RESEARCH

University of Alaska Fairbanks

OFFICE OF THE VICE CHANCELLOR

IMPACT

SPRING 2025

UAF photo by JR Ancheta

Vice Chancellor for Research Report

Laura Conner

Welcome to the second edition of *Impact*, UAF's research review publication! This edition continues to showcase the innovative work undertaken by UAF faculty, staff and students across a variety of disciplinary areas. During these past months, these efforts have taken place against a backdrop of rapid federal change and uncertainty. In these times, it is more important than ever to highlight the ways that our work is truly critical and relevant to our state, the nation and the world.

This issue celebrates 50 years of research at UAF's remote Toolik Field Station (pg. 7), construction of a tower to figure out how to enable drones to fly safely in icy weather (pg. 5), groundbreaking research from the International Arctic Research Center, where scientists are uncovering new insights into Alaska's changing environment (pg. 14), and work in critical minerals (pg. 11), among other highlights. Our work across the board continues to center a culture of belonging for all. I am proud of what we have accomplished, and of our continuing role as a leader in Arctic research.

As we navigate the challenges ahead, we also are looking forward to the many opportunities that change creates. We invite you to join us on our journey of discovery.

– Laura Conner
Vice Chancellor for Research, University of Alaska Fairbanks

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Aurora over Troth Yeddha' Campus
UAF photo by Todd Paris

Bridging Research & Community

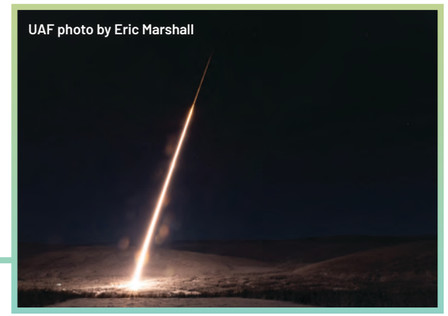
DECEMBER

UAF photo by Rod Boyce

UAF at AGU

UAF researchers made 189 overall appearances, presenting 122 posters and 55 oral lectures at the American Geophysical Union fall 2024 meeting in Washington D.C. The theme for AGU24 was "What's Next for Science." The UAF booth was visited by hundreds of people, including students, faculty and researchers from other universities and science institutes as well as representatives of federal agencies.

JANUARY



UAF photo by Eric Marshall

Rocket launch season kicks off

Poker Flat Research Range had a successful launch season. Two rockets launched in February in a NASA-led mission to study two types of aurora features. Three rockets launched in late March to better understand how the aurora affects the upper atmosphere. That mission was led by UAF physics professor Mark Conde.

FEBRUARY

UAF photo by LJ Evans

Science for Alaska

The 2025 Science for Alaska lecture series, hosted by the UAF Geophysical Institute, connected research and community through free public talks held every Tuesday in February. Scientists shared insights on rockets, volcanoes and Alaska's changing landscape. The long-running series celebrated over 30 years of bringing Alaska-based research to science enthusiasts in Fairbanks and beyond. Recordings are available online at *www.gi.alaska.edu/events/science-for-alaska.*

MARCH

UAMN photo by E. Koehler-Platten

Museum Family Day: Moose

The UA Museum of the North explores monthly themes to foster connection and curiosity about collections and research. During "Family Day: Moose" in March, hundreds of participants made moose art, explored moose uses, learned about being safe around moose and examined specimens such as a set of antler-locked moose skulls.

UAF Research *by the numbers*

PUBLISHING ARCTIC RESEARCH SINCE 1936

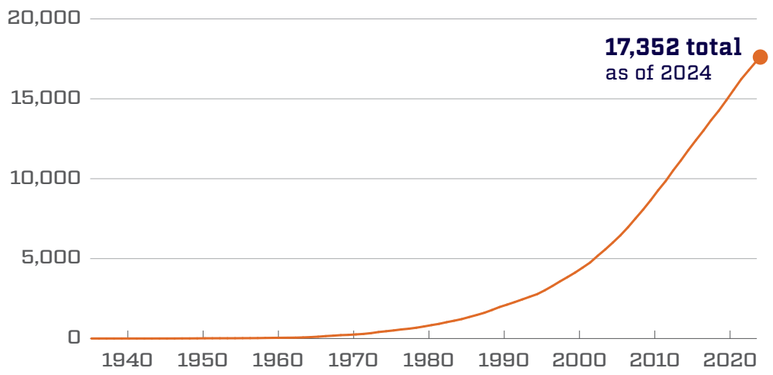
UAF's academic publication history began in 1936, when Ervin Bramhall published his findings on "Auroral Research at the University of Alaska 1930-1934" in Eos, Transactions of the American Geophysical Union. Since then, UAF researchers have published over 17,000 articles on a vast range of subjects, from the revitalization of Iñupiaq Indigenous knowledge (Hauser et al., 2023) to measuring the biological processes in Arctic ground squirrels while hibernating (Goropashnaya et al., 2025).

