND Formula Society of Automotive Engineers (FSAE) Racecar Competition

Our UND Formula SAE Team set out to complete a lot in the 2019-2020 Academic Year. There were a lot of participants this year so we set out to create a completely new car design with the intention to more closely match the cars abilities with the competition scoring system. The newly designed car dropped from last year's 500 pounds to a relatively lightweight 400 pounds. This was accomplished through dropping our engine size from 600 cubic centimeters to a much smaller 321 cc engine. With a smaller engine, all of the other components could be downsized as well. The challenges that we faced were related to project management. It is difficult to keep everything moving smoothly with such a large number of components being manufactured at the same time. With this newly designed lighter car, we hoped to place better than we had ever done before at our FSAE Lincoln 2019 event. While we did not accomplish that goal the new racecar platform that we developed shows a huge amount of potential and we are looking forward to proving it during the 2020 competition. Thank you.



NDSU Robotics Mining

The NDSU engineering team, Bison Robotics, competed in the NASA Robotic Mining Competition held in Tuscaloosa, Alabama in May. Their team designed and built a mining robot that could navigate challenging simulated off-world terrain. During this year's competition, their robot excavated gravel and returned the material to a collector bin to simulate a mining mission on another planet. Their team earned second place overall and won several other honors, including the IEEE Innovation Award, second place for the Caterpillar Autonomy Award, and second place for the On-site Mining Award. They became the second team in the competition's 10-year history to complete full autonomy in both competition runs.



UND Robotics Mining

In May, the 2019 UND Robotics Team placed 4th in the standard mining category. The goals for the year were to reduce the mass of the entire robot, and to simplify the electrical system. The team managed to reduce the mass by 24% compared to the 2018 robot, as well as creating a robust electrical system. This competition presented many instances of problem-solving and teamwork, adding to each individual's experience. Over the course of the year, the team had displayed the robot explaining the capabilities of robotics to high school students.



Trey Husar and Jacob Ose were the two finalists chosen out of 36 experiments sent in.

Student Spaceflight Experiments Program

Laurie Salander, a ND teacher and program director from Northern Cass School, guided 330 middle and high school students on a mission to the International Space Station (ISS). On Mission 13 of SSEP, these student launched an experiment to space on a rocket! Read below to hear about her class' experience with the great opportunity:

What experiment did you launch to the ISS? The question we are focusing on is whether kefir grains will grow in size in microgravity. We chose kefir because we learned that kefir is a healthy drink which includes many microbes. Kefir grains are also reusable and feasible. If you are able to grow kefir on the space station then, we will be able to provide a very healthy drink for astronauts. Our experiment will include one of the minilabs. In our minilab, we are going to include four kefir grains and sugar inside volume two of the tube and distilled water in volume one of the tube. On the interaction days, the experiment will be unclamped and shaken for 45 seconds to filter the water to interact with the kefir grains. The clamp will be re-clamped and sent back down to earth.

Tell us about your experience with the mission! The experiment and opportunity was incredible. It gave our students a chance to apply all that they have learned in all their classes... not just science. All those involved learned a valuable lesson on how not everyone gets picked and the aspect of competing for a position on the ISS.

What did the students learn from the experiment? One of the lessons they learned is how it is difficult working with the Kefir grains. This is because the grains are different sizes and when the students put them in the test tube, the ground truth experiment was different from the ISS experiment. One of the things the students considered is how they opened their clips differently than how the astronauts would have opened it on the ISS. They felt they should have explained a little more on the procedure for when it was time to unclamp and reclamp the experiment. They also learned there is a big difference between the ground truth experiment and the ISS. The ground truth kefir grains became moldy as well as the tube they were contained in. The ISS experiment did not mold even weeks coming back and sitting out. They felt a more sterile environment plays a big role in how the grain grew, along with how healthy they might stay compared to the ground truth experiment.

NDSU Unmanned Vehicle Systems

The NDSU team participated in the Association for Unmanned Vehicle Systems International Student Unmanned Aerial Systems competition (AUVSI sUAS) in the 2018-2019 academic year. In addition to designing a UAS, the team was required to deliver a fact sheet with design parameters, a technical design paper, proof of flight video document, safety pilot log, and team promotional video.



The NHSC team puts final touches on their rocket.

First Nations Launch

The Wisconsin Space Grant Consortium (WSGC) hosted the 10th annual First Nations Launch High-Powered Rocket AISES Competition, culminating in a launch in April of 2019. Two North Dakota teams participated in this year's program, the Starseed Ascension Rocket team from Nueta Hidatsa Sahnish College and the Thunderbirds team from United Tribes Technical College.



UTTC faculty mentor transports rocket to the launchpad.

Earlier that year in January, the NDSGC team met with the WSGC and the Thunderbirds team at United Tribes Technical College. This great opportunity allowed the NDSGC to meet the FNL students and team mentors, learn how to construct rockets, and network with the WSGC.

Traveling with the teams to Milwaukee, Wisconsin, the NDSGC team supported the two ND teams, watched impressive rocket launches, and brought back valuable knowledge on how other Space Grant Consortia conduct their competitions. These new ideas were integrated directly into the 2019 Near-Space Balloon Challenge operations. The NDSGC is grateful to the WSGC for inviting them to FNL and proud of all the students' hard work!

A successful launch for the UTTC FNL team.

A successful launch for the NHSC FNL team.



The UTTC team retrieves and inspects their rocket payload following the launch.



Undergraduate Student Instrument Project

USIP



Anamika, Laura Banken, and Justin Germann help fill the balloon.

The USIP is a competitive project that promotes hands-on flight research for 47 higher education teams across the nation. The NDSGC concluded their Undergraduate Student Instrument Project (USIP) efforts in 2019. The NDSGC's goals were to launch multiple high altitude balloons to capture a temperature profile of the atmosphere. UND Engineering students constructed a sensitive thermosonde to gather data for the UND Atmospheric Science team. The first launch occurred late at night on May 4, 2018, followed by the last launch on May 3, 2019. This final launch was held at Mayville State University, made possible by Jeff Hovde, an NDSGC affiliate. Thank you, Jeff!



Atmospheric and Engineering team members monitor the radiosonde's data. (Featured L to R) Blake Sorenson, Kyle Foerster, and Michael Mullins.



Pre-launch photo: (featured L to R) Anamika, Laura Banken, student lead Denise Buckner, Devi Dina, Rakesh Ravi Shankar, Taren Wang, Steven Russell, and Justin Germann.

Inflatable Lunar/Martian Analog

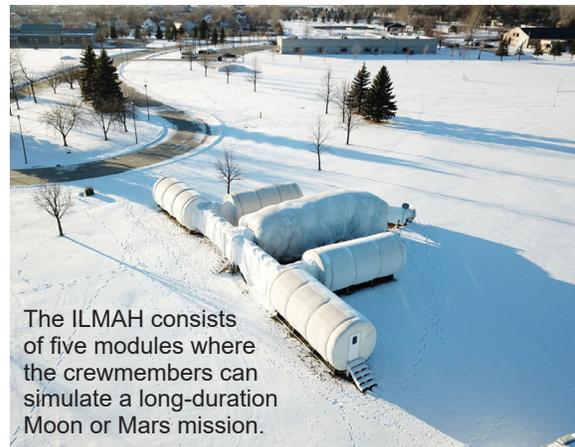
Habitat

The University of North Dakota (UND) conducted its seventh mission in the Inflatable Lunar/Martian Analog Habitat (ILMAH), in May 2019, housing three crewmembers for 14 days. UND is the only university in the United States to conduct this type of space exploration research, which helps prepare for long-duration Martian missions. The crewmembers live in this confined environment, studying psychological factors, biomedical research, and mission operations.

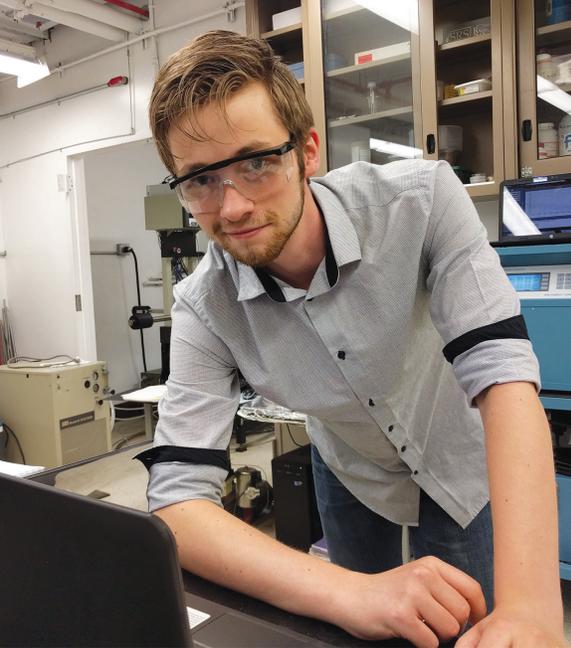
Crewmembers lived in three modules: the living quarters, a botany/greenhouse module, and an extravehicular activity (EVA) module. Docked to the ILMAH via a tunnel is the Pressurized Electric Rover (PER), which students use to conduct EVAs outside of the habitat. During the seventh EVA, these three crewmembers launched a high altitude balloon with the help of the Atmospheric and Educational Student Initiated Research (AESIR) Ballooning Team, led by NDSGC ballooning team, led by NDSGC student, Denise Buckner. The ILMAH crewmembers tested flight systems, simulating a Martian launch. New ballooning equipment was designed, space suit flexibility was examined, and the eGPS systems were utilized. The mission was a success, and the crew members received great flight data. To learn more about the Human Spaceflight Laboratory at UND, visit: <https://aero.und.edu/space/human-spaceflight-lab/>



Two crewmembers successfully prepared, filled, and launched a high altitude balloon on one of their EVAs.



