Eklutna Glacier Monitoring Program Yields Actionable Data - by Carol Brzozowski

The Eklutna Glacier serves as a water resource for Chugach Electric and Anchorage Water and Wastewater Utility, providing 15 to 20 percent of the area’s hydropower and 90 percent of the drinking water.

It also serves as a resource for salmon.

Through the Eklutna Glacier Monitoring Program, Alaska Pacific University (APU) students are utilizing field method data collection and analysis augmenting on-campus classes in principles of glaciology, geospatial technology and environmental science.

Under the direction of APU environmental science assistant professor Jason Geck in a project beginning in March 2020 and ending January 31, 2024, students are determining the glacier’s health by studying its mass balance over its entire surface and the rates of winter snow accumulation and summer melt to determine its growth or shrinkage.

Modeled mass balance values from 1985 to 2019 show a thinning over the entire glacier area. Negative mass balance results in the ‘mining’ of water resources with more water extracted from the glacier than replenished in the short term.

The project focuses on May to September melt season discharge, which represents less than 90 percent of the lake’s water budget.

It also examines the Eklutna River’s fluvial discharge at its East and West Fork.

While the COVID-19 pandemic necessitated Geck having to deploy instrumentation on his own in early 2020, later in the year students calculated mass balance using ablation stakes and snow pit data, the geodetic method (DEMs and SfM products from APU’s mapping system), field-based glacier river hydrology calculations and energy balance calculations using on-glacier automated weather station datasets.

Continuous monitoring of Eklutna Glacier’s changing geography uses photogrammetry to produce a digital elevation model.

“We can now get an entire surface of the glacier to see how much actual melt is occurring over a year,” says Geck.

A new mapping system enables bi-yearly repeat photography from a fixed-wing plane.

Students used the data to create a scientific poster or an ESRI story map.

“We know the trend is that we’re having more melt and more melt water,” says Geck. “That’s consistent with the pattern both in Alaska and throughout the world.”
The Alaska Pacific University (APU) has had a long-term monitoring program of the Eklutna River, Eklutna glacier and rivers upstream of Eklutna Lake.

A recent Anchorage Assembly work session on the Lower Eklutna River highlighted multifaceted issues facing the watershed.

The Eklutna watershed stands as an ideal place-based case study for an interdisciplinary course focused on water issues in partnership with the Native Village of Eklutna.

To that end, Erin Larson, Ph.D., APU Assistant Professor of Environmental Science, served as a PI for the ’Using Experiential, Place-Based Learning About Water Resource Management for Undergraduate and Graduate Education’ project from September to December 2020.

“The project allowed students to work with data collected from a local watershed – the Eklutna – that is important as a source of Anchorage’s drinking water, a recreation site, and the ancestral homeland and salmon waters of the Native Village of Eklutna,” Larson notes.

The project enhanced an existing APU water resource management undergraduate and graduate class, helping to bolster STEM-based educational and workforce opportunities.

The course examines basic hydrology, water use, water rights, water quality, floodplain management, and dams, focusing on Alaskan water issues using hydrological, ecological, and geological approaches.

The project also entailed the study of the impacts of the 2018 removal of the lower dam on the Lower Eklutna River, below Eklutna Lake.

Students learned about the history and practice of water resources planning and management, land use effects on watershed processes, water resources planning analytic methods, and the impact of government policies on watershed management.

During summer 2020, Larson and an undergraduate assistant worked on the Lower Eklutna watershed collecting water quality data such as temperature, dissolved oxygen, and nutrient concentrations for analysis.

Students in the water resource management course used collected field and Geographic Information System and modeling approaches and analyzed collected water quality data for one of their problem sets.

That information was shared with the Native Village of Eklutna through the Technical Working Group process.

Educational materials about the Eklutna watershed were created in partnership with the Anchorage School District and the Bureau of Land Management’s Campbell Creek Science Center.
The location of the University of Alaska Southeast (UAS) within the Tongass National Forest and on the margins of the Juneau Icefield and the Inside Passage positions the campus as a dynamic outdoor laboratory.

