First Nations Launch

Two rocket teams competed for the first time in the NASA-sponsored rocket launch held at Carthage College in Wisconsin, which involved 19 colleges and universities. The teams built 2 rockets. The first team, The Morningstar team built a rocket that had a single engine and payload that included sensors that measured such atmospheric conditions as carbon monoxide, carbon dioxide, ozone and coal gas, all conditions that are relevant to the air quality in Lame Deer and the effects of the coal plant in Colstrip. It was launched nearly 7400 feet into the air and was successfully retrieved. The second team, the Salamanders, built a cluster rocket for the AISES challenge that had no payload but had 3 motors, two of which ignited after the rocket launched. This rocket launch was launched about 5500 feet and successfully executed as well.

The teams won first place among tribal colleges for the first rocket launch and third place for the second rocket launch. Besides building the rockets, which required learning the physics of rockets as well as designing the technology, the students also prepared presentations. College student interns included Royalle Chavez, George Nightwalker, Scott Shoulderblade, Danielle Fremont, Richard Bearquiver, and Jade Three Fingers.

2017 Rocket Club Started

CDKC's rocketry program has introduced around 35 students to engineering, physics, and rocket design/building. Students are given the opportunity to get hands-on experience with high-powered rockets and see their hard work turn into success.

Each school year CDKC Rocket Club participates in the "First Nations Launch" rocket competition held in Wisconsin. The competition is divided into two categories: the AISES challenge and the Tribal challenge. This school year CDKC is limited to one category, the AISES challenge. Several members will also level 1 and level 2 certify through the Tripoli rocket organization. Outreach projects to the surrounding schools are also in the planning stages.

CDKC Rocket Club members include: Troy Bearcomesout, Ryon Olson, Race Littlehead, Hailey Ash-Eide, Andrew Lincoln, JP Alden, Steve Vought, Mason Hazel, Forrest Oldman, Mariah SoldierWolf, Kaylee SoldierWolf, and Calvin Russette.

Voohevȧ Ledger

Chief Dull Knife College

Special STEM Edition
Fall 2017

SCIENCE, TECHNOLOGY, ENGINEERING, & MATHEMATICS EDITION

AISES Chapter Chartered

AMERICAN INDIAN SCIENCE AND ENGINEERING SOCIETY

The American Indian Science and Engineering Society's mission is to substantially increase the representation of American Indians in Science, Technology, Engineering, and Mathematic studies/careers. Through scholarships, internships, workforce development, career resources, national/regional conferences, science fairs, leadership development, and other STEM focused programming, AISES is the leader in STEM opportunity for American Indians.

CDKC AISES members include: Troy Bearcomesout, Ryon Olson, Race Littlehead, Hailey Ash-Eide, Andrew Lincoln, JP Alden, Steve Vought, Mason Hazel, Forrest Oldman, Mariah SoldierWolf, Kaylee SoldierWolf, Calvin Russette, and Lynette Peppers.

ROBOTICS

A new program has been added to introduce students to the building, wiring, and programming of robots. Outreach projects to the surrounding schools are also in the planning stages.

CDKC's robotic collection currently stands at 9 robots, with more to come soon. CDKC Robotics Club members include: Troy Bearcomesout, Steve Vought, Lynette Peppers, Haley Ash-Eide, Ryon Olson, Mason Hazel, and JP Alden. Contact Troy at 477-6215 Ext-197 for more info.

In This Issue

CHIEF DULL KNIFE COLLEGE 1979

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CDKC Awarded NASA Grant

Chief Dull Knife College has been awarded a second NASA grant for 2017-2019. Only three tribal colleges in the country were selected from the many submissions made nationwide. The grant will continue to promote research opportunities for students from CDKC. The grant will focus on several one-week research experiences for students away from the reservation. Students will conduct research and "try out" campus life on several Montana campuses including Carroll College, The University of Montana, Montana State University and St. Labre Catholic School. Each research experience will be slightly different and prepare the student for traditional longer (8 week) research commitments at NASA and university facilities. Students will return to the home campus in Lame Deer on alternate weeks to continue research and work on writing about and presenting on their experiences. The grant was written and submitted by Jeff Hooker.