The ILMAH consists of five modules where the crewmembers can simulate a long-duration Moon or Mars mission.



Elias Holte

Fall 2018 Recipient
Space Studies,
University of North Dakota

**Investigating Deliquescence
and Vapor Diffusion in Halite
Evaporites**

"The NDGSC has allowed me to spend time researching relevant literature, developing my ideas into code, and write proposals for future experimental work relating to the project."

Research Fellowships



Jeremy Harris

Fall 2018 Recipient
Space Studies,
University of North Dakota

**Initial Research for
Analysis of Ammonia-Water
Thermodynamic Power
Cycle on the Lunar Surface**

"This experience allowed me to further develop my dissertation proposal."



Buckner and fellow student, Anamika, perform an Extravehicular Activity to test spacesuit design and emergency operations during Mission VI in the Inflatable Lunar/Mars Analog Habitat.

Matthew Lein

Fall 2018 Recipient
Software Engineering,
Valley City State University

**SQL Server Implementation
for Radon Detectors and
Inventory Management for the
Deep underground Neutrino
Experiment**

"Working on this research has given me a better understanding of embedded systems and networking."



Denise Buckner

Fall 2018 Recipient
Space Studies,
University of North Dakota

**Atmospheric and Experimental
Student Initiated Research**

"My Space Grant Fellowship allowed me the unique opportunity to conduct multiple research projects with high altitude ballooning and to bring STEM education outreach to students across the state of North Dakota."



Jacob Huesman

Fall 2018 Recipient
Electrical Engineering,
North Dakota State University

Bézier Spline Based Path Planning

"I can trace the start of much of the experience I've gained and success I've had back to my first summer performing a research project funded by the NDSGC. Their continued support on various projects throughout my undergraduate career has helped me to gain experience and skills that would have been otherwise unattainable."

Nick Thomas

Spring 2019 Recipient
Mechanical Engineering,
North Dakota State University

Unsteady Wake/Blade Interaction Simulations

"Receiving this fellowship has helped me pursue my goal of completing my Master's degree by allowing me to focus my time and energy into research for my thesis. In addition, I have gained invaluable experience in the field of computational fluid dynamics where I hope to start a career in the future."



Halley Score

Spring 2019 Recipient
Mechanical Engineering,
North Dakota State University

Rocket Combustion Chamber Design and Structured Analysis

"My dream is to become a combustion engineer. This research opportunity funded by Space Grant allowed me to gain hands on experience that will hopefully help me achieve this dream."



**The NDSGC
research
fellowships are
awarded on a
competitive
basis to
undergraduate
and graduate
students at all
affiliate colleges.**

Jason Schirck

Spring 2019 Recipient
Mechanical Engineering,
North Dakota State University

Optical Nozzle Design and Diagnostics for Supersonic Flow Studies

"My research experience set the course that I have today. Without this experience I would have never considered graduate school, but now I know that's where I belong!"



Research Fellowships



Brian Teske

Spring 2019 Recipient
Aerospace Sciences,
University of North Dakota

Can Safety Management System Attributes be Determined? Developing a Survey Instrument

"Without the help of the NASA grant, I would not have been able to complete my research in such detail. Helping NASA and the commercial space industry with additional safety potential protocols is a great honor for me."

Andrew Jones

Summer 2019 Recipient
Software Engineering,
North Dakota State University

Decision-Making for Self-Replicating 3D Printed Robot Systems

"I'd like to thank the North Dakota Space Grant Consortium and NASA for their support. With the fellowship, I've been able to purchase research supplies that will be used to conduct experiments for my dissertation."



Aaron Knudtson

Spring 2019 Recipient
Mechanical Engineering,
North Dakota State University

Turbulence Modeling of Flow Over a Rotating Cylinder

"This research opened my eyes to the reality that things may not always go your way, but the pursuit of knowledge is worth it! Research through Space Grant definitely helped me validate my decision for a PHD in the future."



Eric Ramesh

Summer 2019 Recipient
Space Studies,
University of North Dakota

Asteroid Farming: Investigating the Suitability of Asteroid CI Chondrite Soil for Plant Growth

"I was so enriched by having the opportunity to research asteroid composition and plant growth in microgravity for my thesis project on asteroid farming. I am very grateful to the NDSGC for funding my education and research as I continue my path toward a career in astronomy and space exploration."



John Spaight

Summer 2019 Recipient
Physics and Mathematics,
North Dakota State University

Modeling Hydration-Mediated Ion-Ion Interactions in Electrolytes through Oscillating Yukawa Potentials

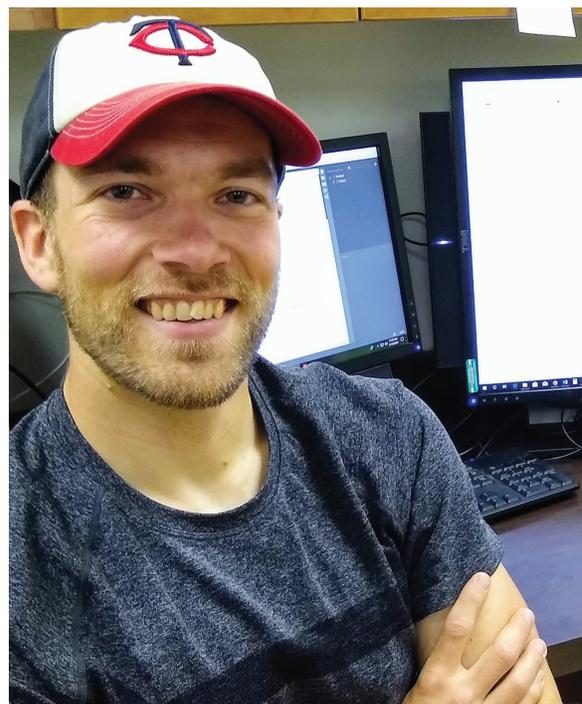
"More than anything, I think this experience helped me just by giving me a taste of what it's like to be able to do research without having to worry about classes getting in the way."

Jason Hicks

Summer 2019 Recipient
Computer Science,
University of North Dakota

Automation and Visualization of Program Correctness for Automatically Generating Code

"This great experience enabled me to spend my summer gaining a deeper understanding of several very interesting areas of computer science and software engineering research while also opening my eyes to the many ways in which every academic discipline can contribute in a meaningful way to the ongoing mission of NASA. This has served to further my resolve to include NASA-relevant topics in my research and teaching as often as possible in the future!"



Paul Kvamme

Summer 2019 Recipient
Air Traffic Management,
University of North Dakota

Exploring Immersive Technologies for Dome Theater Learning

"Space Grant funding helped me to not only pursue my own goals and interests, but also assist the University in furthering its educational mission."





Summer Faculty Fellowships

The NDSGC awards fellowships to ND faculty each summer to develop new courses or revise existing courses in STEM fields, of relevance to NASA. Faculty are encouraged to incorporate engaging educational techniques focused on improving student learning.

Fardad Azarmi

Mechanical Engineering/
North Dakota State University

**Materials Selection
in Design**



Eric Brevik

Natural Sciences/
Dickinson State University

**GEOL 100L -
Earth Science
Laboratory**



Mandy Guinn

Environmental Science/
United Tribes Technical
College

**ATS 101-
Introduction to
Atmospheric Science
and Lab**

Guinn works with Origami bats to teach community members about ecosystem services provided by North Dakota bat populations at the Teddy Roosevelt Family Day event.



UTTC Environmental Science Department Chair, Mandy Guinn, mentors a team of summer undergraduate research students.



Steffan instructs a DSU student on the importance of soil structure and porosity as it relates to soil health.

Joshua Steffan

Natural Sciences
and Agriculture and
Technical Studies/
Dickinson State University
**BIOL/SOIL 455 -
Soil Microbiology**



Steffan places his hand into a cannulated cow to sample rumen contents including microorganisms that will eventually enter the soil.

American Indian Scholarships



Kimberlee Blevens

United Tribes
Technical College

*American Indian
Scholarships are given
to students at each of
the five Tribal colleges
who plan to complete
a four-year degree in
a STEM field.*

Samantha Borah

Sitting Bull College

Shayla Gayton

Nueta Hidatsa
Sahnish College

Seth Vivier

Turtle Mountain
Community College



Isnala Roan-Eagle

Cankdeska Cikana
Community College



Pearl I. Young Scholarship

Emmelinne Miller

I am a student at the University of North Dakota going into my sophomore year majoring in Air Traffic Management and Unmanned Aircraft Systems. Along with studying aviation, I am a part of the honors program and an officer in the Honors Program Student Organization. Aside from my classwork, I am also working toward earning my private pilot license. This semester, I volunteered for UND's Aerospace Community Day, teaching kids the basics of the air traffic control simulators. As a member of the Student Air Traffic Control Association on campus, I had the privilege to attend the Communicating for Safety conference hosted by NATCA, which is a leading conference held not just for air traffic controllers but for the aviation industry as a whole. While at this conference and in my studies, I am learning how components in aviation work safely together, which I will need in my future career in the industry.

