The Class of 2023

Doctor of Philosophy Degrees

College of Engineering and Mines

Dr. William E. Schnabel, Dean

Fahimeh Dehghani *

Ph.D. ***Engineering: Mining Engineering***

B.S., Iran University of Science and Technology, 2008; M.S., Amirkabir University of Technology, 2011.

Thesis: Investigating Impact of Pulp Density on Flotation Performance

To decrease water consumption in flotation circuits, solid percent in the pulp increased. Increasing solid percent negatively affects the flotation performance. These effects were investigated. To optimize the flotation performance, several parameters were tested and controlled. They included the type and dosage of the chemicals, pH/Eh, bubble sizes and turbulence.

Major professor: Dr. Tathagata Ghosh

College of Fisheries and Ocean Sciences

Dr. S. Bradley Moran, Dean

Monica Elizabeth Brandhuber

Ph.D. ***Fisheries***

B.S., Colorado State University, 2016; M.S., Colorado State University, 2017.

Thesis: Endocrine Biomarkers to Improve Reproductive Monitoring in Female Polar Bears

Polar bears are threatened by climate change in the wild and experience only moderate reproductive success in zoos. A suite of understudied reproductive and metabolic hormones in wild and zoo-housed female polar bears was characterized to better understand estrus and predict reproductive success.

Major professor: Dr. Shannon Atkinson

Kari Hammarsten Fenske **

Ph.D. ***Fisheries***

B.S., University of Wisconsin Madison, 2000; M.S., University of Maryland College Park, 2009.

Thesis: Implications of Spatial Population Dynamics for Abundance Estimation and Catch Apportionment of Alaska Sablefish (*Anoplopoma fimbria*)

Sablefish are a highly valued fish with complex spatial population dynamics that make management challenging. A spatial population model and spatial simulation models were developed to inform managers about spatial abundance and sustainability, alternative methods to divide harvest opportunity were examined, and tradeoffs among harvest opportunity alternatives were shown.

Major professor: Dr. Curry Cunningham

Amy Lorraine Kirkham *

Ph.D. ***Fisheries***

B.S., Stanford University, 2012.

Thesis: Physiological Regulation of Annual Life History Events in Adult Female Weddell Seals

To characterize regulation of annual reproduction, mass change and molt in female Antarctic Weddell seals (*Leptonychotes weddellii*), hormone concentrations and nutritional status in relation to these processes were assessed. Hormone and mass dynamics varied with recent reproductive history, altering seasonal patterns in seals that skipped reproduction in a given year.

Major professor: Dr. Jennifer Burns and Dr. Shannon Atkinson

* *Summer degree recipient*
** *Fall degree recipient*

Thilo Klenz

Ph.D. ***Oceanography: Physical***

B.S., Kiel University, 2014; M.S., Kiel University, 2017.

Thesis: Lagrangian Surface Drifter Analyses From Observations and Numerical Modeling in the Subpolar North Atlantic

Lagrangian surface drifters aid in understanding the processes driving observed oceanic variability across a variety of scales. Observational and numerical drifters were used to understand the mechanical input of wind energy into the ocean and to infer information about the underlying dynamical regimes by investigating the Lagrangian frequency spectrum directly.

Major professor: Dr. Harper Simmons

Christopher J. Sergeant **

Ph.D. ***Fisheries***

B.S., University of Washington, 2000; M.S., University of Washington, 2004.

Thesis: Freshwater Pressures on Pacific Salmon in the Coastal Watersheds of Alaska

A warmer, wetter climate's impacts on Pacific salmon were explored. While future flooding and drought events are likely to harm salmon abundance in Alaska, conservation measures that protect high-quality, diverse freshwater habitat will give salmon a fighting chance in the face of climate change and natural resource development.

Major professor: Dr. Jeffrey Falke

Lauren Nicole Sutton **

Ph.D. ***Marine Biology***

B.A., Western Washington University, 2012; B.S., Western Washington University, 2015.