UAF ranks third globally on journal articles published about the Arctic, behind only the Russian Academy of Sciences and the Arctic University of Norway.

What is a publication?

The data shown here are articles that have appeared in academic journals—periodical publications where scholarship relating to a particular academic discipline is published. Journal articles are the most widely used metric in determining a researcher's success in their field.

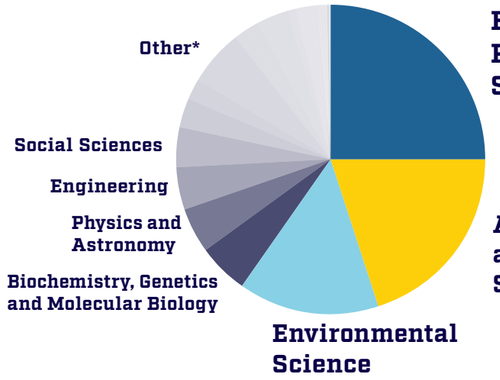
UAF PUBLICATIONS, 1936-2024



UAF's most prolific researcher is Dr. Terry Chapin, Distinguished Professor Emeritus of Ecology at the Institute of Arctic Biology, and member of the National Academy of Sciences. Chapin's research explores the connections between ecology and ethics, with a specific focus in the Arctic, where climatic and ecological changes are altering the carbon-rich expanses of tundra and boreal forest.

What are UAF's primary fields of expertise?

The majority of UAF's published articles are in the three broad subject areas of Earth and Planetary Sciences, Agricultural and Biological Sciences, and Environmental Science, reflecting the productivity and longevity of UAF's largest research institutes and colleges.

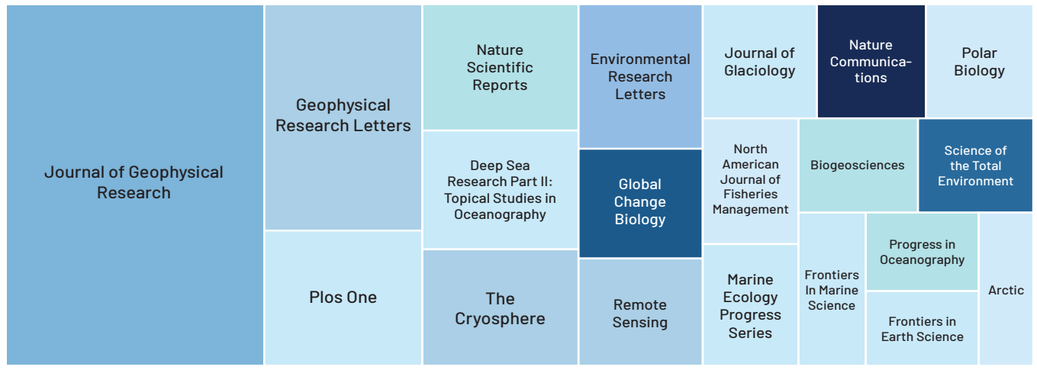


*In order of frequency: medicine, chemistry, multidisciplinary, mathematics, materials science, energy, arts and humanities, immunology and microbiology, computer science, economics, econometrics and finance, chemical engineering, business, management and accounting, neuroscience, psychology, pharmacology, toxicology and pharmaceutics, other, veterinary, decision sciences, health professions, dentistry, undefined

Where does UAF Research get published?

UAF research has featured most regularly in the *Journal of Geophysical Research,* a journal that focuses on the physical, chemical, and biological processes that contribute to the understanding of the Earth, Sun, and solar system.

Academic journals can be ranked by their Impact Factor, a metric based on the number of times articles from the journal are cited elsewhere in the literature. Journals with higher impact factors are often considered to be more prestigious.



Top 20 journals publishing UAF research, shaded by impact factor

The data behind these graphics comes from an online database designed to track and curate academic publications (www.scopus.com).

