

Advancing Microbial Resources for Mining Alaskan Critical Elements

Principal Investigator: Brandon Briggs

Co Investigators: Tathagata Ghosh and Rajive Ganguli

ABSTRACT:

Rare earth elements (REE) are vital to the U.S. as they are used in a variety of consumer goods such as computers, batteries, cell phones, fluorescent lighting and are critical in defense and healthcare industries. The demand for these REE has surged over the past two decades. Unfortunately, the nation's only REE supplier went bankrupt and no REE were domestically mined in 2016-17 causing a 6% increase in imports (USGS 2017). The U.S. needs a domestic supply of REEs. Alaskan coal and coal by-products are a potential source of REEs. Preliminary analysis of REE content in Alaskan coal shows upwards of 600 ppm total REE (Gupta et al. 2017). Such recovery will increase the U.S. REE production by six times.

Currently, these sources of REE are not economical to mine mainly because of low concentrations and low efficiency in the extraction process (Lin et al. 2017). In this sense microbes can be used to concentrate and increase the extraction efficiency by increasing the weathering rate. We propose to use redox reactions in a novel way to weather minerals that contain REE, allowing for extraction without the harmful effects of acid production. The overall objective of this proposed work is to develop an integrated bio-weathering process that minimizes the economic and environmental challenges of REE extraction, while concentrating REEs. Specifically, 1) identify and characterize the REE concentrations and associated mineralogy of the best potential feedstock from Alaskan Coal; 2) determine the best organism and its effectiveness of microbial redox cycling on REE extraction; 3) develop a cross campus collaboration that builds an interdisciplinary and innovative area of research.

To achieve these objectives two major tasks will be performed 1) Mineralogical and REE content analysis of Alaskan coal and coal by-product feedstocks; 2) Bio-weathering of Alaskan coal using previously characterized and novel microbial isolates. This cross-campus interdisciplinary team will work collaboratively to achieve these tasks. Successful completion will provide potential technology transfer from UA to mining operations and preliminary data to apply for external funds that will allow for scaleup of processes.

Total Awarded: \$65,000

An Evening of Mozart

Principal Investigator: Jaunelle Celaire

Co-Investigators: Lorna Eder and Mari Hahn

ABSTRACT:

The goal of “An Evening of Mozart” is to bring two Alaska universities, UAF and UAA, together to help serve and preserve the UA mission in years to come through classical vocal music.

Total Awarded: \$3,200.00

Culturally Responsive Professional Schools for Alaska

Principal Investigator: Scott Christian

Co Investigators: Ute Kadene and Jonathon Bartels

ABSTRACT:

There is a critical need in Alaska for collaboration between pre-school through twelfth grade (P-12) school districts and the University of Alaska to prepare the next generation of teachers and to provide the professional development necessary to nurture and retain currently practicing teachers. The Alaska Professional Schools (AKPS) will address these critical needs. There are four goals for this project. 1.) To establish a statewide planning team consisting of P-12 administrators and teachers (urban and rural), university faculty, Alaska Native educators and representatives from the Alaska Department of Education and Early Development (DEED) to develop a plan for establishing three secondary professional schools in Alaska. These schools will implement evidence-based best practices in school reform, culturally responsive pedagogy, assessment and evaluation according to district and community priorities. 2.) In order to further the established collaboration among secondary faculty, UAA, UAF and UAS will have the opportunity to place student teachers in all three schools, while offering innovative and contextualized professional development for in-service teachers. 3.) In addition to implementing three professional development schools in the fall of 2019, this collaboration will form the basis of a P-20 network of professional schools, eventually offering opportunities for elementary, special education and education leadership students and in-service educators. 4.) As the learning communities in the professional schools develop, there will be opportunities for structured case studies to address CAEP Standard IV, “provider demonstrates the impact of its completers on P-12 student learning and development,” as well as other research projects identified by the P-12 and university partners.