Thesis: Drivers of Functional Ecology of the Alaskan Arctic Epibenthos

Functional traits were used to examine Arctic epibenthic community function and stability in relation to environmental conditions, a new approach. A much-needed benchmark was created to assess regions of ecosystem vulnerability and resilience in Alaska's Arctic.

Major professor: Dr. Katrin Iken

Brian Philip Ulaski **

Ph.D. ***Marine Biology***

A.A., Santa Barbara City College, 2012; B.S., University of California Santa Barbara, 2014.

Thesis: Seaweeds Across Ecosystem Boundaries: From Habitat Formation to Harvest Implications

An investigation of wild seaweed ecology in the context of harvesting pressures used field and laboratory experiments to evaluate post-harvest regrowth and reproduction of attached plants, and reproduction and habitat formation of detached plants. This study provided fundamental benchmark information for harvest regulations as human use of seaweed increases.

Major professor: Dr. Brenda Konar

Alexis M. Walker **

Ph.D. ***Marine Biology***

B.S., University of California Santa Cruz, 2009.

Thesis: Exploring the North American Arctic Benthos: Community Structure and Oil Degradation Potential of Sediment Bacteria and Archaea

The Arctic benthos houses ecologically important organisms subject to environmental changes. Benthic microbial communities can reflect these changes. Arctic, benthic microbes were characterized and their response to oil exposure was assessed. This first-of-its-kind survey of benthic microbes in the North American Arctic generated valuable insights for the changes to come.

Major professors: Dr. Sarah Mincks and Dr. Mary Beth Leigh

College of Liberal Arts

Dr. Ellen D.S. Lopez, Dean

Michael James Letzring *

Ph.D. Historical Geography: Interdisciplinary Studies

B.A., Brooks Institute, 1986; M.A. University of Alaska Fairbanks, 2012; M.S., East Carolina University, 2017.

Thesis: Cartography, Territory and Empire Mapping the Alaska Boundary Dispute, 1821–1903

After the Klondike gold rush, a long-simmering dispute over the Alaska–Canada boundary rose to a boil. Colonial cartography contributed to a competition for imperial space on the northwestern coast, and the analysis of colonial mapping in this dissertation revealed geography mediating history, maps creating territory and the power of geographic knowledge.

Major professors: Dr. Mary Ehrlander and Dr. Brandon Boylan

Keggutailnguq Catherine Moses

Ph.D. Linguistics: Interdisciplinary Studies

A.A., University of Alaska Fairbanks, 1983; B.A., University of Alaska Fairbanks, 1984; M.A., University of Alaska Fairbanks, 2010.

Thesis: Collaborative Dialogue for Ellangellerkaq and Crosslinguistic Awareness in Third Grade Yugtun English Bilingual Research Centers: A Teacher Action Research Study

This qualitative teacher action research study in Toksook Bay's third grade dual language classroom asked how the students used collaborative dialogue in Yugtun and English in the dual language research centers. Data were analyzed using constructivist grounded theory. One finding was that students engaged in collaborative dialogue during writing

Major professors: Dr. Sabine Siekmann and Dr. Joan Parker Webster

Angass'aq Sally P. Samson

Ph.D. Linguistics: Interdisciplinary Studies

B.E.D., University of Alaska Fairbanks, 1997; M.A., University of Alaska Fairbanks, 2010.

Thesis: Elitnaurilleq Piciryaramtenek Qanemcitgun: A Participatory Teacher Action Research Study to Improve Language and Literacy Instruction in a Yup'ik Immersion School

Four Yugtun immersion teachers investigated Yugtun literacy instruction through lesson study. They asked how teachers' involvement in participatory action research can contribute to their own professional development, improve their language teaching and generate new strategies for teaching Yugtun reading. Data were analyzed using constructivist grounded theory.

Major professors: Dr. Sabine Siekmann and Dr. Joan Parker Webster

Russell W. Vander Lugt *

Ph.D. Arctic and Northern History: Interdisciplinary Studies

B.M., Wheaton College, 2000; M.A., University of Alaska Fairbanks, 2010; M.S., Embry-Riddle Aeronautical University, 2012.