Here on Troth Yeddha'

ACUASI Icing Tower

By Rod Boyce

A new icing tower at the UAF Geophysical Institute will help aerospace engineers improve drone safety in icy weather. As Alaska expands drone use for deliveries and emergency response, the Alaska Center for Unmanned Aircraft Systems Integration is leading efforts to tackle icing challenges.

Ice buildup on wings or rotor surfaces disrupts airflow, reducing lift and control—critical issues for both drones and crewed aircraft flying through clouds. Unlike high-altitude aircraft that can escape icing conditions, drones operate at lower altitudes where they are frequently exposed to icing hazards.

"If drones are going to be a robust option for cargo delivery, search and rescue, and other uses, then they need to be reliable," said Eyal Saiet, systems and technology integration specialist at ACUASI. "They have to be able to handle icing, and in Alaska that's a major barrier to cross."

ACUASI's new icing tower, located behind UAF's Reichardt Building, functions like a small vertical wind tunnel. It generates controlled icing conditions, allowing researchers to test drones in realistic environments. Built by Coda Consulting of Canada, the tower enhances previous designs by David Orchard of the National Research Council of Canada.

"This facility is truly one-of-a-kind," said Coda CEO Mathieu Gibeault.

UAF photos by JR Ancheta

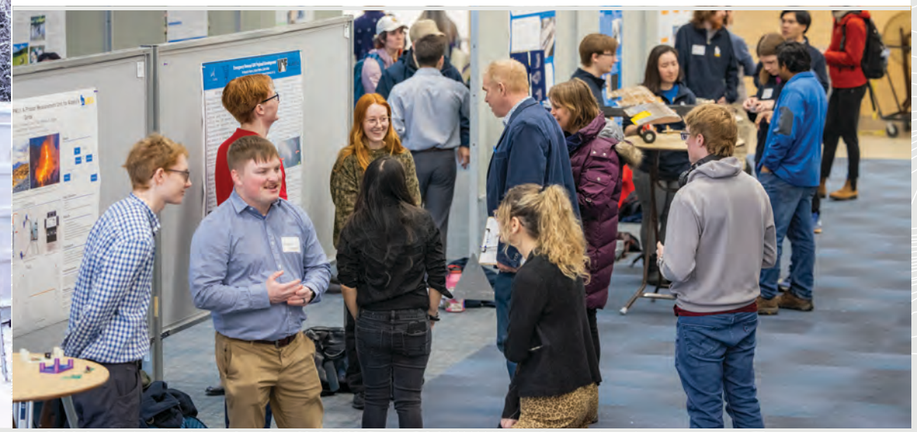
UAF photos by Leif Van Cise

Research and Creative Activity Day

UAF's Office for Undergraduate Research and Scholarly Activity hosted the 2025 Research and Creative Activity Day on April 1 in the Great Hall on the Troth Yeddha' Campus. This signature annual event celebrates undergraduate engagement in research, creative work and scholarly exploration across all disciplines. It offers students the opportunity to showcase projects developed throughout the academic year through posters, performances, demonstrations, art and more.

This year, 68 students representing 12 UAF colleges and research institutes participated, contributing 52 individual and group poster submissions. The variety of topics reflected the breadth of inquiry at UAF—from studies on local plant species and Arctic fish to oral history projects and prototype innovations.

Research and Creative Activity Day highlights the value of undergraduate contributions to academic discovery and creative expression. It also reinforces UAF's commitment to fostering a culture of exploration and hands-on learning at America's Arctic university.



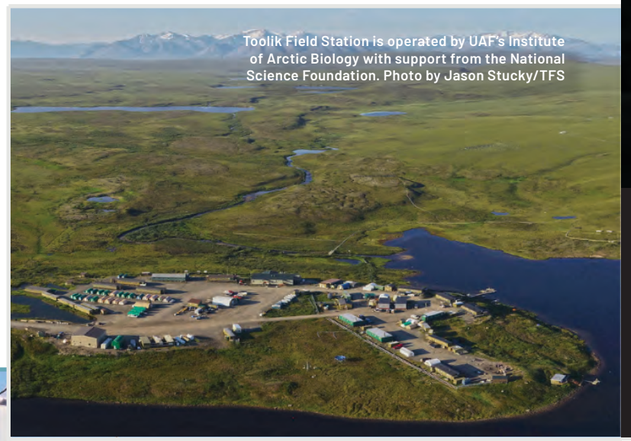
From the Field

Toolik Field Station: 50 years of Arctic research in the far north

By UA Statewide and Haley Dunleavy

Nestled in the foothills of the Brooks Range, Toolik Field Station has served as a base for thousands of scientists and students as they conduct "boots on the ground" field science in the face of a rapidly changing Arctic. The observations and experiments at the remote field station have led to advancements in scientific fields ranging from space physics to animal physiology and from ecology to atmospheric chemistry. Much of this work contributes to the Arctic Long-Term Ecological Research program, anchored at Toolik since 1987.