Others intern discussed the training for the GPS/GIS project and the skills they gained. While a lot of training was required, the interns appreciated working together and relying on each other. The following interview quotes indicate the views of different interns on what they valued about the GPS/GIS project.

> First we started out with the ESRI trainings. They prepared us for working with topography and the GPS units themselves. They trained us to create our own topography maps. I'd say that half of our internship was training on ESRI. We would go occasionally and do hands-on work with GPS, put it on a topography map, and map out locations.

> Two or three of us would go out with another group, like [CDKC Math instructor D]'s group, and we would use our GPS along with them to pinpoint the locations where they were collecting samples. In that, we kind of relied on each other.

> It was pretty good, the trainings. You would forget something, and another one would remember it. Once we worked with the other groups, we would map the out on the computer and would print it out for them to use.

> Just working with the topography maps and learning different elevations was incredible. When we would go out with other groups, I would start to notice the environment we were in, and that would become more interesting. Before, I would see a tree, a rock, a hill, but after the training with the topomaps, I started seeing things differently. I started seeing topographically, and it was amazing.

In addition to the research projects, several interns went with a CDKC group to Wallops Islands to participate in a NASA program where they built rockets. One intern described the challenges she experienced, saying, "The computer programming was intimidating." However, she really liked soldering and said she "got really good at it." Additionally, there were lots of Native American students in the program, and she learned that the tribal college students kept up

The benefits of the internship experience

Several interns discussed the benefits of their internship experiences and the skills they acquired. For example, one student commented about the value of the GPS/GIS training:

> Just having the knowledge of GPS/GIS is valuable. You have those certificates, and that is a specific knowledge you gained from what you took during the summer. If you apply to the BIA, you have those certificates to show them for passing the courses. This is a great opportunity and it's worth it. Those certificates have your name on it for completing a course. And if they ask you, "Do you know how to run a Trimble unit?" you can say "Yes, I do. I've done that before."

Other interns expressed different views of the benefits of the internship experience. For example, one intern commented that the internship helped her to learn to be outgoing and gave her exposure to new things. Similarly, another intern commented on the benefits of his participation in the program:

> Someone talked to me yesterday that they were glad to see me back here. He said, "We're all rooting for you." …I want to push forward in a lot of aspects of my life. The more you know, they better off you are, but it's hard being your own advocate. Once you're in something like this, you get opportunity. What you do with it is up to you.

The science paraprofessional highlighted additional benefits, from his perspective, that the interns gained from their participation in the internship program:

> I think it's the process of doing research itself. It's irrelevant what we throw at them, whether it's West Nile or alternative energy. It is the process of learning something and doing research and learning new things. Wherever they go from now, they can apply it in life. That's the biggest

2016 CDKC Interns and Mentors

Students Comment on STEM Internships

Deciding to apply to the internship program

Student interns learned about the program in a variety of ways, including from current interns, from faculty and from former interns. Some interns were drawn to the program because of the kinds of opportunities they would have to work on interesting projects.

> I've only heard good things about the college, and coming and being here as an intern, I'm seeing good things. You hear about coming to a college and not getting opportunities until your Senior year, but here, week 2 I had a project proposal on [CDKC Research Director's] desk, for a small scale hover car that I've dreamed up. I can make it a reality if I can get the magnets working.

> When I first got this opportunity with the NASA internship I learned that they worked with forestry. I would have never thought of them working on something like that. It has opened a lot of doors.

> Besides the money, it's a great atmosphere here. The potluck is just very nice. This room gives you opportunities for information. The NASA internship, it's not just about rockets and nerds. Ten years ago, I never thought I'd be somewhere like this. It's a different environment than what I'm used to. It's a good experience learning to socialize with other people.

> I would rather be here in an environment where I feel comfortable. Here I am in a family, it feels like a family. Here I'm home. Here I want to take as many classes as I can, and the cost is so much less. I always promise my Dad, I will pay for it myself, you don't need to worry about me. I like that here, they are pushing you to succeed. There I am just a number.