Lillian Goettler Scholarship

Erika Krieger

I am a third-year student studying Civil Engineering at North Dakota State University. As a part of NDSU's Honors Program, I have begun my own research project with a professional mentor's guidance. As my passion lies within environmental engineering, I am writing a proposal to conduct research on comparing Fargo and the United States' solid waste management with Europe's solid waste management and identifying reasons for the difference as well as possible methods for improvement. In addition to this research, I am an active member in Engineers Without Borders and Corrosion Engineers. In Engineers Without Borders, I work with a team of students to design, fund, and help construct needed structures or systems for a community we are partnered with in Guatemala. Corrosion Engineers is a program through which I lead a weekly STEM afterschool activity with first generation immigrant middle school students. I am very thankful for the support from NDSGC in continuing my education here at NDSU!



NDSGC Scholarships

Every academic year, the NDSGC provides each of the affiliate two-year, four-year, and Tribal colleges with scholarship funding. Students are selected by faculty at their home institution and must have an excellent academic record and be majoring in a STEM field.

Bismarck State University

Andrew Bartholomew
Justin Briss
Caitlyn Ell
Alie Glasser
Nathan Goldade
Mandie Haman
Courtney LaRocque
Andrew Schafer
Nathan Spichal
Michael Ternes

Cankdeska Cikana Community College

Leah Demarce
Terry Dunn
Randy Leben
Arlete Lohnes
Isnala RoanEagle

Dakota College at Bottineau

Alex Abrahamson
Francisco Flores
Alexis Gullett
Lydia Hunter
Andrew Huwe
Jonah Kvernum
Colton Soiseth

Dickinson State University

Karissa Bohn
Allison Buckman
Lexee Craig
Jayden Dolechek
Brooke Doyle
Olivia Goguen
William Hultberg
Kevin Pineda
Marissa Schatz

Lake Region State College

Amanda Amacher
Rachel Hill
Shad Mack
Chandelle McCall
Mark Nienhuis
Precious Rawlins-Manuel
Jakenda Short
Samantha Shumway
Howard Wilson

Mayville State University

Jacob Bilden
Anna Bradner
Lexi Carpenter
Shayla Fossum
Jerry Hernandez
Josephina Juarez
Laura Jacobson
Frida Nirvana Garcia Kjelland
Jacob Leier
Brady Nygaard

Minot State University

Darrel Doll
Mark Fulbright
Sean Goddard
Hannah Haley
Michael Heck
Timothy Kraft
Nathan Miller
Adam Poland
Tess Skinner
Alexander Taylor
Daniel Wilkie
Matthew Winburn
Micah Winburn

North Dakota State College of Science

Drew Biffert
David Caldwell
Joshua Geinert
Jordyn Hjeldness
Alex Johnson
Joseph Langenwalter
Joncy Mastel
Aaron Osowski
Lily Pyle

Nueta Hidatsa Sahnish College

Shayla Gayton
Crystalyn Jensen
Montserat Rodriguez
Janna Steen
Johnny White Owl

Sitting Bull College

Samantha Borah
Dominick Diniz
Jessica Geditz
Heather Scanniello
Moriah Thompson
Christina Turgeon
Floris White Bull

Turtle Mountain Community College

Izaiah Belgarde
Kieler Counts
RaeAna Cromwell
Chance Harris
Denver LaRocque
Tenille Morin
Annadine Rendon
Arlin Thomas
Seth Vivier

United Tribes Technical College

Kimberlee Blevins
Trenton Chamlers
Muriel Friday
Owen Smith

Valley City State University

Ellen Anderson
Kadie Anderson
Rachel Blomquist
Jean Brown
Kelly Cahoy
Emily Christensen
Victoria Christensen
Spencer Dorsey
Katherine Gehrig
Rachel Goerke
Kourtney Hintz
Benjamin Kietzman
Clarissa Olson
Dylan Olson
Caleb Rosenberry
Noah Schaeffer
Ryan Schneider
Konnor Stueve

Student Travel Grants



Alexis Archambault

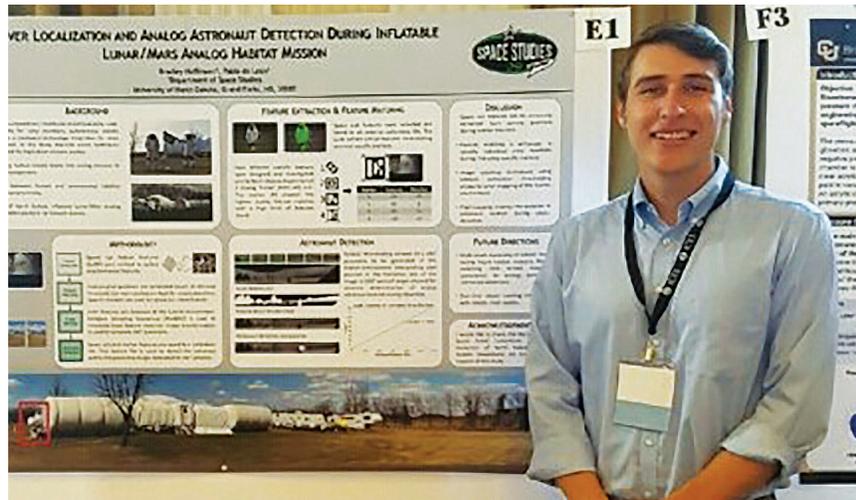
Geological Engineering,
University of North Dakota

Wetland Dynamics in a Terminal Lake Basin Using Remotely Sensed Imagery: Implication to Recent Hydro-climatic Evolution

American Geophysical Union Meeting | Washington, D.C.

"I received great feedback from my audience that ultimately contributed to the direction of my research. I enjoyed attending the AGU conference because it was full of diversity and gave me the opportunity to attend numerous sessions that were similar to the research I am doing here at UND. It was also interesting to attend sessions that I had little familiarity with. My experience at AGU was educational, informative, and increased my perception of the vast world of science."

I would like to express my gratitude to the NDSGC for the travel scholarship that was awarded to me for this great experience. Thank you for your generosity which has allowed me to discover the vastness of AGU and be impacted by the knowledge that is shared at this respected conference."



Brad Hoffmann

Space Studies, University of North Dakota

Rover Localization and Analog Astronaut Detection During Inflatable Lunar/Mars Analog Habitat Mission

International Conference on Environmental Systems | Boston, MA

"The opportunity to attend ICES 2019 allowed me to present my thesis research. Thanks to the North Dakota Space Grant Consortium, I was able to network and build connections with leading professionals in the space industry."

Kathryn Hall

Chemical Engineering, University of North Dakota

On the Design of Novel Lignin-Based Green Materials

Materials Science and Technology Conference | Columbus, OH

"This was the first conference where I wore my traditional beadwork. I had previously presented at other international materials science conferences but hadn't worn any jewelry to them. It felt so strange to have people staring very intently at me as I walked through the conference center but I'm sure that it was the first time that many of them had seen a Native American in person. It was a very interesting experience to say the least."



Kathryn is pictured wearing a medallion made by her sister-in-law, which was given as a graduation present for her B.S. in Chemical Engineering. She also earned an M.S. in Chemical Engineering in fall 2018.

The NDSGC provides travel grants to North Dakota students to present papers or posters at conferences throughout the U.S. The students have the ability to not only share their research with others in the STEM community but also to network with others in their field. This allows them to eventually become employed in a STEM field as a result of their travel to the conference.



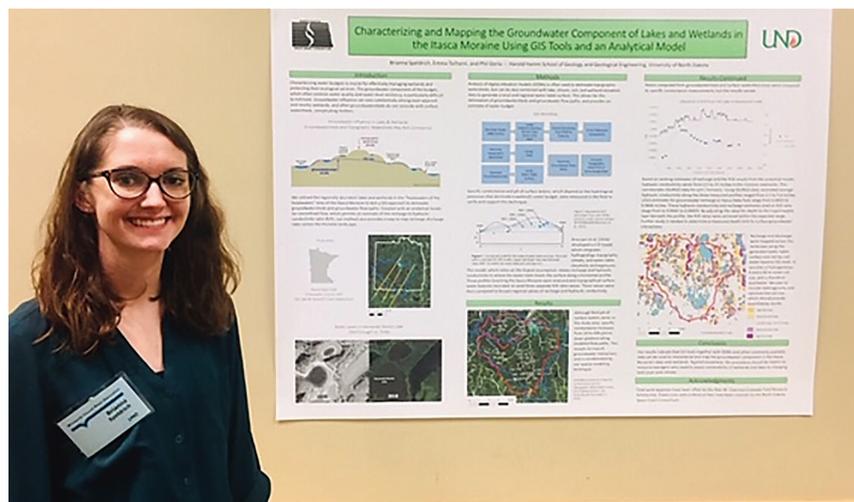
Joseph Allen

Biomedical Engineering,
University of North Dakota

**Digital Image Processing and
Metabolic Parameter Linearity to
Non-Invasively Detect Analyte
Concentration**

International Astronautical Congress |
Washington DC

"This year's IAC conference exposed me to cutting-edge research, various opportunities in the field, and allowed me to network and meet great individuals. Attending this conference allowed me to further my goals of implementing innovative medical solutions to ultimately contribute to the advancement of humanity. I'd like to continue pursuing my graduate education in this field and conduct research to eventually commercialize the medical devices."