Total Awarded:

\$125,000

Quantifying Hydrologically- Driven Lateral Carbon Fluxes in Alaska's Coastal Temperate Rainforest

Principal Investigator: Jason Fellman

Co Investigators: Eran Hood, Jeff Welker, and David D'Amore

ABSTRACT:

The riverine transport of carbon (C), mainly as dissolved organic (DOC) and inorganic carbon (DIC), is an important pathway for C loss from terrestrial ecosystems. Thus, terrestrial C balance studies that do not incorporate these lateral C fluxes can result in considerable overestimation of the terrestrial C sink by not accounting for the translocation of net primary production as dissolved C to surface waters. Lateral C fluxes are likely to play a particularly important role in the C balance of forested ecosystems found in the Tongass National Forest of southeast Alaska, which are characterized by strong hydrological coupling between terrestrial and aquatic ecosystem. The Tongass is the largest national forest in the United States and one of the largest intact coastal temperate rainforest (CTR) ecosystems in the world. Globally, CTR ecosystems occupy more than 40 million hectares, yet the hydro-biogeochemistry of these ecosystems remains vastly understudied compared to other high latitude biomes. The purpose of this proposal is three-fold: 1) to develop a novel framework for understanding and quantifying lateral carbon fluxes in Alaska's humid CTR ecosystems, 2) to collect seed data that will be used to develop a proposal for the National Science Foundation Hydrological Sciences Program, and 3) to enhance cross-MAU collaboration in hydrological and biogeochemical sciences within the UA system. These goals will be achieved through a pilot study on the hydrological controls of lateral C fluxes in the Fish Creek Watershed in the Tongass National Forest near Juneau, Alaska.

Total Awarded: \$35,000

Development of the Municipality of Anchorage Climate Action Plan through a Campus-Community Partnership

Principal Investigator: Micah Hahn

Co Investigators: Brian Brettschneider, Shannon Donovan, and Libby Roderick

ABSTRACT:

Over the past 60 years, Alaska has warmed more than twice as fast as the rest of the U.S. In Anchorage, this warming trend is projected to lead to increased winds and fire risks and possible threats to the city's drinking water supply and wildlife. As the largest population center and commercial hub of the state, changes to Anchorage's natural systems will affect supply chains and infrastructure and have a ripple effect throughout Alaska. In December 2017, the Municipality of Anchorage and UAA signed a MoU supporting collaboration on community opportunities and challenges, and the development of a Municipality Climate Action Plan (CAP) is one such initiative. The CAP provides a framework for policies that reduce emissions and support adaptation actions that reflect the values of Anchorage as an equitable, resilient community. A small number of volunteer faculty and student interns have worked with the Municipality to prepare the framework of the CAP, including seven sectoral chapters, and we are now prepared to move into the creation of specific recommendations under each sector. Recognizing the importance of engaging UA faculty, non-profit, governmental, and community-based organizations, citizens, and Municipal staff in the development of these recommendations, this proposal will allow us to create multidisciplinary working groups to do so. Through four technical working sessions, the groups will 1) collaboratively discuss and write the sectoral recommendations, and 2) establish key social and environmental indicators to monitor changes affecting their sector for integration into a citizen-based monitoring program. This project is critical not only to ensure community resilience, but also to provide a framework for future research for the entire UA faculty body. It should lead to externally funded projects that will be examples for other northern latitude communities on interdisciplinary, community-engaged resilience work and will enhance UA's status as a leader in environmental monitoring and climate change research.

Total Awarded:

\$80,000.00

Addressing Insomnia in an Effort to Prevent and Reduce Cardiovascular Disease Risk Among Alaska Natives

Principal Investigator: Anayansi Lombardero

ABSTRACT:

Epidemiological data indicate that Alaska Natives/American Indians (AN/AIs) have higher rates of insomnia and sleep problems compared to the general population. There is also evidence of independent associations between insomnia symptoms and cardiovascular-related mortality—the leading cause of mortality among AN/AIs—among elderly Native American people. In the general population, insomnia has been found to be associated with psychological disorders, suicide, and chronic diseases such as diabetes, chronic pain, and cardiovascular disease. Cognitive Behavioral Therapy for Insomnia (CBT-I) has been shown to be as effective as medication in the short-term treatment of insomnia and more effective than medication in the management of chronic insomnia. Although CBT-I is now recommended as the first line of treatment for insomnia by the American College of Physicians, insomnia is still primarily treated by use of medications that can have dangerous side-effects, especially when combined with other medications (e.g., opioids). Further, the effectiveness of CBT-I has not been tested among AN/AIs. The current project has the long-term goal of preventing and lowering rates of cardiovascular disease among AN/AIs by addressing sleep problems using culturally-informed treatments for insomnia in Tribal Health settings in the state of Alaska. Guided by the Consolidated Framework for Implementation Research (CFIR), the short-term goal of the current proposal is to conduct qualitative interviews among patients, providers, and Tribal Health administration assessing the need as well as the perceptions regarding behavioral treatments for insomnia in order to inform cultural adaptations of CBT-I. The major steps required to meet the goals of the current proposal are: a) To build a stakeholder team representing patients, administration, providers, and the community; b) To meet with this team to discuss proposed qualitative interview questions assessing barriers, facilitators, and fit/potential cultural adaptations of CBT-I for AN/AIs; c) To write Tribal and UAA IRBs; d) To conduct qualitative interviews, and f) To disseminate results of interviews back to the stakeholder team. Results from this project will be used to write a pilot grant testing a culturally-adapted CBT-I protocol among Tribal Health research participants.