Another intern discussed how she decided to take a chance on the internship. She heard about the science internship program from the Math instructors. She explained that they would talk about the projects and it sounded interesting. Although she said she was "kind of intimidated at first," once she got started in the internship she really liked it.

Now she wants to get her AAS; "It really changed my mindset."

Experiences with the science research projects

Student interns discussed their experiences with different science research projects from either the year before or the fall semester. The students appreciated the opportunities to learn about the projects and then choose projects to focus on. One student who started working on the water sampling project explained, "I had never really been in science or research, but after seeing what was

> It was cool; it was different. It was cool just to learn how to go out and find different wells; to go out and test them and go and find out what was in the water. Then, we got to send them out to different labs to find out even more. I've never had that experience.

Another intern also described her experiences with the water research project, indicating that it meant something to her to be part of a project that could help local communities.

> The very first project I worked on was the DNA extraction. I helped a little with this project, then this summer I was on the water research team. We were looking at domestic ground water, which is considered safe for domestic use, to see if there are concentrations of different chemicals in the water. We wanted to see what is in the different wells. We did a little DNA extraction too. Just being able to be a part of something that could help the reservation was really nice.

One intern discussed her uncertainty about joining the GIS/GPS project and what that experience involved:

> When I came on I was working on the GIS/GPS project. When I applied I wasn't sure where I would end up. …I had some knowledge about how many acres are in a section, but there was a lot to learn. Working on the project was a long process, from using GPS to Google Earth, but it was awesome to know what a computer device and the GPS could do together to bring the map alive.

NIH Board Visits CDKC

Dr. Dianna Hooker (CDKC), Dr. Brian Bothner, (MSU) Director and Principal Investigator of the Montana INBRE (IDeA Network of Biomedical Research Excellence), Mary E. Wilson, MD (Harvard), Dr. Joe Dan Coulter (University of Iowa, Dr. Ann Bertagnolli (MSU), Dr. Joseph Brain (Harvard)

External Advisory Committee (EAC) for Montana INBRE along with the new director and program coordinator visited Chief Dull Knife College earlier this Fall. The group was very interested in traveling to a Tribal College and one of their partner institutions. They met with Dr. Dianna Hooker, other CDKC Project Leaders and student interns during their visit. The campus tour highlighted the West Nile Virus Research Lab, the research green houses and the Cultural Center. The group was fascinated with learning some of the local culture and history along with seeing firsthand the research opportunities the college offers undergraduate students. INBRE funding is used for student research on the presence or absence of West Nile Virus on the Northern Cheyenne reservation. Student interns collect mosquitos, prepare them for analysis, and then analyze them using a PCR (Polymerase Chain Reaction) instrument. In addition to the WNV research, CDKC has other ongoing research in alternative energy, growing culturally relevant plants, high altitude ballooning, water quality, GIS, sediment sampling on the Tongue River and educational research on mastery based mathematics programs offered at the college.

NASA RockOn! 2017

During June 2017, 8 CDKC STEM interns along with 3 faculty members participated as four teams in NASA's RockOn! national rocketry workshop. This elite workshop sponsored by NASA's Wallops Flight Facility and the Colorado and Virginia Space Grant programs brings 71 students and faculty from STEM colleges and Universities nationwide to build sounding rocket payloads. Teams have four days to follow NASA protocols to create their payload, and then get to watch the payload launch on the 6th day to 70 miles high! A live feed from the launch was streamed on NASA TV on June 22, 2017.