Brianna Speldrich

Geological Engineering, University of North Dakota

**Characterizing and Mapping the Groundwater Component
of Lakes and Wetlands in the Itasca Moraine using GIS Tools
and an Analytical Model**

Minnesota Groundwater Association Spring Conference |
St. Paul, MN

"Along with presenting the preliminary results of my master's thesis, I was able to participate in networking opportunities at this conference. I visited with someone who is currently working in a position that is one of my ultimate career goals. She kindly gave me a better idea of the responsibilities, challenges, and rewards that come with the position. Overall, I really enjoyed my experience at the conference and would like to thank the consortium for assisting with my travel and attendance costs."

Manna Khan

Geography, University of North Dakota

**North Dakota Spring Wheat Yield in
Relation to Temperature and Precipitation**

American Association of Geographers Meeting |
Washington, DC.

"The AAG Annual Meeting allowed me an opportunity to represent UND. I was fortunate to present my M.S. thesis in the Climate Specialty Group Poster Session. I was also able to learn information on the latest research, techniques, and resources in geography."



Manna Khan (left) with fellow student researcher in D.C.



Alexandria Borah

Social Work

Sitting Bull College

"My experience as a Stem Ambassador was short but I got the chance to look into what being a STEM Ambassador is all about, and I really believe what they are doing is amazing. Engaging kids in hands on STEM activities in the classroom is a great way to get kids involved in STEM, which I believe is so important for our future generations!"

STEM Ambassador Program

Connie Nelson

Elementary Education

Mayville State University

"Working as a STEM Ambassador helped me gain confidence in my abilities to teach STEM concepts to elementary students. I love working with younger students and watching them collaborate to solve problems. There is nothing more rewarding than seeing 23 1st-4th graders build their own bristle bots!"

While completing her degree, Connie also holds a position at Mt. Pleasant School in Rolla, ND as a Special Education Paraeducator



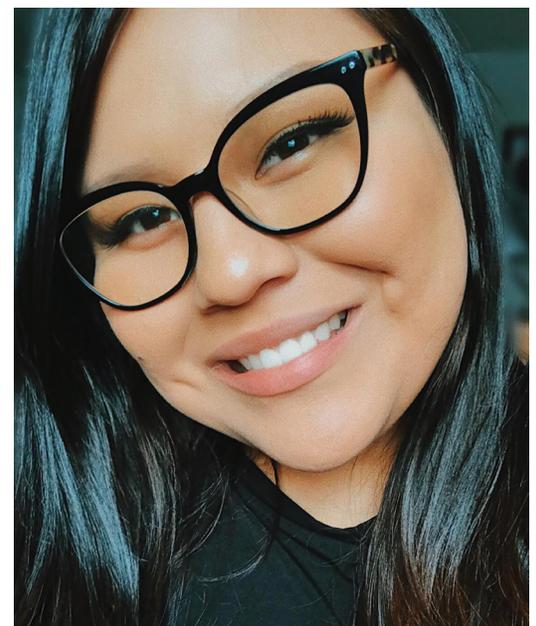
Janna Steen

Environmental Sciences and Sustainable Energy

Nueta Hidatsa
Sahnish College

"I want to make an impact on the lives of our next generation. Working with this program allowed me to do just that. I love science and I love seeing the kids get involved with my passion."

Janna is pictured giving a research presentation at Spirit Lake. Alongside her is her daughter, Lydia, who joins in on learning opportunities with Janna, and serves as her inspiration in her continued studies.



Althea Fox

Pre-Engineering

Sitting Bull College

The STEM Ambassador program is designed for North Dakota college students to conduct NASA-relevant STEM outreach across the state with K-12 students, teachers, and the general public. Ambassadors participate in a hands-on training at the start of the academic year to become familiar with best practices for engagement and to build relationships with other students participating in the program.

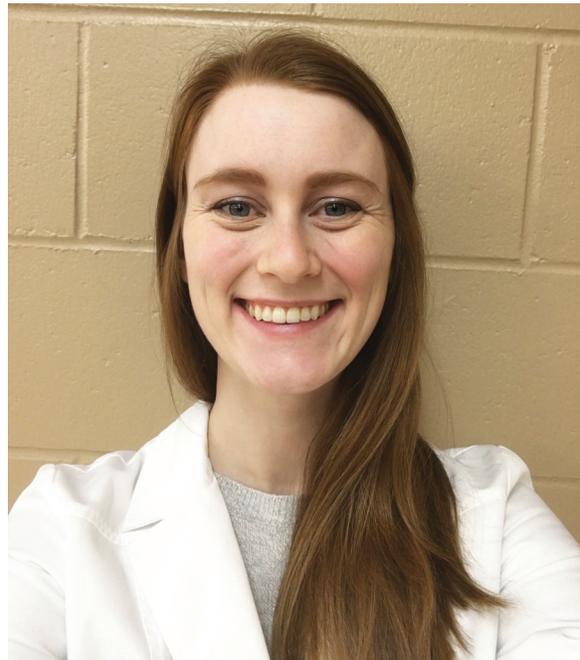
In the 2018-2019 academic year, these students significantly contributed to the number of North Dakotans reached through informal and pre-college education initiatives. STEM Ambassadors worked with 5,500 K-12 students and more than 5,200 members of the public, in *addition* to regularly scheduled NDSGC outreach events.

Emma Twedt

Biological Sciences Education
North Dakota State University

"Being a STEM Ambassador helped prepare me in really practical ways for my first year of teaching. I learned how to find creative ways to introduce STEM concepts that engage students in their own learning. I learned how to be flexible and how to adapt activities for kids with different interests and strengths. I'm even preparing some of my older high school students to teach these same STEM Ambassador activities to elementary students on Astronomy Day! Being a STEM Ambassador also helped me strengthen my skills with atmospheric and space sciences. I was a life sciences major and didn't think I would ever teach Earth Science or Astronomy, yet here I am teaching both! I can approach these classes with excitement instead of fear because I've taught all of these topics before. Finally, being a STEM Ambassador helped me learn about the different opportunities that are present through the Space Grant Consortium. Even though I am no longer in North Dakota, I knew that I could contact the Space Grant Consortium in my state to find helpful resources."

Emma graduated from NDSU with a B.S in Biological Sciences Education in May 2019. She moved to south-central Minnesota, where she is teaching Earth Science, Astronomy, and General Science at the middle and high school level. A scientific highlight of her year was visiting the Wisconsin Dells to see amazing sandstone formations.



Shae Skager

Communications,
Minors: Nonprofit Leadership and Space Studies
University of North Dakota

"I hope to work in science centers, helping spread my love of space to the public and to students all around the world. Working as a STEM Ambassador is giving me the experience and tools that I need to accomplish my goals and build a career!"

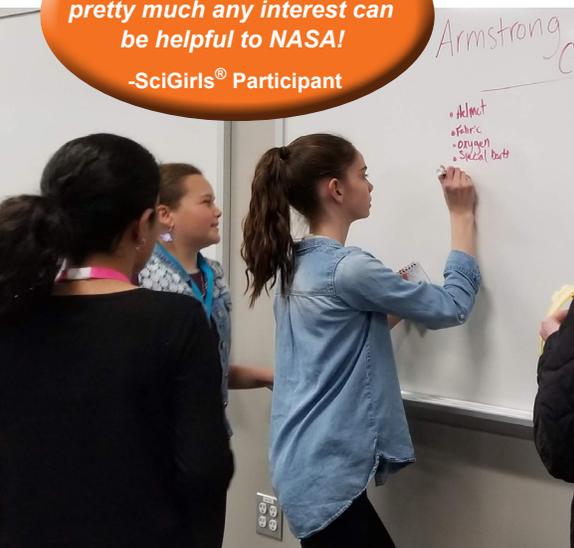
Shae has also completed STEM Ambassador work through their position at the Gateway to Science Center in Bismarck, ND as a STEM leader, summer staff, and administrative intern. Through these roles, Shae designs curriculum, teaches summer camps, and helps at various outreach events.





Team-based challenges allowed students to work together to complete tasks, such as rover design for payload transport along the surface of Mars.

It really opened my mind to all the different fields in NASA. It's so cool that pretty much any interest can be helpful to NASA!
-SciGirls® Participant



The "NASA Armstrong Team" brainstorms factors that must be considered in spacesuit development.

SciGirls® Space Camp

In 2019, the NDSGC conducted an afterschool space camp for middle school girls. Twenty middle school girls from the region participated in seven hands-on sessions in spring 2019, leading to the culminating event of a live downlink to the International Space Station on August, 19, 2019. The North Dakota girls were one of five organizations participating in the call from around the country. They were able to send their questions to NASA for Astronaut Christina Hammock Koch to answer, via live video. The girls asked questions ranging from role models to hobbies, training in NASA's Neutral Buoyancy Laboratory to animal science, and from Artemis to analog research stations.