Taku Glacier is a tidewater glacier that advanced and prograded a proglacial moraine into Taku Inlet over the last century. The glacier feeds into Taku Inlet at the mouth of the Taku River, which cuts through the Coast Range, and is one of only a few large transboundary rivers in Southeast Alaska.

Recent photos and mass balance data suggest climate warming is about to begin a calving retreat.

Students will study glacier and fjord dynamics, glacier geomorphology, marine ecosystems, political ecology, and the impact of processes occurring in the region on Juneau’s economy, which includes fishing and tourism.

‘Undergraduate Field Studies Across the Icefield-to-Ocean Environment of Southeast Alaska’ with Jason Amundson, associate professor of geophysics in the UAS Department of Natural Sciences serving as PI is a four-year project at the glacier and inlet.

“We are working to develop a long-running, interdisciplinary field course incorporating emerging technologies to strengthen our programs while also collecting data to help us to better understand the icefield-to-ocean environment of Southeast Alaska,” says Amundson.

Project goals entail developing a robust, interdisciplinary undergraduate field course spanning terrestrial and marine systems and incorporating emerging technologies, providing students with tools to address complex, societally relevant issues related to climate and ecosystem change.

The first year has focused on ramping up drone technology expertise for subsequent field courses. UAV surveys of the Jensen-Olson Arboretum were conducted from which orthomosaics and digital elevation models were produced.

Grant money has been used to purchase kayaking equipment for upcoming field courses. Smartfins – typically attached to surfboards to collect data – were purchased to be affixed to two kayaks and used to measure water surface temperature as the kayaks navigate the field site.

“By developing a long-term, interdisciplinary field program, we hope to acquire long-term data sets exploring the interactions between glaciers and their proglacial fjords,” says Amundson. “Similar data sets are only available from a few locations around the world.”
URISE Program Provides STEM Research, Peer Support Opportunities
by Carol Brzozowski

STEM programs face challenges attracting and retaining underrepresented students.

Anchorage hosts one of the most diverse populations in the U.S. and is positioned as a successful application of Alaska Undergraduate Research and Interdisciplinary Science Exploration (URISE).

URISE gives students with no prior research experience opportunities to engage in faculty-mentored research while being supported by a peer-learning community of other research students, notes Dr. Erin K.S. Hicks, associate professor of astronomy at the University of Alaska Anchorage Physics & Astronomy Department.

Its focus: to positively influence the diversity of students earning degrees in the natural sciences and closely-related STEM fields with the long-term goal of building a more diverse STEM workforce supporting NASA.

“Engagement in research is widely recognized as a high impact practice that positively influences retention and graduate rates of all students, but is particularly impactful in traditionally underrepresented groups in the natural sciences,” adds Hicks, PI for the four-year program running through AY2025.

Weekly enrichment meetings “provide the expected essential professional development opportunities, but more importantly serve as a time for students to share experiences, learn from each other, celebrate successes and identify strategies for tackling challenges in their research, academics, or life outside of being a student,” says Hicks.

Topics of particular relevance to those who are underrepresented in their fields include impostor syndrome, self-efficacy, and implicit bias.

The COVID-19 pandemic meant Zoom meetings instead of in-person gatherings. Hicks made funding available to students throughout the academic year rather than concentrated in the fall semester, which addressed lab access challenges.

Hicks notes most students remain engaged in research, which she anticipates will translate into a higher graduation rates compared to their peers who did not participate in the program.

First cohort students who are no longer supported by the program still engage in weekly meetings, something Hicks hopes will translate to near-peer mentorship as students who began the program as a novice researcher transition to experienced researchers and then build relationships with students in newer cohorts.

Cohort 2 included 10 females, six males, two LGBQT+, five first-generation, two Alaska Natives and five minority race or ethnicity students.