Toolik is more than a collection of buildings and data sets. It is a collaborative space where science happens in real time. Researchers live and work in close quarters, sharing not just lab space but meals, field gear and late-night conversations under the midnight sun. The dining hall becomes a meeting ground where a fire ecologist might swap insights with an animal physiologist, or a graduate student learning UAV mapping might find themselves planning a field project alongside a researcher who has been returning to Toolik for 20 seasons. That environment fosters new ideas, strong mentorship and a kind of scientific continuity that few places in the world can offer.



Toolik Field Station is operated by UAF's Institute of Arctic Biology with support from the National Science Foundation. Photo by Jason Stucky/TFS

2024-2025 FIELD SEASON AT A GLANCE:

- **7414** user days
- **1738** hours of field support for 43 projects
- **1157** new sampling sites
- **472** researchers
- **110** residents at peak population
- **64** projects in residence
- **54** peer-review publications
- **36** aerial drone surveys
- **19** GIS surveys
- **10** projects with autonomous instruments
- **10** graduate theses & dissertations
- **3** field courses

Research Technician, Mayra Meléndez González
Photo by Joe Franich

Toolik makes winter research possible

Between the extreme weather, lack of sunlight and remote location, doing fieldwork in the Arctic during winter months can be challenging. What's more, it's a season when researchers often lack data, leading to a critical gap in the scientific understanding of the Arctic. That's where Toolik Field Station's Spatial and Environmental Data Center steps, or rather, skis in. Staff offer year-round support to scientists by conducting winter fieldwork and collecting data or samples for them at request. Last winter, Toolik staff supported 28 projects with a wide range of science tasks, from changing memory cards and batteries on wildlife cameras, to fixing broken sensors on autonomous instruments, to drilling into lake ice to track temperature profiles of Toolik Lake.

Toolik is expanding its capacity for winter and shoulder-season research, growing drone and modeling capabilities and strengthening co-production partnerships with neighboring Alaska Native communities. It is also becoming a more intentional training ground, helping to shape Arctic researchers' understanding of the place as well as the science.

Aurora and mountain. Photo by Seth Beaudreault/TFS

Graduate student Brandon Yokeley demonstrates a field sampling technique to a visiting high school class near Galbraith Lake in August 2024. Photo by Erin Towns

REFERENCES:

https://www.uaf.edu/toolik/news/all-scientists-meetings/2025.php

https://www.alaska.edu/news/did-you-know/2025-did-you-know-Toolik-Field-Station-celebrates-50-years.php


Photo by KTOO

Researcher Spotlights

Gwen Holdmann: ACEP Chief Scientist and Rural Energy Systems Researcher

Alaska Center for Energy and Power

Gwen Holdmann is no stranger to Alaska's most remote energy frontiers. She started out designing and building energy systems, leading development of the only geothermal plant in the state at Chena Hot Springs.

She was always motivated by the question of how we can help rural communities move toward greater energy self-sufficiency, using local resources. In her Ph.D. dissertation, she explored energy burden, resource pooling and innovation across Alaska's decentralized utility landscape.

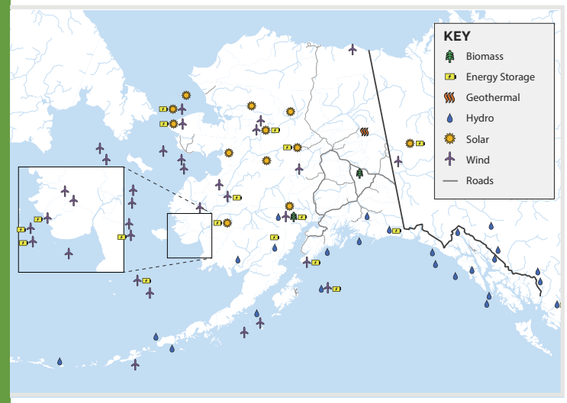
Holdmann points out that rural Alaska is a hotbed for everything from high-penetration renewable systems to advanced metering infrastructure and creative utility rate design.