Thesis: Among the Dene: Allen's 1885 Trans-Alaska Expedition

In 1885, Lt. Henry Allen crossed Alaska, surveying 2,500 miles of Dene territory along the Copper, Tanana and Koyukuk rivers. Allen, with Dene support, documented the social and physical environment of Alaska's Interior. Mutual respect between Allen and Alaska's Dene played an integral role in the expedition's success.

Major professor: Dr. Mary Ehrlander

Eduard Zdor

Ph.D. Anthropology: Culture

B.A., Moscow Humanitarian University, 1998.

Thesis: Chukchi Communities of the Bering Strait Region, a Hundred Years after Bogoras

An ethnographic portrait was drawn of Chukotkan communities a century past the time of Bogoras. Subsistence remains a great factor in shaping the Chukchi identity. However, they are also integrated within a global society. The clash of influences gives rise to a complex pattern of human passions and life goals.

Major professor: Dr. Sveta Yamin-Pasternak

College of Natural Science and Mathematics

Dr. Karsten Hueffer, Interim Dean

Ameneh Arabi **

Ph.D. ***Biochemistry and Neuroscience: Biochemistry***

B.S., Payam Noor University, 2011; M.S., Payam Noor University, 2014.

Thesis: Development of a MUC1 Cancer Immunotherapy Using Complement Targeted Liposomes and Organoplatinum (IV) Complex as an Effective Anticancer Drug

Integration of TLR agonists with a MUC1 cancer vaccine to improve its effectiveness was investigated. Synthesis of organoplatinum compounds also was researched. Four octahedral organoplatinum(IV) compounds, namely [Pt(CH3)2X2{bipy-R2}] (X = Br, I; bipy-R2 = 2,2′-bipyridine, 2,2′-bipyridine-4,4′-dicarboxylic acid), have been isolated and structurally characterized.

Major professors: Dr. Max Kullberg and Dr. William Howard

Stefan Awender

Ph.D. ***Physics***

B.S., California State University San Bernardino, 2015.

Thesis: Generalized Modeling of Complex Dynamical Systems: An Application to the Stability of Ecological Networks

Specific models describe biomass flow in food webs, but limited empirical observation induces uncertainty. Generalized models can produce stability of equilibria and are more efficient for larger webs and multiple replicates. One notable discovery: A phantom ecological network, which represents rare species, can positively impact food web stability.

Major professors: Dr. Renate Wackerbauer and Dr. Greg Breed

Jordan Wilson Bishop **

Ph.D. ***Geophysics: Solid Earth Geophysics***

B.S., University of North Carolina Chapel Hill, 2016.

Thesis: Improved Computational Tools for Infrasound Analysis

Statistical outliers in infrasound array data were investigated, and a statistical approach to recognize these issues was proposed. Advanced numerical methods for infrasound propagation (finite differences and spectral elements) also were used to quantify the effects of terrain on propagation at local and regional distances.

Major professor: Dr. David Fee

Drew Alexander Coffin

Ph.D. ***Space Physics***

B.S. University of Iowa, 2014.

Thesis: A Wiggle Around a Giant: Exploring the Hot Electrons Within the Io Torus

The System IV rotational periodicity at Jupiter maps to a persistent subcorotation within the Io plasma torus. The author proposed that this periodicity's origin is from superthermal electrons within the torus, energized by Alfvén waves to the planet. Also explored were consequences for Jovian aurora and moons.

Major professor: Dr. Peter Delamere

Federico Covi **

Ph.D. ***Geophysics***

B.S., Universita Degli Studi Di Trento, 2013; M.S., Universitat Innsbruck, 2016.

Thesis: Processes in the Percolation Zone in Southwest Greenland: Challenges in Modeling Surface Energy Balance and Melt, and the Role of Topography in the Formation of Ice Slabs

In situ observations and satellite images were used in conjunction with local and regional scale numerical modeling to investigate melt and subsurface processes in the percolation zone of the Greenland ice sheet.