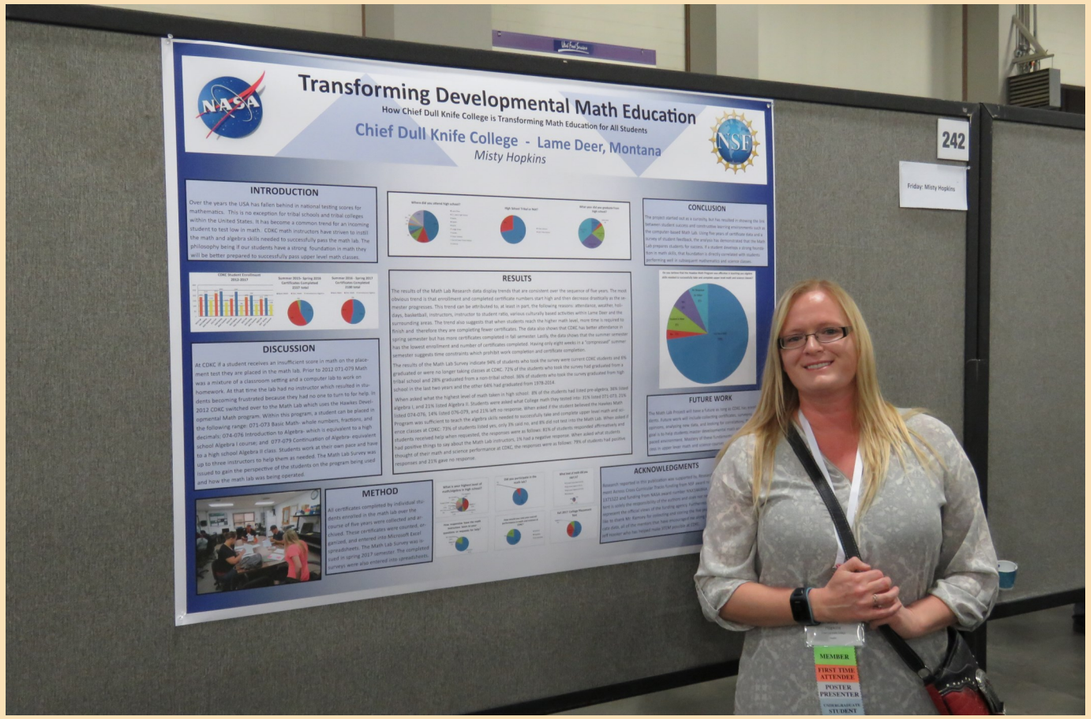
Research Director Doug Brugger was on a team with Forrest Oldman. Despite having a two-member team (most workshop teams had at least 3 members), their team was a top finisher for each step of the building process. Doug explained: "Forrest has really taken charge of the whole thing, so I'm sitting back and he is doing fantastic." Charlee RisingSun was on a team with Misty Hopkins and Mikel Capjohn-Wolf, and remarked after the second day of the workshop: "Think about what we just did today. We wired an entire circuit and in a couple of days it will be flying into space. Now that's just awesome!" Out of 23 teams, Charlee, Misty, and Mikel's team was the second to finish their payload integration, a top honor at the workshop. Jim Bertin, Haley Ashe-Eide, and Steven Vought's team was one of four teams selected to build a payload for the lid of their canister. According to Steven, working with the flight code was his favorite part of the workshop: "I love coding…that's why I wanted to come to the workshop to begin with, because I wanted to learn more. I'm ready to learn more." Haley Ashe-Eide received extremely positive feedback from workshop staff for quickly learning how to solder on her team's circuit board. Kia Timber, Marquel LaForge, and Kacey Jones were the fourth CDKC team. "Kia and Marquel were simply amazing at this workshop, it was an honor to be on a team with them," Kacey Jones explained, "they both showcased their talents and potential as future engineers and scientists, but regardless of what they chose, I hope that they and the other STEM interns will always remember how much they were able to accomplish during their week at NASA." RockOn! Director Chris Koehler challenged all the workshop participants to do something with the workshop, and teach others about what they learned during the week, so expect to hear more about NASA, sounding rockets, and CDKC's future in the program from the CDKC STEM interns.

CDKC Student Presents at SACNAS

Misty Hopkins a science intern at CDKC became the first student from Chief Dull Knife College to present at a SACNAS conference. SACNAS (Society for the Advancement of Chicanos/Hispanics and Native Americans in Science) hosted its annual conference in Salt Lake City, October 17-21, 2017 with over 4,000 attendees and over 1,000 student presenters.