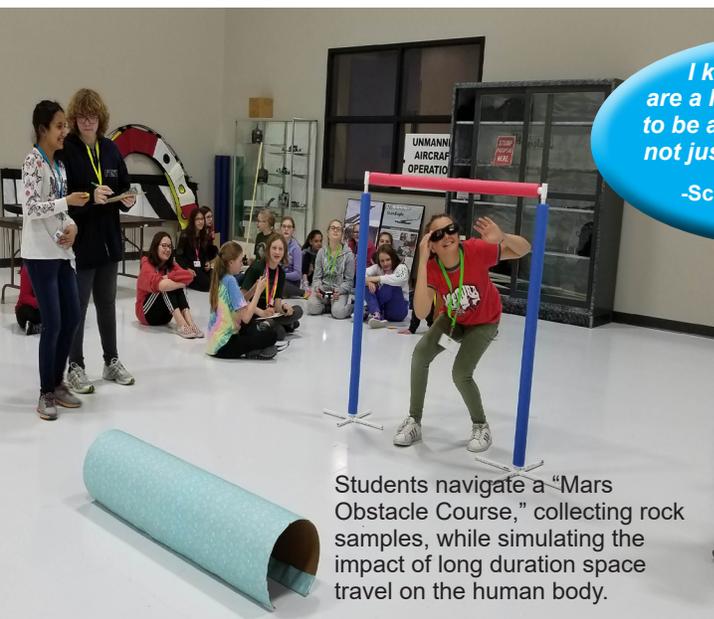
Over the course of the afterschool program, the girls completed team-based challenges and toured UND Aerospace facilities. They flew spacecraft simulators, designed rovers for payload transport along the surface of Mars, launched stomp rockets, discovered new planets, simulated long-duration space travel, and designed neutrally buoyant tools for astronauts. Female role models were also central to the space camp. Associate Dean of UND Aerospace, Dr. Beth Bjerke, shared her experiences as a pilot and stories of women in Aviation. Space Studies graduate students, Anamika and Denise Buckner, presented their research in high altitude ballooning and human spaceflight. High school student volunteer, Shri Patel, worked with the NDSGC team each week to help guide the program participants through these hands-on investigations.

This program was made possible through a partnership with the PBS series, SciGirls®. The NDSGC is a partner in their SciGirls® in Space! Program.

An article on the program and video highlight can be found online here: <http://blogs.und.edu/und-today/2019/08/space-talk/>

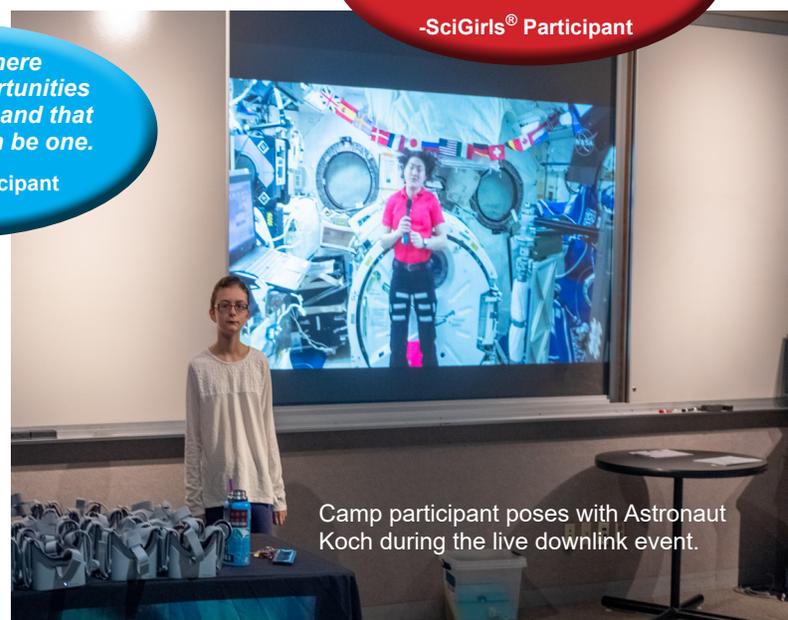
A full video of the ISS downlink can be found online here: <https://tinyurl.com/SciGirls2019>

SciGirls® impacted my views of space a lot! I learned a ton, and I am much more interested in STEM now.
-SciGirls® Participant



Students navigate a "Mars Obstacle Course," collecting rock samples, while simulating the impact of long duration space travel on the human body.

I know that there are a lot of opportunities to be a scientist, and that not just boys can be one.
-SciGirls® Participant



Camp participant poses with Astronaut Koch during the live downlink event.



This program made me believe that women and girls can do amazing things. We just have to show people more often.
 -SciGirls® Participant

SciGirls® in Space made me think that girls can do anything. Girls are more than just a pretty face.
 -SciGirls® Participant

The "NASA Langley Team" sketches their payload designs for a rocket launch.



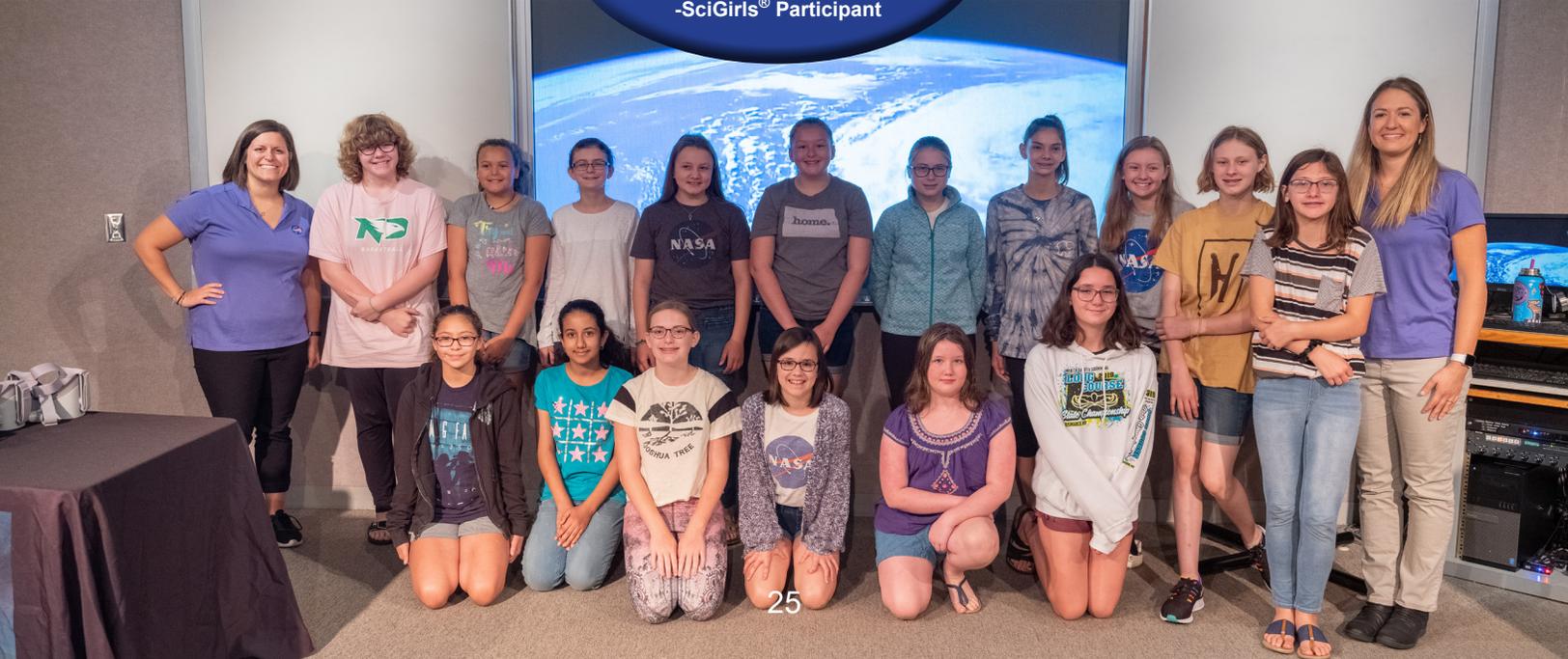
Congratulations!
 You successfully completed your NASA training!

Middle School girls from the Greater Grand Forks area participated in the program.



SciGirls® helped me realize that building rockets, getting to space, and finding astronauts isn't easy. I love STEM even more.
 -SciGirls® Participant

Mission success! Students were able to safely launch their payload to Mars.