CALENDAR OF EVENTS 2021 - 2022

**September 2021**
- STEM Education Fellowship applications due
- Early Career Undergraduate Research Apprenticeship applications due

**October 2021**
- Fall 2021 Space Grant Directors meeting, Jackson Hole, WY

**December 2021**
- Graduate Research Grant applications due

**January 2022**
- STEM Education Fellowship applications due

**February 2022**
- Spring 2022 Space Grant Directors meeting, Crystal City, VA
- NASA Internship applications due

**March 2022**
- Higher Education and Pre-College grant applications due
- Summer Undergraduate Research Apprenticeship applications due
- Summer Early Career Undergraduate Research Apprenticeship applications due

**April 2022**
- Alaska Industry Internship applications due
- Alaska Space Grant and NASA EPSCoR Education and Research Symposium
The 2019 Covid-19 pandemic caused a sudden and drastic shift from in-classroom learning to a virtual platform.

Challenger Learning Center of Alaska (CLCA) utilized the latest in technology and online delivery systems in 2020 to adapt existing on-site workshops including Light & Energy, Rocketry, Robotics, Stability & Navigation and Living in Space to provide Virtual STEM academies and workshops.

The program focused primarily on third- to eighth-graders in the Kenai Peninsula Borough School District (KPBSD, including the Migrant Student Program.

CLCA trained educators in online delivery of the workshops, including encouraging teamwork in a virtual environment to spark excitement in the future of space exploration and spur students to pursue STEM careers.

The initial pilot program with Alaska and Bermuda students won recognition as the recipient of the Arthur C. Clarke Award for Innovation in Education.

Student, teacher and parent feedback indicated the program attained success in engaging students in hands-on science and exploration and indicated a desire to do other programs with Challenger Learning Center.

Suzanne Phillips, CLCA director of educational operations, notes “communication and collaboration among students is an integral part of all our programming. It was important to us that these virtual programs not lose that real-world skill.”

That included Zoom breakout rooms to encourage teamwork in brainstorming and problem-solving.

Hands-on activities were included to ensure the program was interactive. Needed materials were purchased and shipped to each student, a factor appreciated by parents concerned about having to source them.

To find a set-up that worked for the Flight Directors to interact with the students in an engaging and dynamic way, the Simulator was as a backdrop. A system of computers and tablets enabled close-ups on activities and demonstrations.

Phillips says some programs will be continued on a limited scale as on-site programming is resumed.

“Though challenging, this has been a great opportunity to re-envision how we can deliver our programs to as many students as possible,” says Phillips. “We want to build on the Challenger Goes Virtual program opportunities to reach schools and groups in areas we hadn’t been easily able to in the past.”

CLCA Successfully Pivots In-Classroom Learning to Virtual STEM Instruction - by Carol Brzozowski

*Courtesy of Suzanne Phillips.*
In summer 2020, the Alaska Aerospace Corporation (AAC) hosted two Alaska Space Grant interns. Initially, Brad Choi, a senior electrical engineering student at the University of Alaska Anchorage, and Joseph Egbejimba, a senior mechanical engineering student at the University of Alaska Fairbanks worked in the AAC’s Anchorage office. According to Joseph, “Mark Lester, the CEO of AAC, wanted us to see the planning that goes on prior to a launch and the pre-launch preparation by the Aurora Launch Service (ALS) operations team on the ground.”

Joseph and Brad worked as a team. Together, they completed Federal Aviation Administration and US Coast Guard licensing, Notice to Airmen and Mariner safety closure analysis, and 3D rocket trajectory plotting.

The interns spent mid-July to early August at the Pacific Spaceport Complex Alaska (PSCA) on Kodiak Island. Commercial and military sub-orbital and orbital vehicles are launched from this year-round facility. They participated in the daily tasks of running the spaceport. For example, they helped to build three containers for the antenna system. Brad said, “it was so fascinating to see all the equipment that was needed for launching a rocket and the actual rocket.”

They also replace over two miles of fiber optics to increase the spaceport’s digital data capacity, which took four days to complete. Brad recalls that “it was a hard and excruciating task, but it was worth it. This is something I will always remember because it was a great learning opportunity.”

For Joseph, the most memorable activity of their internship was “our participation in the completion of AAC and ALS off-site mobile telemetry, which was a major task that we performed during our stay in Kodiak.”