"It's a dynamic, niche innovation ecosystem — and one that's often overlooked. I want to shine a light on that story," she said.

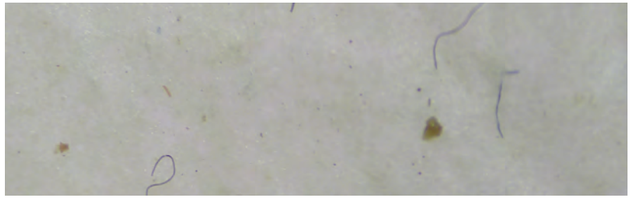
Holdmann continues her focus on rural energy systems alongside a dedicated team of researchers across ACEP. Together, their efforts are helping shape policies and technologies that support local decision-making and sustainable heat and power systems in cold regions.

Beyond research, Holdmann is a passionate science communicator. She writes regular Sunday energy features for the Fairbanks Daily News-Miner and other publications and hosts the podcast Closing the Gap, which explores the history, policy and science behind our energy systems.

"One of the most important parts of my work is making energy concepts understandable — and meaningful — to the public and to the communities we serve," she said. "That's where real change starts."



Map by Molly Putman/UAF Geophysical Institute
This map shows existing renewable energy projects in Alaska.



Microplastics (colored threads pictured) found in meat from a Fairbanks grocery store.

Lara Horstmann: Marine Mammal Biologist

By Jeff Richardson

Lara Horstmann and her students have spent the past four years searching for microplastics in Alaska's marine mammals. They've analyzed stomach contents, muscle tissues, even placentas and amniotic fluid.

"We found it everywhere," said Horstmann, an associate professor at UAF's College of Fisheries and Ocean Sciences.

Those discoveries have underscored a grim reality: Even in some of the most remote regions on Earth, microplastic pollution is abundant.

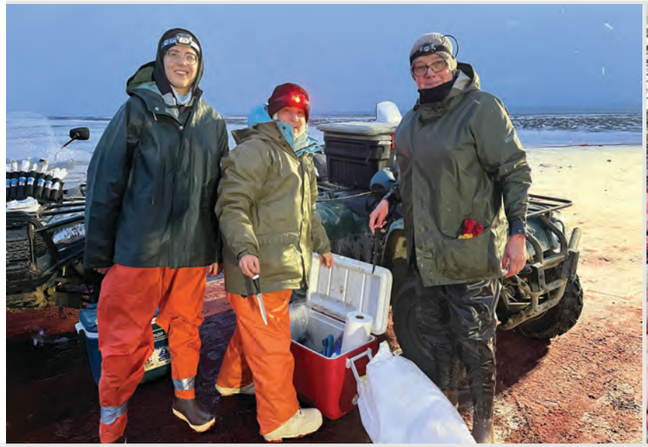
One of Horstmann's former students, Alexandria Sletten, first explored the topic while working on her graduate project in 2021. Subsistence hunters wondered whether their foods contained microplastics, leading to an analysis of seal stomachs that had been collected by the Alaska Department of Fish and Game. That project spiraled into a growing interest for Horstmann and her students. Three undergraduate and three graduate students are currently working on microplastics projects, including studies on bowhead whales, belugas, northern fur seals and walruses. An analysis of polar bear bones is up next.

"As you are answering one question, others pop up, and that's pretty much what happened here as well," Horstmann said.

Horstmann has been careful to keep the research in perspective for people who eat subsistence foods. An analysis of steaks, pork chops and chicken breasts from a Fairbanks grocery store found microplastics in that meat as well, although the types and sources were different from the wild foods.

"The concentrations were very similar to those we found in marine mammals," she said.

Analyzing the contents of a whale's stomach. UAF photos provided by Lara Horstmann



Research Group Showcase

Alaska Critical Minerals Collaborative

Alaska is a land of abundant but underutilized critical minerals and materials. UAF's Alaska Critical Minerals Collaborative brings together researchers and labs across the university to help realize Alaska's role as a source of critical minerals for the United States. This UAF innovation hub advances interdisciplinary critical minerals and materials research, education, technology and partnerships to discover and produce critical mineral resources.