FIRST Robotics

Northwood-Hatton Thunder Robotics Team

In October, the Thunder Robotics team took 1st place at the NMRC tourney in Bemidji, MN. At the Duluth Northern Lights Regional, Team 876 placed 13th out of 60 teams in Qualifications, and was chosen for the 4th ranked Alliance. We beat #5 to advance to the semi-finals, but lost to the #1 Alliance. At the Great Northern Regional in Grand Forks, Team 876 placed 7th out of 52 teams and was chosen by the #3 Alliance. We beat #6 to advance to the semi-finals and we defeated #2 to advance to the finals where we lost two close matches to #1. Thunder Robotics was awarded the Wild Card berth to the World Championships in Detroit in April. Team 876 competed against 68 other teams in the Carson Division at the Detroit World Championships! We placed 22nd and were selected to be on the 7th ranked Alliance. We faced off against the eventual Division champions and were eliminated from further competition. All of our students felt good about how we performed, having finished above 46 quality teams. Our team also ran the David Hedland Memorial Golf Tourney, the ThunderStorm Prime Rib Supper, helped start other North Dakota teams, and assisted at the Northwood Mens' Club Coyote Hunt.



Cando North Star Robotics Team

Our North Star Robotics Team 877 is made up of junior and senior high students from five area schools as well as the homeschool community. We competed in FIRST Robotics Competition events, including the Great Northern Tournament in Grand Forks. We really had a blast with this year's theme, Destination: Deep Space presented by the Boeing Company. We built an awesome robot that featured a deployable ramp, allowing alliance members to scale the top level of the habitation platform. Our all-rookie drive team did a great job this year and will continue to improve. We learned a lot about welding this season and made some upgrades to our X-Carve equipment. We shared our love of STEM with our communities at pep rallies, at the local nursing home, and at a Back-to-School Carnival. We are working on programming and mechanism skills this summer. We are so fortunate to have the ND Space Grant Consortium as our lead sponsor. Thank you for your support!

Jamestown FIRST Robotics Team

This was our first year of FIRST Robotics at Jamestown High School and it was amazing! We want to thank the NDSGC for their dedication to continuing to provide resources such as this to enhance our student outcomes. In our rookie season we recruited 10 students who, beginning in December, began engaging in activities with FIRST Robotics. Two of our mentor teams, West Fargo and Hatton-Northwood, proved indispensable as the year got started and throughout the build phase. During the seven-week build we were able to recruit local volunteers from MidMach Machining, Collins Aerospace and Butler Machinery to support the team as mentors. These mentors and students had a great time working together with critical thinking, innovation, and problem-solving alongside technology and robotics. This program is a powerful program, and our students are fired up for next year. We attended a training at Lake Itasca, several meetings in West Fargo, and our regional competition in Grand Forks. Even in our rookie year, we finished ahead of several teams. We learned quite a bit as an organization and will perform even higher next year. We want to thank you for the opportunity, and hope Space Grant will continue to support our students' future.

West Fargo "the Herd" Robotics Team

The West Fargo team, the Herd, competed in the Great Northern Regional in Grand Forks. They won both games of the quarter finals but unfortunately lost to the #1 seeded alliance. They were awarded the Quality Award, which reflected their reliability, high performance, efficiency, and maintainability of the robot design. The Herd performed extremely well, propelling onwards to the Iowa Regionals.

After qualification matches finished, they were ranked #3 with a 10-4 record! For the second time, they were alliance captains. They made it to the semifinals where they faced the #2 team. They won the first match, but in the second match their robot tipped on the scale during auto and they were red-carded. Unfortunately, they lost the match and did not advance any further. During the awards ceremony, they received the Quality Award again! Throughout the whole competition, their team continued to work as a team and they left everything out on that field. The Herd looks forward to recapping and setting up their returning members with the skills necessary to be successful next year.

Near-Space Balloon Competition



Students tracked both balloons in real-time.

The 8th annual Near-Space Balloon Competition (NSBC) was held on November 16-17, 2018, at the University of North Dakota. A team of Space Studies graduate students, including the student lead Denise Buckner, facilitated this project with 10 teams. The UND students served as mentors, judges, and the launch and recovery team. With their help, this hands-on experiential launch program allowed middle and high school students to complete the entire engineering design process. Teams from Enderlin, Flasher, Garrison, Grand Forks, Kindred, Medina, New Town, Rolette, and Shiloh Christian (Bismarck) spent the entire fall semester designing an experiment, launching it to the stratosphere, tracking their payloads at "Mission Control", analyzing their flight data, and producing a final report.

This year's theme revolved around NASA's 60th anniversary, where teams' experiments reflected the goals, spirit, past missions, and current topics that celebrate space exploration. To conduct the launch, two balloons were released from Discovery Elementary School in Grand Forks, reaching almost 92,000 feet. Students tracked the balloons in real-time and monitored the location of their payloads. Both balloons touched down in northwestern Minnesota by Bagley, MN. One balloon was able to be recovered, which was brought back for analysis for all of the teams. After reviewing the final reports, the first place award went to the Garrison team. Congratulations to all teams involved!



Students finished coding and constructing their payloads at integration night.



Teams are excited for the balloon launch!

Nearly 100 students gathered to release their experiments on two high altitude balloons.





Students work on chemistry experiments at NDSGC outreach events.

Community Outreach Events

During the 2018-2019 academic year, the NDSGC team worked with K-12 students and their families at various outreach events across the state. With the help of the STEM Ambassador program, the NDSGC reached a total of nearly 8,700 North Dakotans in informal education initiatives. Through K-12 specific programs, the NDSGC impacted more than 6,000 K-12 students and nearly 150 teachers.



STEM Ambassador, Shae Skager, works Family Science Night during TimeOut Week & Wacipi for local Tribal Communities.

These events included: Marketplace for Kids events, visits to public libraries, STEM Days, STEAM Days, public presentations, Super Science Day, Water Festivals, SciGirls® in Space Afterschool program, FIRST Robotics mentorship, Hour of Code, FIRST Lego League Robotics, afterschool programs, Destination Imagination, programs with the North Dakota Vision Services/School for the Blind, Culture Camp, K-12 symposiums, Boys and Girls Club, K-12 classroom visits, Apollo 50th events, and UND Aerospace Community Day. These outreach events took place in Grand Forks, Fargo, Litchville, New Town, Northern Cass, Drake, Bottineau, Mandan, Minot, Mayville, and Bismarck, impacting students statewide.



Student teams test neutrally buoyant objects in hands-on challenge.

These outreach events are a joint effort of all affiliate institutions. A special thank you is extended to the North Central Education Cooperative, Dakota College at Bottineau, Nueta Hidatsa Sahnish College, United Tribes Technical College, Mayville State University, and the Gateway to Science Center for their coordination and participation in these initiatives in the past year.



Middle school girls take "spacewalks" using virtual reality.



Tour groups view shows in the newly updated Atmospherium at UND Aerospace.



Tours of the UND Human Spaceflight Laboratory inspire the next generation of explorers.



Faculty members fly the vertical takeoff spacecraft simulator.

Tours of Human Spaceflight Laboratory

The HSFL, housed within the Space Studies Department at the University of North Dakota, includes the space suit laboratory, spacecraft simulators, electric rover, and inflatable habitat. New to UND Aerospace in 2019, was the Atmospherium, a planetarium where audience members can view various shows on the domed ceiling in high resolution. The Atmospherium is now included in the HSFL tours. In-person and virtual tours of the Human Spaceflight Laboratory at UND included groups from Girl Scouts, Boy Scouts, FIRST Robotics teams, preschool groups, K-12 field trips, the Nurturing American Tribal Undergraduate Research and Education (NATURE) program, the Research Experience for Undergraduates (REU) program, Aviation Camps, UND honors students, Tribal Visit Day students, School for the Blind Superintendents from across the U.S., NASA personnel, ROTC cadets, the UND Faculty Mentorship program (Alice Clark), the Anne Carlsen Center (non-profit organization for individuals with development disabilities), and various summer camps.



Superintendents of Schools for Blind from across the country had a blast touring the HSFL.



Junior ROTC cadets pose outside the UND Habitat, now equipped with 5 modules for analog missions.



Students practice using an adapted Lunar excavation tool from Apollo missions.



Apollo 50th Rover Challenge

The NDSGC supported three North Dakota teams in Tribal communities to participate in the 2019 Apollo Next Giant Leap Student (ANGLeS) Challenge to celebrate the 50th Anniversary of NASA's Apollo 11 mission. ND teams came from Tate Tiopa Tribal School, New Town Middle School, and Turtle Mountain High School. The South Dakota Space Grant Consortium hosted a regional challenge hub in Rapid City, SD where the ND teams competed in July 2019. The Washington Space Grant Consortium and the Northwest Earth and Space Sciences Pipeline organized the national hands-on challenge (14 competitions were held across the country), which gave students the opportunity to recreate a Lunar lander using a drone and Lego Mindstorms EV3 robot.

In addition to the engineering design challenge, teams were tasked with designing a mission patch to represent both the competition and their home community. Scoring was associated with social media posts, payload design, team uniform, rock identification, Lunar lander build, design of the EV3 robot, and the final competition runs.

One of the ND teams, Tate Tiopa Middle School, selected a buffalo skull to represent their community in designing their payload, due to its importance to the lives of their ancestors and the Spirit Lake reservation. They overcame challenges with airflow changes impacting their drone flight at the SD competition, and won a trip to NASA's Kennedy Space Center in Florida! Congratulations to all the teams involved on a job well done! Special thank you to the SDSGC for hosting such an engaging event!