The internship broadened Brad and Joseph’s professional aspirations. Joseph said that “my interests have expanded, and I have added the aerospace industry as another potential field of interest for my professional plans.” Brad goes even further. “Before doing this internship, I was not interested in the space industry or space itself. I discovered an interest in learning about space and want to have a career that involves space, especially something related to vehicles.”
Astronauts require about 2,800 calories every day while in space. Currently, that food is grown and processed on Earth and transported to the International Space Station. University of Alaska Fairbanks engineering student Kyle Alvarado is part of an international collaboration trying to figure out how to provide those calories more economically and sustainably. Their surprising answer: bacteria.

Bacteria can provide many of the nutrients that human beings need. Growing food in space is difficult due to a lack of a pressurized growing area, sunlight, and gravity. There is also the risk of contamination and exposure to ionizing solar radiation. Bacteria are resilient and require few resources to grow. Some bacteria can even grow using electrons from their environment.

Kyle was looking for a way to collaborate with NASA and this research provided him with the perfect Master’s degree project. According to him, his primary role “is to design a scalable food production method using electro-active bacteria”. To prepare, Kyle took a graduate biotechnology course and published an article on a food scaling method. A second article about hydrogen-oxidizing bacteria is under peer reviewed. As he says, “I believe it is important for an engineer to learn and adapt to any scientific field.”

His next step is to “determine which calorie source — the bacteria or their byproducts — is more energy effective”. Like many researchers, Kyle’s work has been affected by the COVID-19 pandemic. A trip to NASA Ames Research Center was cancelled in March when the United States went into quarantine. But he says, “conference calls with Dr. John Hogan at NASA Ames allowed me to gather the information that essentially completed the approach of the project.”

Finding a sustainable method for growing food in space is integral to our success in space, especially as we move beyond Earth’s orbit and build outposts on the Moon and Mars. But Kyle’s research has applications here on Earth too. In the event of a sun-obscuring global catastrophe — asteroid impact, nuclear war or extensive volcanic eruptions — conventional agriculture could be disrupted or fail. If that happens, Kyle’s space-mission bacteria production methods might prove crucial to our species’ survival here on Earth.
Megan Brauner, a graduate student at UAA, has been working in the Kenai River estuary since 2019. Her project looks to Earth’s present to understand what may have happened in Earth’s past.

Brauner’s research focuses on how microbes store iron. All life requires iron for various metabolic processes and it’s one of the more abundant elements found in the universe. Not only do other planets (like Mercury) contain iron but Earth’s core itself is made of it.

Like any element iron is found more in some places than others. That is the same now as it was in the past. Unlike now, however, the Earth was not always rich in oxygen. As the Earth’s environment changed this forced microorganisms to evolve. As such, different microorganisms began to store iron differently which, in turn, contributed to the diversification of microbial species.

Her research took her to the Kenai where she took samples of estuary water during break up, in the middle of the summer, and while the region was frozen. Estuary environments mimic the transition from high to low iron, Brauner explained, and are model sites to understand the evolutionary mechanisms of microorganisms.

“I had to work through the ice and snow in order to get samples,” she said, “and it was so cold outside that the water was freezing while we were attempting to filter the microbes!”

Brauner expected iron concentrations to depend on salinity across the estuary. As a result of this, she anticipated seeing more iron storage in samples with a higher salinity. However, her expectations were dashed once she analyzed her findings; she was seeing a lack of iron storage in freshwater samples with no salinity. Yet, despite that, there was no significant change in iron concentration.

While Brauner has been keen to analyze her samples since spring, she was delayed.

“COVID-19 has unfortunately impacted my project,” Brauner said. “The university closed and for a few months I was unable to get into the lab.” COVID-19 also impacted the arrival of reagents - substances necessary for chemical analysis.

Brauner explained that thanks to her advisor (Dr. Brandon Briggs) and other UAA staff she was able to get back into the lab and get her project moving forward.