Major professor: Dr. Regine Hock

Julia Elisabeth Gestrich **

Ph.D. ***Geophysics: Solid Earth Geophysics***

B.S., University of Hamburg, 2017.

Thesis: Acoustic and Seismic Signature of Sustained Volcanic Eruptions

To connect seismic tremor to physical eruption properties, a river seismicity model was adapted and applied. Infrasound signals during sustained eruptions were compared to anthropogenic jet noise spectra to confirm volcanic jet noise. The connection between infrasound and lava fountain dynamics was analyzed using jet noise scaling laws.

Major professor: Dr. David Fee

Jordan R. Jenckes

Ph.D. ***Geoscience***

B.A., University of Alaska Anchorage, 2012; B.S., University of Alaska Anchorage, 2015.

Thesis: Variability of Hydrogeochemistry and Chemical Weathering Regimes in High Latitude Glacierized Coastal Catchments

The hydrogeochemistry of freshwater discharged to the Gulf of Alaska is not well understood. To close the knowledge gap, a unique set of stream samples compiled from across the Gulf of Alaska watershed was utilized. Glacier coverage, watershed slope and geology are important controls on the variability of freshwater geochemistry.

Major professor: Dr. Paul McCarthy

Jaewoong Jung *

Ph.D. Physics

B.S., Seoul National University, 2017.

Thesis: Exospheric Neutral Density Study Using XMM-Newton Soft X-Ray Observations and MHD-Based Magnetosheath Model

The exospheric density at 10 Earth radii was estimated, which can help explain atmospheric loss due to the space environment and infer the evolution of Earth's atmosphere. A model was also developed for predicting soft X-ray images by parameterizing key parameters in the magnetosheath, which could aid future satellite missions.

Major professors: Dr. Hui Zhang and Dr. Hyunju Connor

Jishnu K. S. Krishnan **

Ph.D. Biochemistry and Neuroscience: Neuroscience

B.S., Periyar University, 2008; M.S., Bangalore University, 2010.

Thesis: Effects of Diet and Hibernation in Skeletal Muscle Performance

Skeletal muscular contractility and fatigue resistance in ex-vivo muscle tissues after being subjected to hypothermic stress were studied. Results showed that diet and hypothermic stress can alter various functional features of skeletal muscle, and summer-active AGS is more fatigue resistant than mid-torpor AGS.

Major professors: Dr. S. Ryan Oliver and Dr. Kelly Drew

Emilie Morrell

Ph.D. Biochemistry and Neuroscience: Biochemistry

B.S., Brigham Young University, 2014.

Thesis: Impacts of Sex, Biometals Homeostasis, and Dietary Fructose on Non-Alcoholic Fatty Liver Disease Pathogenesis

Worldwide, one in three people have non-alcoholic fatty liver disease; however, treatment options for this disease are limited. The impacts of biometals homeostasis, dietary fructose intake and sex on NAFLD pathogenesis were examined to identify potential mechanisms and pathways that could be targeted for the development of future therapies.

Major professors: Dr. Jason Burkhead and Dr. Lawrence Duffy

Jeffrey Park **

Ph.D. Mathematics

B.A., California State University Fresno, 2013; M.A., California State University Fresno, 2016.

Thesis: Controllability of Non-self-adjoint Systems of Partial Differential Equations

Controllability was investigated for three separate non-self-adjoint systems of partial differential equations: N one-dimensional coupled wave equation, the vector Schrödinger equation on the interval with a non-self-adjoint matrix potential, and the beam equation on an interval. The inverse problem for the second system was also solved.

Major professor: Dr. Sergei Avdonin

Anna Rix **

Ph.D. Biological Sciences

B.S., Michigan Technological University, 2012.

Thesis: Exploring the Evolution of Fishes at High Latitudes

Millions of years of evolution under extreme conditions have shaped the genetics of high-latitude fishes. Patterns of genetic variation in two evolutionarily distant types of high-latitude fishes were examined to enhance predictions of how these animals may respond to future environmental changes.