The Alaska Critical Minerals Collaborative includes research labs and facilities from the Geophysical Institute, the Institute of Northern Engineering and the UAF Community and Technical College:

- **Hyperspectral Imaging Lab** aids in the search for minerals and understanding of mineral systems
- **Remote Sensing Lab** develops new tools for mineral exploration
- **Geochronology Lab** provides precise dating of rocks and minerals
- **Advanced Instrumentation Lab** prepares surface and elemental analysis and electron microscopy
- **Water & Environmental Research Center** solves remediation, water resources and closure issues
- **Hydrogeochemistry Lab** provides exploration and environmental geochemistry and data science
- **Mineral Industry Research Lab** conducts metallurgy and mineral recovery, hydrometallurgy and biometallurgy tests
- **Petrology Lab** studies magmatic processes at high temperatures and pressures
- **High performance computing** supports data science
- **Mine Training Center** prepares a mine-ready workforce
- **Critical Minerals Lab** analyzes the elemental composition of soils, rocks and water

Critical minerals are necessary for the manufacture of high technology devices, national defense applications and green energy-related industries. A critical mineral is one that is important for these specialized applications yet is at risk for supply disruption.

Alaska Critical Minerals Collaborative

Critical minerals research projects at UAF and the Alaska Critical Minerals Collaborative cover a range of topics, including:

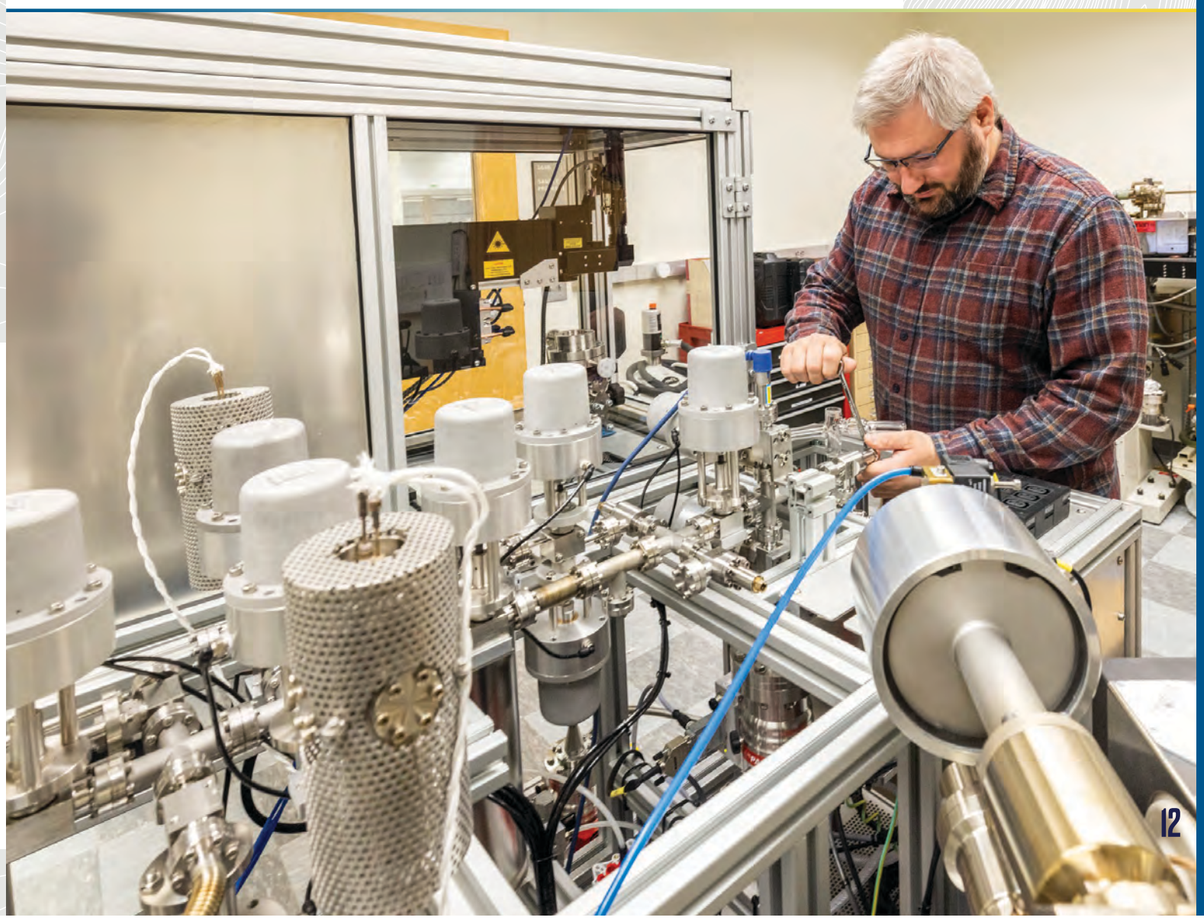
- **Bacterial remediation** of and metal recovery from mine waters (led by UAA)
- **Critical minerals in sedimentary basins** across Alaska
- **Detailed structural and geochronology studies** of Alaska ore systems
- **Lithium brines research** in the Southwest United States and South America
- **Bench scale testing** of bacterial recovery of rare earth elements
- **Hyperspectral imaging** of critical minerals systems in Alaska from airborne and bench scale imaging
- **Algal accumulations** of rare earth elements in near-deposit marine environments
- **Regional exploration** for buried mineral deposits with metal isotopes