Doing research in Alaska under normal conditions can be a challenge, but doing so under the shadow of COVID-19 is anything but normal. Who would have thought digging through ice and snow for water samples from the Kenai estuary in winter would be the easy part?
NASA Goddard Space Flight Center is developing an S-band (2 to 4 gigahertz or 15 to 7.5 cm wavelength) transceiver suitable for small satellites and CubeSat applications. Mitchell Hay, an engineering undergraduate student at the University of Alaska Fairbanks (UAF), spent his 2020 virtual internship working on this project. He assisted in the development of several components for this system including Wilkinson power dividers, attenuators, and bandpass filters. He also gained experience with communication link analysis and radio frequency (RF) design.

The RF components were designed in Keysight Technologies’ Genesys, an RF and microwave synthesis and simulation application. Hand calculations were used when possible, but final design tuning and optimization were done using Keysight Genesys. Mitchell successfully designed components that met NASA’s performance specifications.

It was not possible to make and test the components Mitchell designed because his internship was virtual. He is hoping to manufacture a Wilkinson power splitter at UAF using a Printed Circuit Board (PCB) mill. However, he says that “I will not be able to manufacture many of the components [at UAF] either because I doubt the PCB mill has the tolerances needed to manufacture the tightly coupled microstrip lines for the filters.”

He did complete momentum simulations and component layouts. Mitchell says that “the experience I gained with RF design as well as the link budget analysis was extremely valuable.” He is putting his RF design experience to good use: “I am involved in the CubeSat Communications Project at the moment and am the lead engineer for both the communication and retrodirective antenna subsystems.

Mitchell’s internship not only gave him the opportunity to gain experience in RF design; it also changed his mind about what he wants to do next. “Before joining this project, I had only briefly considered attending graduate school, but now I fully intend to pursue a master’s degree in this area. I hope to eventually complete a thesis in the field of microwave design, ideally regarding microwave components such as filters or amplifiers.”
Christopher Smith, a Master’s student at the University of Alaska Fairbanks, is on a mission. He wants to improve assessing boreal wildlife burn severity using readily available satellite data. Wildfires are a fact of life during Alaskan summers. With climate change, their frequency, severity and duration have increased. Many of these fires are near major population centers where the wildfire smoke affects a human health — irritated eyes, impaired breathing, and worsening heart and lung conditions. Finding a way to provide accurate information about local wildfire fuel and behavior could make a significant contribution to fire hazard management.

Fire fuel information is crucial for assessing fire risk and spread. Through his involvement in an EPSCoR project, Chris produced a fuel map of the Bonanza Creek Experimental Forest that is 90% accurate when compared with direct observations. He did this by including AVIRS-NG hyperspectral satellite data in his fuel maps. Similar maps based solely on Landsat data are only 30% accurate.

This summer Chris and his collaborators are doing fieldwork just outside of Fairbanks. They are assessing the severity of the 2019 Shovel Creek burn using the Composite Burn Index. Thanks to the COVID-19 pandemic, this fieldwork nearly didn’t happen. “We only found out at the last minute that we could go ahead,” says Chris. Following the Centers for Disease Control and Prevention protocols is now an integral part of their fieldwork best practices.

These direct observations will be used to “teach” the classification program that Chris is using to evaluate the satellite data to better identify burn severity based on its wavelength signature. This information will be correlated with vegetation and topography data to create a burn potential map.

Chris is also involved in creating a course based on his research with his supervisor, Dr. Santosh Panda and a PhD student. The course, tentatively called Remote Sensing of Wildfires, will be available online. “This course will reach people all over the country and maybe some of them will consider studying wildfires at UAF,” Chris says. At the very least, they will learn about the important research being done on Alaska wildfires.
Luka Spaic of University of Alaska Anchorage - by Kim Morris

During his 2020 NASA summer internship, University of Alaska Anchorage student Luka Spaic worked with Asmita Korde-Patel of the Goddard Space Flight Center. He focused on analyzing the photometric brightness of visible band images of constellations using compressive sensing. This signal processing technique allows sampling at less than the Nyquist rate yet reconstructs the signal back with little or no loss of information.

Luka used an observed image, consisting of the original noisy data, and a reference image, a cleaned-up version of the dataset. He performed image differencing on the two images (subtracted one image from the other) to create a new image that he reconstructed using compressive sensing.