You can watch a video of Tate Tiopa Middle School's competition run online here:
<https://tinyurl.com/TateTiopaApollo>



Tiopa Middle School wins a trip to NASA's Kennedy Space Center!



Tate Tiopa Mission Patch, Drawn by Student Kallen Omen, "MNI WAKAN DAKOTAHI" = Spirit Lake Dakota



(L to R): Tate Tiopa Team Coach Chris Morin, Durwin Bull, Kallen Omen, Coach Penny Morin, with Lunar competition map

UND Aerospace Community Day

This was the second year that the NDSGC team helped organize and host the UND Aerospace Community Day, where 3,000 guests visited this “open house” outreach event. Children, adults, and industry members visited UND to immerse themselves in aviation, space, sustainability, meteorology, and flight operation activities. Guests stamped their “UND Aerospace Passports” at various stations throughout the day, exploring what academic aerospace and NASA opportunities are available at UND. Families could explore static displays of helicopters and airplanes, aircraft and spacecraft simulators, real-life experiences from industry members (many UND alumni!), flying UAV (mini-drones), the space suit laboratory, virtual reality, the 360° air traffic control tower simulator, and much more. NDSGC’s STEM Ambassadors offered tremendous assistance throughout the event, presenting hands-on STEM activities, meteorites, atmospherium videos, and other public engagements.

Photos by Caleb Wilkinson



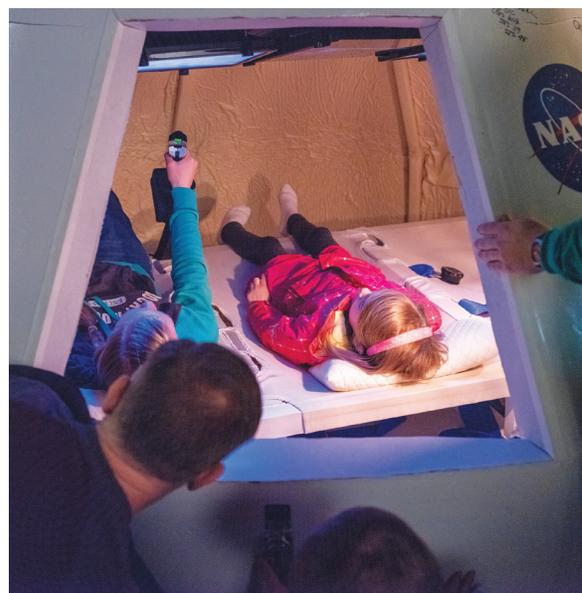
Brad Hoffmann, a Space Studies Grad Student, demonstrates how the ISS robotic arm works.



Children explore Dr. Mike Gaffey's real meteorites and fossils.



Young children build and launch their own stomp rockets.



Children fly the spacecraft simulator.



NDSGC Activities with NDVS/SB

The NDSGC enjoys collaborating with the North Dakota Vision Services/School for the Blind (NDVS/SB). Located in Grand Forks, our team visits their school to conduct multiple hands-on STEM activities with students who are visually impaired or blind. The NDVS/SB students also visit UND, touring the Human Spaceflight Lab, exploring tactile space books, and visiting the UND dining hall.

While visiting the NDVS/SB and talking about NASA careers, two students expressed interest in visiting the Visual Impairment Program at Space Center Houston. The NDSGC supported these students, Rylee and Jennah, to travel and participate in this May space camp. The students were able to conduct inquiry-based and accessible STEM activities, tour the space center, visit the Saturn V rocket, and meet other students with vision impairments.

A student has fun while getting hands-on while wearing a helmet.



Students who are blind or have low vision were able to experience space suits.



Staff and students from the NDVS/SB had a great day exploring UND Aerospace!

Career Fairs

To increase awareness of Space Grant opportunities, the NDSGC participates in career fairs at affiliate institutions and community-led events throughout the state. At these fairs, students receive information on available scholarships, fellowships, NASA internships, and college-level STEM programs. This year, the NDSGC team reached high school students at the Northern Valley Career Expo in Grand Forks and the Health, Tech, and Trades Career Expo in Fargo. To reach college students, the NDSGC team set up an informational booth at Dakota College at Bottineau, Minot State University, and Lake Region State University to better advertise these opportunities for students.



A high school student designed and tested his own ISS end effector.



High school students hold an iron meteorite.



High school students learn about Space Grant opportunities.



Educator Professional Development

The NDSGC held an in-service teacher workshop from June 20-22, 2019 at the University of North Dakota. These teachers could earn one professional development credit, which is used to renew their North Dakota-based teaching licenses. Eleven teachers from all around North Dakota participated in this workshop, where they conducted new hands-on STEM activities, networked with other ND educators, heard about NASA opportunities available to them, and toured the Human Spaceflight Laboratory. To celebrate the 50th anniversary of the Apollo 11 mission, all activities were lunar-themed, culminating in an academic journey to the Moon and the appearance of a special object: a lunar sample disk, which had six samples of real moon rocks inside! Many thanks to Dr. Mike Gaffey, who spoke to the teachers, showing them his meteorite collection and sharing insights on the lunar rocks and Dr. Pablo de León, who brought the teachers around the Human Spaceflight Laboratory, including the analog habitat.

Dr. Mike Gaffey taught the teachers about meteorites and lunar rocks. Thanks Mike!



Teachers got hands-on with real meteorites and learned how to incorporate them into various NASA lessons.



To celebrate the 50th anniversary of the Apollo missions, ND teachers explored a Lunar Sample Disk with real moon rocks inside.



Teachers put their critical thinking skills to the test in this “Martian Water” activity.



Teachers participated in hands-on STEM activities, such as the Apollo 13 communications challenge.



Teachers worked in teams to design payloads and launch their rockets to Mars.



Teachers explored the Human Spaceflight Laboratory with the assistance of Dr. Pablo de León.

Educator Professional Development



MSU students design rovers to remove Martian regolith from solar panels.



VCSU students launch stomp rocket payloads to Mars.



UND students are excited about the Strange New Planet activity.



VCSU students work in teams to design rocket payload containers.

The NDSGC conducted educator workshops for more than 150 pre-service teachers in 2019. These education students were enrolled at Minot State University, the University of North Dakota, and Valley City State University. Workshop participants worked in teams on hands-on activities such as the design of Mars Rover Landers, development of “Bristle Bots,” and launching of stomp rockets to save Mark Watney on Mars. The NDSGC also shared NASA and STEM resources and engaged these college students with innovative teaching strategies. UND education majors also experienced the Human Spaceflight Lab, learning how they could integrate UND’s space research into their future curricula.



MSU students attempt to land their rocket payloads on the surface of Mars.



NASA's Commercial Crew Program Virtual Reality Workshop

In May 2019, the NDSGC became a partner in NASA's Next Gen STEM Commercial Crew Program Pilot. The NDSGC Deputy Director and two affiliate representatives attended the training on NASA's Virtual Reality initiatives in Omaha, NE. Thank you to the Kennedy Space Center and NASA team for conducting the training and thank you to the Nebraska Space Grant Consortium for hosting the workshop!

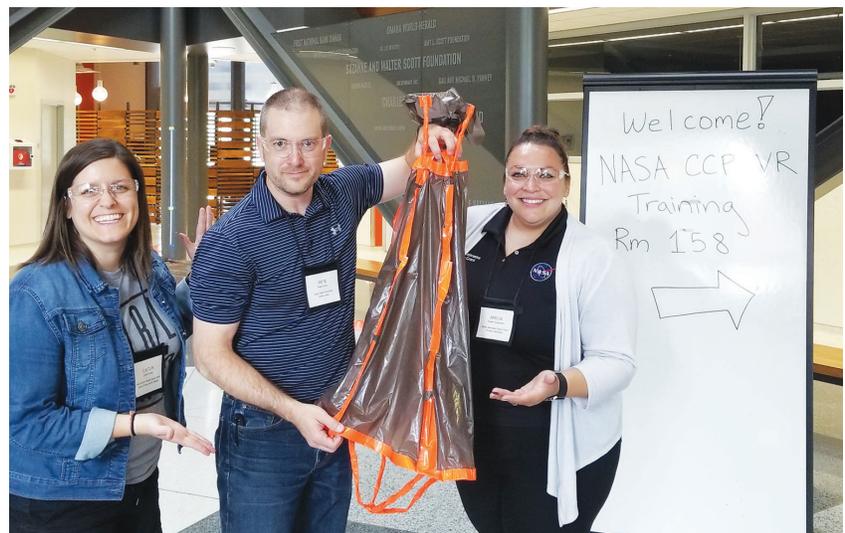
Angie Bartholomay, faculty at Dakota College at Bottineau, and Kerry Hartman, faculty at Nuetta Hidatsa Sahnish College, both participated in the training. Each of their campuses are now equipped with full virtual reality headset classroom sets, and have been used for various outreach events. These sets have been used in informal education settings, K-12 education settings, and educator professional development. The NDSGC is excited for the release of additional NASA content, and looks forward to using the headsets for future activities through the STEM Ambassador program and other events.



Nolby and Bartholomay practice a workshop activity related to sound waves.



Hartman and Bartholomay explore NASA content with Oculus Go headsets.



ND, IA, and NE worked together to protect their "eggstronaut" in one of the hands-on investigations.