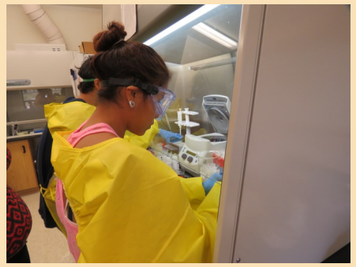
Misty has been researching changes in the Developmental Math Program at CDKC and how these changes are benefitting students. Success in Developmental Math Programs often times leads to higher achievement in upper level math and science courses. Misty's research has been a combination of tabulating success rates in classes along with surveys where students have shared their opinions related to their success in mathematics.

Misty shared her research at the conference through a judged poster presentation. During the presentation Misty received some great feedback from other researchers who are looking at similar data in mathematics education. In addition she had the opportunity to develop new contacts from other universities who have volunteered to work collaboratively with her on the project in the future. Nice Job Misty and Good Luck With Your Future Research!



Science Thriving At CDKC

Last summer the college offered an eight week "Student Research Experience" which enrolled fourteen (14) college level students. Six of the students were funded under National Science Foundation (NSF), six under NASA, and the remaining two under the National Institute of Health's (NIH) Idea Network of Biomedical Research Excellence (Inbre) program. The workshops engaged students in ongoing research on West Nile Virus Tracking, water sediment organism assessment using deoxyribonucleic acid (DNA) extraction and identification of bacteria and viruses present in sediments of the Tongue River in southeastern Montana, soil characteristics of soils found on the Northern Cheyenne reservation, alternative energy production using solar power, and irrigation techniques using programmable controls. In addition students were introduced to GIS/GPS technologies used for locating sample sites and recording geospatial data. In addition to the college level interns, fourteen (14) area high school students (8 funded under NSF), representing three high schools, were brought to campus to share the research experience and take classes from the college during the summer "free tuition" session. These high school students were exposed to CDKC's math lab through developmental courses offered throughout the summer and partnered with tribal college students in research. The college will run the program once again this summer and high school and college students are encouraged to apply. Call Doug Brugger for details, 477-6215 Ext-141.



Fourth of July Pow-Wow from 200 meters above.

Taken by camera on CDKC's tethered blimp

CESU

During the week of September 11th through the 15th, Bill Briggs attended the annual RM-CESU (Rocky Mountain-Cooperative Ecosystem Studies Unit) executive committee meeting in Gunnison, Colorado. The event was hosted by Western State Colorado University.

What is the Cooperative Ecosystem Studies Unit?

It is a nationwide consortium of federal agencies, universities, conservation organizations, and other partners working together to support agency missions and inform public trust resource stewardship.

What kind of projects does the RM-CESU do?

The RM-CESU develops interdisciplinary projects that address the cultural, social and natural resource issues of the Rocky Mountain region. Some example project themes include:

- Understanding ecosystem and social change and impacts to cultural resources
- Improving university and agency interaction and collaboration
- Enhancing dialogue between and among scientists, scholars, and resource managers
- Understanding, addressing, and educating about the national importance of the legacy of the wild Rockies and wilderness
- Assisting with the training of effective resource managers and the education and training of future agency employees.

Chief Dull knife has been a member of the consortium since 2014 and hopes to have students and faculty participating in projects with RM-CESU partners in the near future. The University of Montana is the hosting site for the CESU and the NPS stations a liaison with the unit there. Faculty and agencies submit proposals to the unit and the CESU coordinates and finds funding for the projects.

In addition to the general business of the CESU, the meeting hosted two students who presented the results of their research projects that were conducted with the NPS at Rocky Mountain National Park while several other projects were highlighted in poster form. In addition the committee toured a Paleolithic / Folsom site known as the 'Mountaineer site' that is on Western State Colorado University land which is changing the way the Folsom culture is looked at; visited a cheat-grass study site in a local park and toured the "RuMBL" Rocky Mountain Biological Lab which is a field study station in the ghost town of Gothic, Colorado. The station is a world class facility with research studies on going for seventy years and more.