Monte Carlo, or probability, simulations, was used to evaluate the accuracy of the reconstructed signals. A Monte Carlo simulation uses repeated sampling to determine the statistical properties of a phenomenon. Luka ran Monte Carlo simulations that took 100 samples to assess the difference between the reconstructed and original signals. These simulations took a long time due to the complexity of the procedure and the large amount of data involved.

Luka’s main task during his internship was to reduce the time needed to run the Monte Carlo simulations. This time reduction could be achieved by either speeding up the run time of existing programs or creating new programs that would execute tasks more effectively. He used multi-processing, also known as parallel processing, to speed up the program’s execution time. This method involves creating several processes that execute multiple steps of the program simultaneously. The addition of multi-processing functions to the program required that it be rewritten and allocated more memory space. By adding multi-processing and other changes to the program, he reduced the running time from about 100 hours to approximately 32 hours.

According to Luka, “I gained a lot of new skills, experience, and knowledge I would never have obtained without this opportunity.” He wants to continue exploring the power of algorithms as an analytical tool. He was also impressed by the NASA staff, who made him feel “welcomed in every situation and propelled my learning experience forward.”

 Courtesy of Luka Spaic.
Tyler Summers of University of Alaska Fairbanks - by Kim Morris

From early June to the end of September, Tyler Summers was a virtual intern at the NASA Goddard Space Flight Center. The University of Alaska Fairbanks Master’s student examined the air quality resulting from Alaska wildfires (aerosol particle size, fine-mode-fraction, and aerosol optical depth). He used the new high-resolution Multi-Angle Geostationary Aerosol Retrieval Algorithm (MAGARA) to extract and analyze the relevant Geostationary Operational Environmental Satellite (GOES) data.

Before using the MAGARA, Tyler completed a line-by-line documentation of the algorithm. He explains that “this ‘deep dive’ into the code helped me understand how the MAGARA works and benefits future users by describing the algorithm’s essential elements.”

Next, he began the process of moving, or porting, MAGARA from a desktop computer to a supercomputer. Tyler’s research uses large GOES datasets. A supercomputer was required to run the MAGARA efficiently with these large input files.

Then, Tyler modified the MAGARA to retrieve data from high latitudes (> 56 degrees). The MAGARA was designed to retrieve data over the contiguous United States using either GOES-16 or both GOES-16 and -17. Alaska sits on the outer edge of GOES-17’s field-of-view and is not imaged by GOES-16 at all. The pixel sizes and shapes of GOES-17 data acquired at high latitudes are distorted by more extreme view angles and the curvature of the Earth making these data more difficult to work with.

Finally, he used NASA’s Worldview tool to identify three Alaska wildfire events in the 2019 MODIS (Terra) true color reflectance dataset. Unfortunately, the Alaskan wildfire MAGARA run remains a work-in-progress because the “initial results demonstrated a temporal interpolation issue between the algorithm’s time intervals and the GOES-17 data that needs to be resolved.”

Tyler gave two presentations about his research to the NASA Goddard community and participated in weekly NASA staff meetings. His NASA mentor, Dr. Mariel Friberg, is now a member of his graduate degree committee. He says that his internship “has given me invaluable research experience and networking opportunities that will undoubtedly further my future academic and professional development.”
Cory Vaska of University of Alaska Fairbanks - by Kim Morris

In summer 2020, University of Alaska Fairbanks (UAF) engineering student Cory Vaska interned at NASA’s Flight Microwave and Telecommunication Systems Branch. This branch focuses on the conception, analysis, design, development, test, and operation of state-of-the-art and advanced radio frequency (RF), microwave, millimeter wave, and optical communication components, and systems.

The engineering senior’s goal was to develop an M-ary Phase Shift Keying (M-PSK) system, a type of digital modulation that simultaneously transmits two or more bits of data by changing, or modulating, the phase of a constant frequency reference signal, or carrier wave. Initially, the M-PSK was developed in MATLAB and Simulink. Ultimately, Cory planned to adapt his system for a field-programmable gate array (FPGA).