The Alaska Critical Minerals Collaborative includes partners from federal and state agencies, university, mining and minerals industry, non-profits, and venture capitalists. Together, these partnerships strengthen our capacity to address the United States' urgent need for critical mineral resources.

REFERENCES:

acmc.alaska.edu/

www.usgs.gov/science/science-explorer/minerals/critical-minerals



Geochoronology Lab *Isotopx NGX-600* mass spectrometer. UAF photos by JR Ancheta

Appointments & Honors

2024-2025 Defense Community Champions National Honoree

Brittany Smart

Senior Advisor for Defense, Community, & Research

The Defense Community Champions program, led by the Association of Defense Communities, recognizes individuals who go above and beyond to support military installations and their surrounding communities. Brittany Smart was named a 2024–2025 National Honoree for her leadership in strengthening Alaska's defense partnerships. She addresses challenges in housing, energy and infrastructure to support military growth in Interior Alaska. As founder of the Alaska Defense Forum, she brings together leaders from across sectors to collaborate on shared goals and promote mission readiness and community resilience across Alaska.

2025 International Arctic Science Committee Medal

Professor Emeritus Vladimir Romanovsky

Geophysical Institute, Department of Geosciences, UAF

The International Arctic Science Committee Medal honors individuals for exceptional and lasting contributions to Arctic understanding. Vladimir Romanovsky received the 2024 award for his influential work on permafrost dynamics, which has advanced global knowledge of climate change in the Arctic. His career at the UAF Geophysical Institute has been marked by a commitment to collaboration, data sharing and mentorship. Romanovsky has authored over 300 publications, guided more than 30 graduate students and contributed extensively to international permafrost monitoring efforts. His leadership reached beyond UAF, including service on the U.S. delegation to the International Arctic Science Committee and as vice chair of its Terrestrial Working Group.

2024 Association of Public and Land-grant Universities, Exemplary Project National Recognition

Fresh Eyes on Ice

In recognition of extraordinary community engagement initiatives, the Association of Public and Land-grant Universities named the Fresh Eyes on Ice program one of the nation's exemplary efforts in community-engaged scholarship at land-grant universities. Fresh Eyes on Ice has built a network of community-based monitoring teams that collect measurements and take photographs of river ice conditions throughout the winter. Scientists and communities use the data to address safety and food security issues along Alaska's rivers.

Photo provided by Helena Buurman

REFERENCES:

freshеyesonice.org

Publication Highlight

Alaska's Changing Environment series

Alaska Center for Climate Assessment and Policy,
Alaska Fire Science Consortium,
International Arctic Research Center

The Alaska's Changing Environment report and its wildfire companion provides timely, reliable and understandable information about how Alaska is changing and impacts to Alaskans lives and livelihoods. The first Alaska's Changing Environment and Alaska's Changing Wildfire Environment were released in 2019 and 2020 respectively. They were popular resources that provided Alaskans with understandable and useful information about changes impacting the state. In the five years since, extreme weather and climate events like landslides and high impact coastal storms have become more frequent. Wildfire activity has continued to change and become less predictable as rapidly increasing temperatures and longer growing seasons alter the state's environment.

https://uaf-accap.org/wp-content/uploads/2023/04/Alaskas-Changing-Environment-2024.pdf

Photo by Heather McFarland

The University of Alaska Fairbanks Troth Yeddha', 'potato ridge,' campus is located on the ancestral lands of the Dena people of the lower Tanana River.

Photo by Jansen Nipko

UNIVERSITY OF ALASKA FAIRBANKS

Read more at
uaf.edu/research