Typically, during this time of year the ADAC Team would be busy exploring the many wonders of Arctic field research in Utqiagvik, Alaska, for ADAC’s annual Arctic Summer Internship Program (ASIP). However, due to the risks associated with the COVID-19 crisis, ADAC had to cancel its traditional in-person summer program. In its place, the ADAC Team worked fast and furiously to transition ASIP to an entirely virtual 10-week summer internship. With the leadership of the program’s Principle Investigator, Dr. Craig Tweedie from the University of Texas at El Paso (UTEP), and program development coordination by ADAC’s Education & Administrative Manager, Ellee Matthews, ADAC’s new online internship program kicked off with a bang on June 2nd, 2020.

In recognition of the dynamic and complex challenges presented by the Arctic region, the 2020 ASIP program takes an interdisciplinary approach to teaching students about the Arctic. In particular, the program emphasizes that the Arctic’s challenges are multidimensional, as they are impacted by the current ever-changing characteristics of the Arctic, while also rooted in the region’s vibrant historical, political, and cultural complexities. As such, the ASIP program covers a compilation of critical topics, ranging from Alaska Native studies to biology. The program is further comprised of a comprehensive series of guest presenters, to include Kaare Erickson of the Ukpeaġvik Iñupiat Corporation (UIC), Dr. John Farrell from the Arctic Research Commission of the United States (ARCUS), Dr. Paul Berkman from Tufts University, and Craig Fleener from the Alaska Ocean Cluster (AOC), among many more.

Spanning nearly all time zones of the United States, ADAC’s 2020 ASIP includes 11 students originating from a total of 6 universities, including the University of Alaska Anchorage, the University of Texas at El Paso, the University of New Orleans, the University of North Carolina Wilmington, the United States Naval Academy, and the University of New Hampshire. Throughout the program’s 10-week duration, students will tackle a wide variety of assignments and activities, such as an independent research project, a group disaster-oriented project, bi-monthly Ignite-style presentations, networking weekly with ADAC’s constituent base, and exposure to numerous skills-based lectures oriented towards both academic and professional development.

With the program already underway, the ASIP team is thrilled to be working with such an enthusiastic, passionate, and bright group of students from all around the country!
Center Update

By Randy “Church” Kee

Distinguished Colleagues,

The Arctic Domain Awareness Center is now in the final moments of our Program Year 6 activities, following a remarkably challenging year, which included 8.5 months of remarkable “in person” activities and 3.5 months of “virtual” efforts. As we will be providing in details via Year 6 Annual Report in late August, the Center and our research network has been remarkably successful in adjusting and moving forward despite the challenges created by the need to close laboratories, shops and workspaces due to COVID-19. To be sure, we will need to ’carry forward’ work planned for late Program Year 6 into Program Year 7 due to the closures, but we are very pleased that we have been able to advance both center activities and project work despite the changes in how we do work that have been created in order to keep people safe.

Most importantly, we are pleased to relay that so far, Center personnel, students and researchers associated/affiliated with ADAC are staying safe and healthy. We will continue to stress that protective actions to preserve the health of our team and our collaborators will remain a priority.

Since 17 March, the ADAC Center management team has been in telework status and based on the current University of Alaska Anchorage guidelines, we anticipate this posture to remain until at least the start of the Fall semester in late August. We are very appreciative that restrictions in field access, laboratories and workshops across our network are loosening, and as a result, will hopefully allow us to quicker the pace on associated research activities.

For the past two years, ADAC has looked forward to our Arctic Summer Intern Project conducted at the Barrow Arctic Research Center, near Point Barrow at 71 Degrees North. Due to COVID-19, and the need to be extra vigilant in keeping the virus away from potentially very vulnerable populations on the North Slope, we made the call in April to transition the program to a virtual set of activities. We so very much look forward to returning to the “BARC” next June!

We start our Program Year 7 on 1 July 2020 and look forward to advancing research, education programs and convening activities in this coming research year to benefit U.S. Coast Guard and other Arctic operators. We will shortly post our Year 7 workplan for all to see what we have in store for this coming year and will also publish our Year 7 Long Range Schedule.