Total Eclipse of the Sun

The 2017 Total Solar Eclipse was studied and attended by CDKC staff and students. At the Casper site students assisted in launch and recovery of “photo” payloads.

This garage is where balloons were inflated on the day of the eclipse. It took quite a few helpers to launch this extra-large balloon from Sent Into Space, a private company out of the UK that flies scientific payloads balloons.

Once outside of the fill garage, the balloons had to be brought to the launch site without touching the ground or any other objects that might pop the balloon. The Wyoming wind wasn't helping.

Because of the tight schedule, students had to run back to the garage after each launch to start filling the next balloons

Research News

Research Director Joins CDKC Staff

Doug grew up in Butte, MT and got a Bachelor’s in Physics from the University of Montana in 2009. In 2013 he earned a Master’s in Civil Engineering from the University of Wisconsin in Madison, studying the increased risk of floods as weather gets more intense due to climate change. Doug then continued graduate work back in Missoula, building an interconnected computer model of hydrology, agriculture, and land use change.

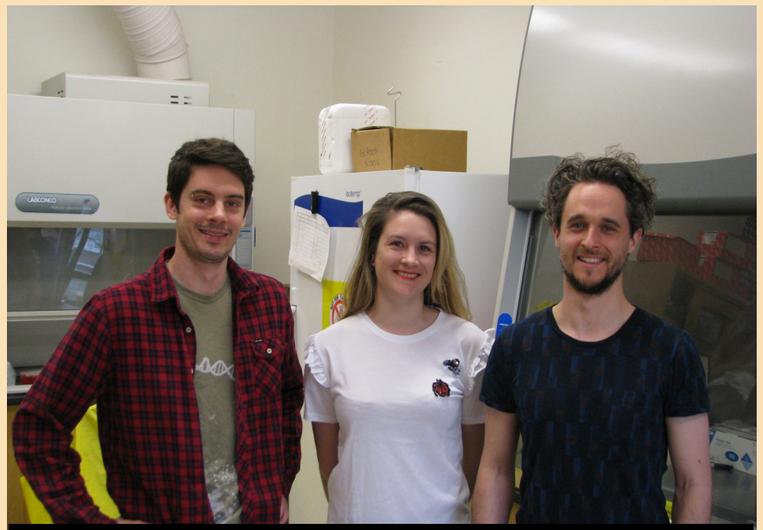
Doug has also been active in tutoring, teaching, outreach, and student advocacy, and in 2016 he was made Flight Director for Montana Space Grant Consortium’s BOREALIS program at UM. As Flight Director Doug mentored interns at UM, Great Falls College - MSU, and Chief Dull Knife College on launching and retrieving high-altitude balloon payloads. It only took one visit to CDKC for Doug to feel at home among the people, the landscape, and the culture of the college and the Northern Cheyenne Reservation. Doug started as Research Director at CDKC in Fall of 2016, and plans to teach physics in the 2017-2018 academic year.

“I’m thrilled to have this opportunity because of the important responsibility of giving students the out-of-classroom experiences that will help them stay motivated through their coursework. Success in STEM is about the regular back-and-forth between scientific theories and the experiments that test these theories. Whether working on a rocket for NASA or surveying trees for the Forest Service, this basic rhythm of STEM success can only be learned first-hand.”