Space Exploration Educators Conference



NDSGC and SCSGC led a session for accessible STEM education.

In February 2019, the NDSGC Deputy Director and Coordinator attended the 25th Annual Space Exploration Educators Conference (SEEC) at Space Center Houston in Texas. They led two sessions for STEM K-12 teachers: one that demonstrated an inquiry-based Mars chemistry lesson and one to integrate inclusive and accessible education into STEM subjects. They were able to collaborate with the South Carolina Space Grant Director and staff from Space Center Houston, networking and bringing back new STEM ideas and experiences to North Dakota. They heard from Gene Kranz, Apollo Program Flight Director, and the recently-landed crew of the 54th Expedition of the International Space Station.



Teachers explore tactile books for students with low vision.



Teachers creating their own tactile activities.



The NDSGC led an inquiry-based session on Martian Geology.



Teachers exploring different planets' densities.

Meet an Affiliate

Stacie Blue has worked for Turtle Mountain Community College (TMCC) for a combined 16 years. Her first experience at TMCC was taking summer courses and working as a summer research technician while she was also a student at UND. Stacie graduated from UND with a Bachelor's in Fisheries and Wildlife Biology. She started working for TMCC as an administrative assistant and soon moved to a grant director position where she started her work on providing community education opportunities around climate change. Her first project was building a straw bale classroom to be used by the college and community so as many people as possible could experience the alternative design. After completing her MS in Science Education from Montana State University-Bozeman, she started teaching her science courses in the TMCC straw bale classroom. Stacie has been teaching science courses full-time since 2009; her courses include Environmental Science, General Biology, and Natural Resources Management. In 2014, she worked with K-12 educators on learning more about climate change and the impact of climate change on the local ecosystems. The greatest interest from the educators was learning about the local plants and animals. Stacie is currently working on her PhD through the NDSU Natural Resources Management program and continues to teach at TMCC and work with schools in the Turtle Mountain area to provide outdoor educational experiences to as many students as possible.

Stacie attended the Western Regional Space Grant Meeting in September of 2019. Her experiences included meeting past and current NASA employees, participating in activities with the diversity team from the Western Region Consortia. Stacie met with Dave Berger of Armstrong Flight Research Center to discuss engaging Tribal College Students in research. She also met with other affiliates to learn more about their programs, research, and collaborations with the goal to understand how she can create opportunities for TMCC students. Stacie's first experience at the regional conference was eye opening and inspiring, and recommends all ND Space Grant members to attend the next regional conference.



Stacie Blue
Turtle Mountain
Community College





We Are #NASAinND

North Dakota students, staff, and faculty work hard, have fun, and accomplish amazing things! Check out their STEM and NASA activities from the past year.



@nd_space_grant

Having a BLAST at the FIRST Nations Launch Workshop, led by #wisconsin @NASASpacegrant at @unitedtribestechcollege.

#GirlsJustWannaDoSTEM
#FutureLeaders
#MondayFunday



@nd_space_grant

Who's ready for a 3-day teacher workshop filled with hands-on space activities celebrating the 50th anniversary of the Apollo 11th mission?!

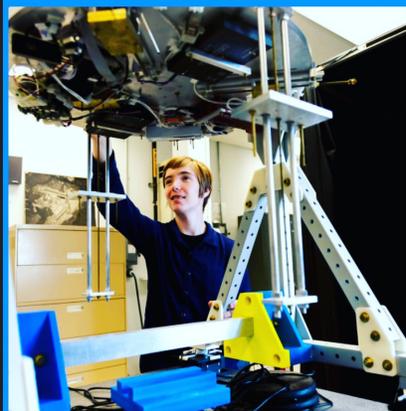
#NASAinND
#NDSGC
#UNDproud



@nd_space_grant

Happy #internationalwomensday from the #NDSGC! To celebrate, we would like to highlight the exceptional women supported through #NASASpaceGrant funding in the past year. First up, shown here are female students from North Dakota who completed #NASA internships in summer 2018.

#BreakingBarriers
#WomenInSTEM
#NASAinND
#RoleModels





@nd_space_grant

Congratulations to our three Near-Space Balloon Competition teams on their outstanding proposals, presentations, and final reports! We still have a missing balloon (hey Minnesotans, let us know if you find it!) but these students demonstrated that they're real scientists and engineers with their determination!
 #NASAinND #NDSGC
 #NASASpaceGrant



@nd_space_grant

Congratulations to "The Eagles Have Landed" Team from Eagles Elementary in Fargo, ND on their First Lego League progress! The students designed a resistance band rowing machine for #astronauts to use in #microgravity for long duration #spaceflight. Good luck at the state competition at the @uofnorthdakota on Feb 9th!

#FLL #STEM
 #STEMeducation
 #FutureLeaders
 #FirstLegoLeague



@nd_space_grant

Congratulations to @unitedtribestechcollege #FNL rocketry team, Brett and Muriel! They rocked their presentation and Q+A from the judges!

#NASAinND
 #wsgcrocketlaunch

@nd_space_grant

This week at @scigirls #SpaceCamp, the middle school girls took the next step in their #Astronaut training! They brainstormed #SpacesuitDesign ideas, viewed #SciGirls #NearPeer role model videos and a #NASA show in the @uofnorthdakota atmospherium, and checked out the #SpaceStudies #spacesuit lab to get a feel for #CollegeStudent #research being conducted right here in #NorthDakota.

#NASAinND
 #GirlsJustWannaDoSTEM
 #FutureLeaders





Space Grant Alumni Success Stories Where Are They Now?

Alexis Archambault

NDSGC involvement
NDSGC Travel Grant Recipient

Education
Nueta Hidatsa Sahnish College: Bachelor of Science in Environmental Science
University of North Dakota: Master of Science in Geological Engineering

Where are you now?
Teaching Assistant at the University of North Dakota, Geological Engineering (PhD)

Advice to Students
Attend at least one conference a year to travel (see the world) and network within your field. When you set an academic goal always keep in mind that everyone's academic journey is different. Be open to alternate paths to achieve your goals and you will persevere.



Jeremy McLeod

NDSGC involvement
2012-2013 Scholarship Recipient

Education
United Tribes Technical College: Pre Engineering
Bismarck State College: Associates in Applied Sciences
South Dakota School of Mines and Technology: Bachelor of Science, Civil Engineering

Where are you now?
Program Manager / Civil Engineer with the Federal Aviation Administration in Bismarck, ND

Advice to Students
Always strive to do your best in school, think of it like a job, "The harder you work the more you get out of it and the greater you will be".

Andrea Dickason

NDSGC involvement
NASA internship and NASA competition team

Education
University of North Dakota, BS Mechanical Engineering

Where are you now?
Sr. Manager, New Shepard Production Test Operations at Blue Origin

Advice to Students
Be open to new opportunities and challenges! Taking on or pursuing something outside your comfort zone can feel risky but those opportunities also tend to be the ones that help you grow the most.

We Want You!

The NDSGC is also looking to expand its reach in various programs with students and educators across North Dakota. If you are interested in any of the opportunities described in this newsletter, or if you would like to arrange a visit from the NDSGC at your institution (e.g. STEM Ambassador outreach events, teacher workshops, informational presentations, etc.) please reach out to any member of the NDSGC team. Contact information is listed on the inside of the front cover.

Social Media

Connect with the NDSGC via social media platforms. Tag us in your posts with #NASAinND. Follow us on the following platforms to stay up to date on events, funding, opportunities, deadlines, exciting projects, and much more!

-  NorthDakotaSpaceGrant
-  @NDSGC
-  @ND_Space_Grant
-  North Dakota Space Grant
-  @ndspacegrant
-  ndspacegrant.und.edu



The NDSGC team moved into new offices in summer 2019. Pictured with the team here is NASA Administrator, Jim Bridenstine.

Thank You!

None of these events would be possible without the amazing work of representatives at the NDSGC affiliate institutions (listed on the back cover). Their efforts allow the NDSGC to expand its reach statewide and ensure that students across North Dakota are able to participate in a number of programs. The NDSGC would like to thank each of them for their dedication to NDSGC programming, promotion of opportunities, and continued involvement.

Thank you also to Kathy Borgen (Graphic Artist in the Department of Space Studies at the University of North Dakota) for designing the Aurora Newsletter each year. Her creativity allows the NDSGC to share successes of the past year and highlight opportunities for more North Dakotans to get involved in future endeavors.



BISMARCK
STATE COLLEGE

**Bismarck
State College**



**Cankdeska Cikana
Community College**



**Dakota College
at Bottineau**



DICKINSON
STATE UNIVERSITY

**Dickinson
State University**



**Gateway to
Science Center**



**Lake Region
State College**



**Mayville
State University**



**Minot
State University**



**North Dakota State
College of Science**



**North Dakota
State University**



**Nueta Hidatsa
Sahnish College**



**Sitting Bull
College**



**STATE
HISTORICAL
SOCIETY
OF NORTH DAKOTA**

**State Historical Society
of North Dakota**



**Turtle Mountain
Community College**



**United Tribes
Technical College**



**University of
North Dakota**



**VALLEY CITY
STATE UNIVERSITY**

**Valley City
State University**



**WILLISTON
STATE COLLEGE**

**Williston
State College**