We in ADAC would like to take a brief moment to remember two very special people of the Arctic and Alaska who have recently passed away. Former State of Alaska Lieutenant Governor, Bryon Mallot and Nome Mayor Richard Beneville. These distinguished leaders both left our midst far too soon and have left a remarkable legacy of service and impact that will be felt for years to come. We mourn their passing and pray for their families and loved ones. We in ADAC are honored to have had the chance to get to know both Lt Gov Mallot and Mayor Beneville and will cherish our memories of these interactions.

The below is a brief recap for your review.

ADAC ASP 2020...now underway. Starting in Early June, ADAC launched our “virtual” Arctic Summer Intern Project, and have been amazed at how well the students associated with this project have leveraged the opportunities of quite an array of guest speakers that our Education and Administrative Manager, Ellee Matthews and our ASIP lead, Dr. Craig Tweedie at University of Texas El Paso has so expertly arranged. In sum, across this 10-week program, our students will receive quite a remarkable sampling of Arctic research, USCG maritime operator views, Alaska Native expert insights, Arctic Security policy briefings and more. A particular highlight will be “virtual” meetings at the locations with the on the ground experts we meet with during our in person ASP experiences when operating from the Barrow Arctic Research Center, brought to us by the champions of Ukpeagvik Inupiat Corporation (UIC) Science in Ukqiqvik, led by the highly regarded Mr. Kaare Erickson. We are so very thankful for Kaare’s help and expert leadership in bringing the North Slope to our students, since due to COVID-19, we are unable to bring our students to the North Slope.

Thank you for participating in the ADAC Annual Meeting. We do hope that many of you found the 14 May 2020 ADAC Annual Meeting a useful investment of your time. We were pleased that a total of 202 people registered for this 7 hour event, and deeply honored for the opening welcome by UAA Chancellor Dr. Cathy Sandeen, keynote reflections by the Commandant of the U.S. Coast Guard, Admiral Karl Schult, a DHS and NOAA S&T “fireside chat” by the DHS Senior Official Performing the Duties of the Undersecretary of Science & Technology, Mr. Bill Bryan and the Deputy NOAA Administrator, Dr. Tim Gallaudet, RDML, USN (Ret) along with key insights Director of the DHS S&T Office of Innovation and Collaboration, Mr. Bob Burns. Per a number of recent requests, we have maintained the Annual Meeting “Event Hub” on our website for people to review project viewgraphs, recent project investigator reviews and the associated project video. We have also provided an access link to the overall Annual meeting recording. Please see https://arcticdomainawarenesscenter.org/AnnualMeeting_Hub for more details.

ADAC Arctic Incidents of National Significance 2019 “Accepted Proposal” notification, ADAC is pleased to announce we have recently been notified by DHS S&T OUP of an “accepted proposal” that is jointly acceptable in terms of science and USCG “customer relevancy” from DHS S&T OUP and HQ USCG. The Project, which is titled “Remote Unmanned Aircraft System (UAS) Inspection and Response Team Development in the Bering Strait Region” is a superb match to meet the USCG District 17 Sector Anchorage concerns that were a big part of the Arctic IoNS 2019 meetings from April and May last year. The proposal team is led by Jessica Garron and supported by researchers at University of Alaska Fairbanks Alaska Center of Unmanned Aerial System Integration (ACUASI), with additional investigator support provided from researchers located in Unalakleet and in the Pacific Northwest. The team is now preparing the associated workplan for review,
and we are hopeful to get this project underway early next month. We will keep all concerned for any further updates on Arctic IoNS 2019 proposals as soon as we have the words ourselves to so relay. We continue to be thankful and appreciative of the proposals provided to this funded solicitation.