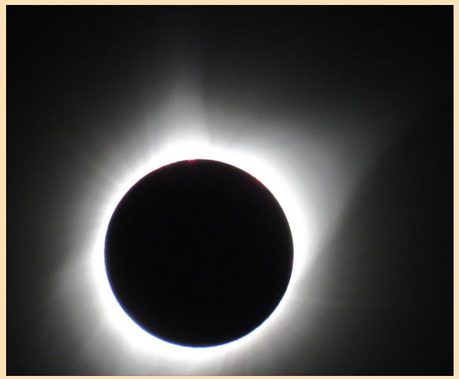
Research News

MIT Researchers On Campus

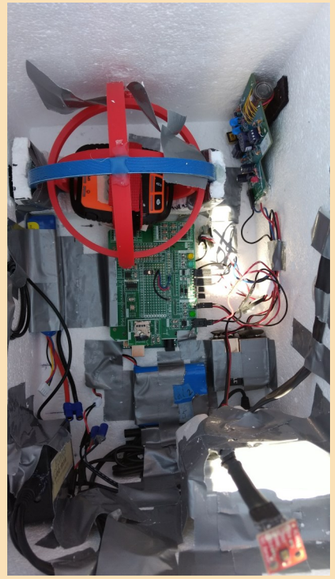
Researchers from MIT in Massachusetts arrived at Chief Cull Knife College during the week of April 11 to kick of an international study into the “microbiome” living in the human gut. The study will look at microorganisms living in the gut through a revolutionary new process of collecting fecal samples from participants and analyzing the remains of digestion. In the modern world of antibiotics, recent research has begun to notice harmful effects of antibiotics on the human gut microbiome. The second leading cause of death in US hospitals is dehydration and illness caused by bad microbes taking over the gut. As the researchers described, “it’s like killing all the plants in your yard and then waiting to see which new plants come up first”. In our yards it will be weeds, in our guts it will be nasty bacteria. The college is excited to be part of this world-wide effort to categorize the microbiomes of populations which rarely have interactions with each other. Each participant will be given an analysis of their sample and informed about what their microbe profile looks like. All data collected in the study is private and anonymous. Procedures which are being used in the study will at some point be part of a routine medical checkup at the doctor’s office.



Sean Gibbons, Mathilde Poyet, Mathieu Groussin



Watching the eclipse (just before totality) from the ground station.



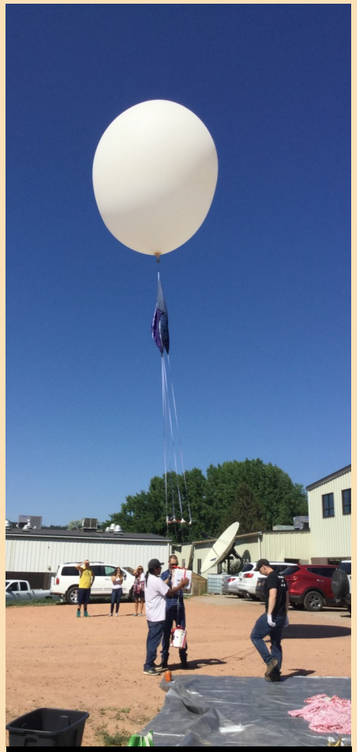
Inside of a payload container

2017 Eclipse

Successfully recovering the payload from ranch land in Nebraska.

Heads in the Clouds

This summer, CDKC students Forrest Oldman, Steve Vought, and Bessie Roundstone participated in a nationwide eclipse ballooning project. This involved 55 teams from across the country that were livestreaming high-altitude video of the moon's shadow crossing the Earth using camera-equipped balloons that can float up to 100,000 feet high. For the eclipse on August 21st the students went to Ft. Laramie, WY to launch a balloon from within the path of totality. The balloon launches were led by Montana Space Grant Consortium, and CDKC students worked alongside students from the University of Montana and Montana State University to launch multiple balloons back-to-back in the hours leading up to the eclipse. Steve Vought was in charge of the 360-degree camera that captured the eclipse from all angles. Bessie Roundstone ran an experiment to test the effects of the upper atmosphere on bacterial spores. Forrest Oldman monitored the video livestream as it was relayed to NASA's website. The students worked hard to make sure the launches were successful, and they were rewarded with a rare opportunity to see the total eclipse from 100,00 feet.



Balloon Readied for Launch

Boys & Girls Club campers at Crazy Head Springs watch a practice launch

Above the Clouds, August 2017

Lame Deer from 5000 feet above during summer of 2016

Forrest Oldman, Race Littlehead, and Ian Fleming of UM monitor the live stream during the practice launch.

Steve Vought (right), Forrest Oldman (left), and Jennifer Fowler of UM (bottom) put finishing touches on the payload before a practice launch this summer at CDKC.