Total Awarded: \$40,000.00

Learning Across, Inside, and Out: Mobilizing State and Community Learning Networks from the Prison to the University

Principal Investigator: Sarah Stanley

Co Investigators: Sol Neely

ABSTRACT:

Currently, there are at least two parallel prison education projects developing across the UA system in Alaska: (1) At UAS, the Flying University—developed and implemented by Dr. Sol Neely (Associate Professor of English) in Fall 2012—brings UAS students inside Lemon Creek Correctional Center (LCCC) every semester for mutual and collaborative study in philosophy, literature, and creative writing; (2) at UAF, the “Area-111-x” project—developed by Dr. Sarah Stanley (Associate Professor of English) in collaboration with eLearning instructional designers Chris Lott and Kendell Newman Sadiik—also brings students and community members inside Fairbanks Correctional Center (FCC) for collaborative research and writing opportunities, as incarcerated students work toward general education course credit. In their own way, these respective efforts have already established cooperative relations between UAS, UAF and local community resources—which includes networking university educational efforts with local prison administrations and DOC personal, local reentry coalitions, and other community groups. This proposal seeks funding to explore ways we can build on the success of these efforts in order to connect, institutionalize, and scale these faculty-initiated community efforts across the state. To accomplish this, co-PIs Neely and Stanley will collaborate over the year in activities that include (a) involving undergraduate Research Assistants for community-engaged and high-impact learning opportunities, (b) organizing two-day think tanks (or mini-conferences) in Juneau and Fairbanks to facilitate such statewide inter-university and state-level cooperation (c) developing effective pedagogical resources and measures that meet the unique circumstances of prison learning environments and enable transfer, and (d) institutionalizing outreach efforts for incarcerated peoples to access higher education and receive credit toward college degrees and certificates. In the end, by rooting these efforts in institutionally protected statewide practices, this proposal hopes to inspire more faculty involvement at UAS and UAF in these ongoing efforts to increase access to postsecondary education inside Alaska’s state correctional facilities while promoting the values and vision of UA, UAS, and UAF mission statements. During budget crisis, it is necessary to build collaborative efforts across the UA system and other state institutions. These efforts hold immense potential for coordinating resources to develop a culture of education in Alaska; they open innovative and high-impact research, teaching, and service opportunities of faculty and students; they strengthen community connections with the University of Alaska; and they address social justice issues that affect our state, including reducing recidivism, enabling recovery, and promoting healing.

Total Awarded:

\$75,000.00

Strengthening Inter-University Indigenous Scholarship and Alaska Native Student Success at the University of Alaska

Principal Investigator: Charlene Stern

Co Investigators: Medeia Csoba-Dehass and X'unei Lance Twitchell

ABSTRACT:

To support a system-wide endeavor that includes a series of academic workshops and a leadership retreat for affiliated Alaska Native faculty and faculty that teach courses in Alaska Native studies across the University of Alaska (UA) system. The Alaska Native Studies Council (ANSC) consists of faculty from across the UA system, and has a history of collaboration since its inception in 2012. The workshops/retreat will provide opportunities to highlight and share Indigenous research and high impact pedagogical practices that can have direct application in the UA system and at each regional campus. The workshops/retreat will provide opportunities for professional development, sharing pedagogical strategies, student successes, and the necessary time to develop a plan to build Indigenous capacity at each respective UA campus. The final outcome of the workshops/retreat will be a ANSC strategic plan with specific actionable items, to be implemented broadly across the UA system as well as at the local/regional campus level.

Total Awarded: \$77,000