Update on upcoming workshops postponed as a result of COVID-19. ADAC is continuing to discuss with the associated workshop collaborators and sponsors for events planned for March, April and May 2020 that have been moved to the fall as a result of the pandemic. Note, ADAC is anticipating the release of an additional workshop sponsored by Alaska Command in the very near future. For the present, here’s the current update, aligned to each currently scheduled workshop for August and September 2020:

- Arctic Air 2020 (Arctic IoNS 2020), 26 August 2020, University of Alaska Anchorage, or possible via virtual means. ADAC is underway in discussions with USCG District 17 regarding the Arctic Air 2020 Arctic IoNS 2020 workshop that was previously planned for 1-2 April 2020 at UAA. If COVID-19 measures prevent a sufficient gathering opportunity, USCG D17 and ADAC planners are preparing an alternative means to conduct the workshop via conference call and sufficiently detailed and sophisticated chat session. More to follow on this in coming weeks. A follow-on in person event is currently planned to take place in winter 2021.
- Arctic Maritime Horizons, an assessment of the maritime transportation system of the Bering, Chukchi and Beaufort Sea regions, 1-2 Dec 2020 (dates subject to change due to COVID, please check ADAC’s website for future changes to the event), UAA. If COVID-19 measures prevent a sufficient gathering opportunity, HQ USCG and ADAC planners are preparing to delay this workshop until social distance measures allow for an in-person gathering at this current time.
- Advancing Collaboration in Canada-U.S. Arctic Regional Security (ACCUSARS) Invitational Workshop. 17-18 September, via distance means. ADAC and the North American and Arctic Defence and Security Network (NAADSN) are planning to transition this workshop to a virtual means due to the likely certainty that many of our Canadian academic colleagues will not be permitted to travel to Alaska for the foreseeable future. Accordingly, our planners are preparing an alternative means to conduct the workshop via conference call and sufficiently detailed and sophisticated chat session.

ADAC Year 7...a focus on commercialization. ADAC’s pending Year 7 plan is adding a new facet to advance discussions and collaboration that advances commercialization of ADAC and like-minded research efforts that supports gaining new capabilities to Arctic operators. Once we have the changes/edits and the approved Year 7 in hands, we will announce these events which will be conducted in a series of events starting in the fall of 2020.

Arctic Circle 2020. Earlier this year, ADAC led the development of two panels for presentation at Arctic Circle 2020, which is still planned for October in Reykjavik. Just today, we have learned that our two panel submissions have been approved.

We accordingly hope that COVID-19 conditions will fade to the point in which we and others can safely travel to the Harpa in Iceland for this important Arctic event.

ADAC participation is underway in support of ONR ICE-PPR. As briefly mentioned earlier, ADAC is honored to support the Office of Naval Research’s International Cooperative Exchange Program for Polar Research (ICE-PPR) as in leading the U.S. Situational Awareness Working Group (SAWG). The overall SAWG lead is with the Kingdom of Denmark Armed Forces and we are in the ICE-PPR US SAWG are in work with providing recommendations for a framework in organizing multi-discipline cooperation in support of U.S. contributions in S&T that benefits domain awareness among partners and collaborators in this multi-national effort.

Thank you...Dr. Larry Hinzman for your incredible service to ADAC. We in ADAC are sincerely and profoundly appreciative of the incredible and incredibly important service of Dr. Larry Hinzman, who has a distinguished career of service at UAF, to include serving as the UAF Vice Chancellor for Research since 2015 and our Research Director since January 2016. Larry has just departed UAF and as ADAC’s RD to assume the duties of Assistant Director of Polar Sciences in the White House Office of Science and Technology Policy and the Executive Director of the Interagency Arctic Research Policy Committee. We wish Larry every good success in his new endeavors!

Welcome aboard, Dr. Nettie Labelle-Hamer as our new RD. Dr. Nettie Labelle-Hamer, who has also had a remarkable career of service in science and technology research and associated activities at UAF, to include long service as the Alaska Satellite Facility Director and Deputy Director of the UAF Geophysical Institute, now serving at the Interim Vice Chancellor for Research at UAF and ADAC’s new Research Director. You may recall that Nettie led the ADAC aspects of the DHS S&T and USCG R&D Center CubeSat Experiment. We are honored and thrilled to be serving with Nettie in this new capacity.