Major professors: Dr. Juan Lopez and Dr. Diana Wolf

Karen Joy Spaleta **

Ph.D. Geoscience: Geology

B.S., Worcester Polytechnic Institute, 2000; M.S., Rutgers, The State University of New Jersey, 2002.

Thesis: Finding Solutions to the World's Pending Critical Minerals Supply Crisis: Developing New Geochemical Analytical Methods and Evaluating the Potential for Tellurium and Bismuth Extraction from Existing Gold Mines

A detailed mineralogical and elemental composition analysis of gold mill extraction samples from the Pogo Mine mill (Interior Alaska) and the Golden Sunlight Mine mill (Whitehall, Montana) evaluated potential sources of the critical minerals tellurium and bismuth that are necessary to meet increasing global demand for carbon-neutral energy production goals.

Major professors: Dr. Rainer J. Newberry and Dr. Sarah M. Hayes

Andrew Thanh Vu *

Ph.D. Physics

B.S., Emory University, 2013; M.S., Georgia Institute of Technology, 2014.

Thesis: Properties and Formation Mechanisms of Foreshock Transients

Interactions between solar wind and foreshock particles can form foreshock transients upstream of planetary bow shocks. Statistical studies of spacecraft observations and numerical simulations revealed their properties and formation mechanisms. This allows for the construction of a kinetic model and the ability to forecast their particle acceleration and geoeffects.

Major professor: Dr. Hui Zhang

Yuanyuan Zhao **

Ph.D. Mathematics

B.S., Tongji University, 2001; M.S., University of Alaska Fairbanks, 2005.

Thesis: Control and the Inverse Problems for the Wave Equation on Metric Graphs

This thesis proved exact controllability of the wave equation on tree graphs and graphs with cycles. It also described the dynamical leaf peeling method, which is used to recover the connectivity, potential function on a tree graph, and the lengths of its edges from the response operator given on a finite time interval.

Major professor: Dr. Sergei Avdonin

College of Rural and Community Development

Mr. Bryan Uher, Dean

Lyla June Johnston **

Ph.D. ***Indigenous Studies***

B.A., Stanford University, 2013; M.A., University of New Mexico, 2017.

Thesis: Architects of Abundance: Indigenous Regenerative Food and Land Management Systems and the Excavation of Hidden History

Eleven Indigenous food and land management systems were examined to elucidate patterns and techniques. Indigenous land managers were interviewed for deeper perspectives. A theory of Indigenous regenerative ecosystem design and policy recommendations was offered. The work closed with an analysis of how precolonial histories are distorted and hidden.

Major professors: Dr. Jessica Black and Dr. Gregory Cajete

Angela Alsta Lunda **

Ph.D. ***Indigenous Studies***

B.S., University of Washington, 1979; M.Ed., University of Alaska Anchorage, 2003.

Thesis: I'm a Killer Whale: The Process of Cultural Identity Development from the Perspectives of Young Indigenous Children

The phenomenon of cultural identity development was investigated using video collected by children wearing forehead cameras as they engaged in activities on the land. Children demonstrated their Indigenous identities by exhibiting intricate knowledge of the land, subsistence practices and core cultural values, with support from peers, teachers, parents and communities.

Major professors: Dr. Theresa John and Dr. Carie Green

John E. Pennington

Ph.D. ***Indigenous Studies***

B.S., California Coast University, 2001; M.A., American Public University System, 2012.

Thesis: Sovereign Disasters: How Alaska's Tribes Participate in Government-to-Government Relations in a Post-Disaster Environment.

The government-to-government relationship between Alaska tribes and the Federal Emergency Management Agency when disasters occur in Alaska Native communities was explored, revealing the incompatibility of the Alaska Native Claims Settlement Act with current federal disaster policies in the United States.

Major professors: Dr. Richard Hum and Dr. Cameron Carlson