Cory started the project by creating a simple binary PSK (BPSK) communications system in MATLAB. Then, he introduced quadrature-PSK (QPSK) and 8-PSK. Cory says that “QPSK doubles the data rate on the same bandwidth as BPSK; 8-PSK quadruples the data rate.” This system is not a transceiver and not very complex. According to Cory, “it could be used on a satellite for transmitting data, but the satellite would require another communications system to receive commands.”

A significant portion of the development focused on pulse shaping and matched filters. A model for the filters was created in MATLAB before switching to Simulink simulations. By the end of the internship, Cory had created Simulink programming blocks for modulating, pulse shaping, and matched filtering. Unfortunately, his internship ended before he could implement his model on an FPGA.

Through his internship, Cory learned about digital communication systems. He is putting this knowledge to immediate use. He has started graduate school at UAF and is planning to develop a communications protocol for an FPGA. According to Cory, his Variable Coded Model “will cause the data transmission system to change modulation based on the signal-to-noise ratio between a satellite and ground station during a pass.” Developing a simpler communications system has given him a better idea of how to approach the development of this digital communication system.
Throughout this past year of uncertainty, Alaska Space Grant continued to provide exceptional educational opportunities to students throughout Alaska. We were forced to adapt to on-line learning platforms and found that at times that virtual learning could be successful and reach a larger audience than strictly face-to-face programs. The Challenger Learning Center of Alaska (CLCA) won recognition as a recipient of the Arthur C. Clarke Award for Innovation in Education for their work in virtual STEM instruction on an ASGP sponsored project.

Adjustments were made to all of our programs to ensure health and safety of our students and faculty. Rather than take a team of students to the Eklutna Glacier, Dr. Geck (APU) had to deploy instrumentation on his own. Dr. Larson (APU) took only one student to the Lower Eklutna watershed to collect water quality data. Both the data from the glacier and the watershed were then used in virtual classes. Some projects made use of the travel ban to improve their courses for future years, like Dr. Amundson (UAS) project to study glacier dynamics of the Taku Glacier.

Regardless of the COVID impacts on the university, our students continued to engage in research and engineering projects. Dr. Hicks (UAA) URISE program provides research opportunities to students with no prior research experience. Like the SSEP program at UAF, the URISE program supports students through a peer-learning community. This peer-learning community has been doubly important during COVID when students often felt the stress of isolation. Our graduate student awardees learned how to manage COVID restrictions and still make progress...
on their projects. CDC protocols are now an integral part of their fieldwork best practices.

One of the most sought after components of the Alaska Space Grant Program is the summer internships at NASA and Alaska Industries. We feared that COVID restrictions would eliminate that program for the 2020 summer season. Much to our surprise, NASA pivoted and provided virtual internships. Our Alaska Industry partners were still able to support on-site internships.

This year it was my honor to receive the 2021 Emil Usibelli Distinguished Teaching award (https://www.uaf.edu/usibelli/). I was nominated for the award primarily by students who participated in the Alaska Space Grant sponsored Space Systems Engineering Program (SSEP) and have subsequently obtained jobs at NASA and other aerospace industries. Alaska Space Grant provided me with the opportunity to positively impact students through the Space Systems Engineering Program. I felt it was only fair that I give back to the Alaska Space Grant Program by transferring my cash prize back to the program. This donation will help fund, in part, a TVAC chamber for the SSEP lab which is essential to increase our design capability, by allowing students to test designs for qualification, acceptance, pre-launch requirements, and in-orbit environment viability.

If you would like to contribute to the Alaska Space Grant Program educational mission, please visit our website, https://spacegrant.alaska.edu/ and select the Donate button at the top of the page. All donations are used to provide the match required by the Space Grant program before we can spend any NASA dollars. Your donation provides funding to increase the educational opportunities for students in Alaska.

### UNDERGRADUATE RESEARCH APPRENTICESHIP Awardees

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<td>Cassidy Berger</td>
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The Twelfth Annual
Education and Research Symposium
Will take place in Juneau, Alaska
April 8, 2022