Please know, the University of Alaska is resilient. As many of you have likely seen in the news, the University of Alaska is continuing under some tough times, with painful decisions made just a few days ago to close some academic programs that impact faculty and students alike. We will refrain from adding more than what our University leaders have already stated for the record…but please know, the University faculty, staff and students are a hardy lot and we will find a way through these tough times. Please keep faith with us...as we will keep faith with you.
Innovative solutions for unprecedented challenges

By Jason “Olaf” Roe

Research, testing, and laboratory experiments are all conducted within defined boundaries as described in project workplans. As milestones and metrics drive project teams to prioritize tasks, routine obstacles such as equipment malfunctions, specimen availability, and unpredictable weather conditions are successfully navigated to keep research on time and budget. These frustrating and time-consuming aspects to research are routinely handled with skill and professionalism by ADAC research teams. As COVID-19 emerged as a global pandemic and communities and institutions sought to flatten the curve through facility closures, travel restrictions, and social distancing, it became increasingly clear that COVID-19 was going to significantly impact most aspects of daily life, including research. It was in the face of those unprecedented challenges that several ADAC research teams successfully overcame obstacles through careful planning and innovative thinking.

As the LRAUV Project Team faced severely restricted lab access at Woods Hole Oceanographic Institution (WHOI), they moved swiftly to install webcams in the lab and ensure uninterrupted communications and power to the vehicle. Through remote communications to the vehicle and utilizing the webcams to confirm vehicle behaviors, the WHOI team gained the ability to successfully test behavior programs and significantly refine software code. As WHOI engineers remotely instructed the vehicle to move forward and backward and deploy or retract whiskers, those behaviors were observed via webcam.

Through remote implementation of 2 summer interns and by increasing the image quality and framerate of Copepod experiment videos, Summer interns are effectively assisting in experiments as though they were there in person. This not only adds to the strength of the Copepod research team, but also provides a more highly beneficial experience for the interns, one that much more closely resembles in-lab activities. As Copepods are introduced to the water column along with oil and dispersants detailed videos of the timing, speed, and distance of their movements can be studied from the precision data collected.

As the Arctic Mussels project faced lab closures and unavailability of testing equipment, they diligently worked to identify alternative laboratory facilities and make arrangements to complete required analysis of tissues, keeping research on track and eliminating the need to collect additional samples.

Throughout the COVID-19 pandemic, ADAC research teams continue to turn challenges into opportunities to innovate.

Farewell to Larry Hinzman

By ADAC Communication Team

ADAC has been blest by the leadership and knowledge of Larry Hinzman since he started working for ADAC in February 2016 as the Research Director. He has been strongly committed to facilitating national and international partnerships to advance our understanding of the arctic system.

Through numerous events and projects, Hinzman’s has contribute countless hours to the Center’s development and continued success; whether it’s developing documents, speaking at events, or going out into the field. Recently, Hinzman has accepted a new role in the Office of Science and Technology Policy as the new Assistant Director for Polar Science and the Executive Director of IARPC. As the Assistant Director for Polar Science, Hinzman will work to coordinate the broad national suite of research in the Arctic and Antarctic. As the Executive Director for IARPC, Larry will lead IARPC’s interagency activities and work to meet its legislative mandates. Additionally, Hinzman will act as an informative resource to the White House and Federal agencies.

ADAC will greatly miss Hinzman, but rejoices with him as he moves on to new horizons. We look forward to hearing about the success he will inevitably bring to his new position!
Arctic Craters
What Are They, and Why They Remain a Mystery
By Jeffrey Kee

Millions of lakes cover the tundra. Alaska, Canada, Russia, all Arctic nations that possess a tundra are covered by these bodies of water that can be a few feet across or miles in diameter, mere inches deep or plunging down 120+ meters. In the state of Alaska, there are over 3 million lakes larger than 5 acres, of which a majority reside in the tundra1. These lakes constantly produce methane3, either from the decomposition of organic material or from fault lines deep underground10. But on the occasion, these lakes can suddenly evaporate or drain. Alaska has documented hundreds of these lakes drain regularly2.

In the year 2013, on Siberia’s Taimyr peninsula, an explosion was reported to be heard 100 km away from its epicenter7. Onlookers saw a glow that lit up the night sky, and when they investigated, they found a giant crater, causing some to believe an underground missile had blown up5. In response, Russia sent researchers to investigate this hole in the ground. After dialoging with locals and investigating the lakes and craters of the region, they started finding a connection between the lakes, the craters, and the presence of permafrost mounds called Pingo.

A Pingo mound is the remains of an old permafrost deposit that forms a mound in a drained lake basin, usually the result of disappearing permafrost and the injection of ground water. But as Russian researchers have observed, methane gas buildup seem to occur in these Pingo, accumulating under the tundra grass or in subterranean wells. Over time, the hill will grow as the pocket of gas continues to expand. If smaller mounds are encountered on the surface, one can step onto these fluid-like hills which compress and shift like a waterbed. Other larger hills are stiff and have a build-up of ice and natural gas deeper inside the earth, slowly growing the hill 50 meters high or more8.

Any eruptions of natural gas have been hard to document, since the tundra is sparsely populated. But in the summer of 2017, local residents finally did witness one of these explosions. Seismic activity was detected in the village of Seyakha on the Yamal Peninsula, and people witnessed the fire and cloud of black smoke that ensued from the eruption. Upon investigation, the research teams found that a local hill, which had been the epicenter, was now a deep Funnel crater. The torn remains of the hill were scattered across the landscape and the deep cavern left from the explosion was beginning to fill with groundwater7.

A Funnel crater is a tunnel-like hole that dives deep into the earth as if someone had used a drill to carve it out of the rock (possibly the reason some originally theorized they were missile silos). Other bowl-shaped or funnel craters are found regularly, but no one knows when these methane wells blew up. Close to a dozen large craters have been found by researchers, and further investigations suggest that there are thousands of Pingo mounds that could experience similar explosions9. Over the process of 2-3 years, all these craters will fill with water and some will see a population of fish established6.

How these gas build-ups form is a mystery, although there are several theories. Methane in the Arctic is believed to come from two sources: Methyl Clathrate comes from methane frozen in ice crystals that form deep underground or underwater, and organic methane that forms as a result of decay9. But other sources around the world can be found around geological

(Continued on page 6)
formations, including fault lines\(^{10}\), suggesting that Arctic fault lines might be contributing to the methane of the Arctic. Since methane decays at a fairly swift rate, it’s likely not going to have a large impact on the region, but if these lakes and Pingo. have always been forming, then it’s likely a natural part of the Arctic’s life cycle\(^{4}\).

But as quickly as these lakes can form, others have been found to disappear just as quickly by draining, evaporating, or merging with other lakes or rivers. Because of the melting permafrost, the steep walls of the lakes can collapse, slowly expanding the lake’s diameter as more soil slides to its bottom\(^{6}\). This could suggest that even large, shallow lakes might have once been a funnel crater.

As permafrost melts in the Arctic, it’s possible that this process of gas escapes might be observed more often, or maybe the thawing will permit the gas to escape more gradually, unhindered by the frozen barrier. It’s a subject that will take more research to fully understand. The Arctic is in a period of transformation. Regions that are losing its permafrost are gradually looking like other regions around the world. While it impacts those living in the tundra, it’s also transforming into a landscape that can better support a larger population of wildlife and development. Though we don’t generally think about it, places like Fairbanks and Anchorage could only be built by melting permafrost. Farms can better support crops, and a wide variety of vegetation can find the warmth of the soil to protect their roots during the cold winters. While it’s possible that permafrost will be restricted to the extreme North, it’s also conceivable that it’s just changing regionally. Change is inevitable in our world, and if there’s one thing we can be certain about Arctic lakes, it’s that they are ever changing. It a curious life cycle these lakes have; and will require more study to truly understand. Hopefully with more observation, we will finally know the reason lake grow into mounds, the craters they leave behind, and the new lakes they form.

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1. adfg.alaska.gov/index.cfm?adfg=nerves.main
6. https://www.youtube.com/watch?v=9g96G20