

2014
*Arctic Science
Conference*

*Fairbanks, Alaska
September 27th – 28th*

Resilience and Adaptation
Interdisciplinary Research, Communities, and Health



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Arctic Science
Conference

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Resilience and Adaptation:
Interdisciplinary Research, Communities, and Health

Fairbanks, Alaska
September 27th – 28th, 2014

• *Notes* •



Cover photography information: Blueberries are easily found close to the ground in Denali National Park. Credit: Photo by Todd Paris, UAF Marketing and Publications.

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• *Conference Organization* •

The Arctic Science Conference is an annual meeting that is organized and supported by the American Association for the Advancement of Science (AAAS) Arctic Division. The locations and themes of the conference vary from year to year, although the themes and locations are always related to the Arctic and the scientific endeavors of the Arctic Division AAAS members and their colleagues. It is a continuing goal of this conference that it be open and accessible to all scientific scholars who are working on Arctic, Alaskan, Canadian, northern or Antarctic issues, and to communicate their interests and discoveries at the event. This year's conference was organized by:

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Marybeth Murray, University of Calgary, Calgary, Alberta, Canada

• *Conference Schedule* •

Saturday, September 27th, 2014

All events take place in the Margaret Murie Building, UAF Campus, Fairbanks Alaska

- 8:00 a.m. Registration and Continental Breakfast**
- 9:00 a.m. Welcome**
- 9:15 a.m. Graduate Education and UARCTIC**
John Eichelberger, Dean, University of Alaska Fairbanks Graduate School
- 9:45 a.m. Integrating art with science to build science identities among girls**
Laura Conner, PI, Project STEAM
- 10:15 – 10:30 a.m. Break**
- 10:30 a.m. Biomedical Education and the One Health Initiative**
Barbara Taylor
- 11:00 a.m. Physiology and policy: Management based on the science behind adaptation and resilience**
Shannon Atkinson
- 11:30 a.m. Update on the Alaska Arctic Policy Commission**
Representative David Guttenberg
- 11:45 a.m. – 1:15 p.m. Lunch on your own**
- 1:15 p.m. – 3:50 p.m. Concurrent Technical Sessions:**
- Resilience and Sustainability: Energy and Policy**
Lawrence Duffy, Chair
Location: Auditorium
- "Arctic Policy Development: Domestic and Foreign Stakeholder Influences", Troy Bouffard
 - "A Synthesis of Existing, Planned, and Proposed Infrastructure and Operations Supporting Oil and Gas Activities and Commercial Transportation in Arctic Alaska", Kevin Hillmer-Pegram
 - "Scenarios as an Interdisciplinary Approach to Explore future Resource Extraction Activity on the North Slope in the Context of Climate Change and Socio-Economic Uncertainties", Olivia Lee
 - "Dynamical Downscaling of ERA-Interim for Alaska", Peter Bieniek
 - "Assessing the Wind Power Potential in Interior Alaska", Gerhard Kramm
 - "Sociohydrological Modeling: Local Knowledge and Hydrologic Data Provide Insight on Harvesting Driftwood from Rivers in Alaska", Chas Jones
- Resilience and Sustainability: Community and Culture**
Todd Radenbaugh, Chair
Location: Room 103
- "The Nushgak Estuary: A Biotic Home and a Road", Todd Radenbaugh
 - "The Evapotranspiration Cycles in High Latitude Agricultural Field", Watcharee Ruairuen
 - "When Muskox Come to Town: Seeking Solutions for an Escalating Problem", Claudia Ihl
 - "Alaska Native Place Names Research: Current Status and Future Prospects", Gary Holton
 - "The Use of Digital Storytelling in Community Based Alcohol Abuse Prevention", Ellis Ott, Amy Bollaert and Inna Rivkin
 - "Undergraduate Students' Experiences Exploring Local Socio-Ecological Systems in a Field-Based Honors Seminar Course", Carie Green

Saturday, September 27th, 2014 — Continued

University of Alaska Biomedical Research Conference: One Health

Kriya Dunlap, Chair

Location: Room 105

- "Can Humans Hibernate?", Kelly Drew
- "Inhibition of Thermogenesis in Mammals and Resultant Arrhythmia via Pharmacologically Induced Hypothermia by Adenosine A1 Receptor Agonist", Bernard Laughlin
- "Weight Gain, Conditioning and Metabolic Syndrome: A Sled Dog Model", Aline Collin
- "Alaska Native Perceptions of Food, Health, and Community Well Being", Melanie Lindholm
- "Characterizing the In Vitro Debromination of PBDE-99 in Staghorn Sculpin and Starry Flounder Derived Hepatic Microsomes", Lisa Hoferkamp
- "Hair and Bone as Predictors of Tissue Mercury Concentration in the Red Fox Vulpes vulpes", Bonita Dainowski
- "Effect of Zinc Oxide Nanoparticles on Neuroblastoma SH-SY5Y Cells", Lawrence Duffy

Interdisciplinary, STEM and General Science Education

Barbara Taylor, Chair

Location: Room 107

- "Alaska EPSCoR: Interdisciplinary Research and Outreach Across Alaska", Tom Moran
- "Preparing Future Arctic Scientists: A Field Excursion to the North Slope to Study Arctic Environmental Change", Amy Breen
- "Greenland Ice Microbiome Project", R Eric Collins
- "We Account the Whale Immortal": Fantasies of Arctic Abundance in Herman Melville's Moby-Dick and Early American Whaling Narratives", Jennifer Schell
- "Long Term Planning for Healthy Sustainable Communities: A Focus on Risks, the Process of Learning, and Education", Doug Cost and Berill Blair
- "The Science Acceleration Strategy (SAS) for Research and Education", Derek Starkenburg
- "Increasing Understanding of Local Social-Ecological Systems through Research in Post-Secondary Classrooms", Cindy Fabbri

Art as Communication

Annie Duffy, Chair

Location: Room 111

- "Modern Utilitarian Ceramic Interpretation of Traditional Northern Native Designs", Kirsten Olson
- "Memory on Trial: The Story of Alaska's Deadliest Unsolved Mass Murder", Brittany Retherford
- "Creating Understanding through Public Performance: The Icon of Salmon as a Commonality for Alaska's Physical and Occupational Communities", Emilie Springer
- "Art and Adaptation: How Creative Practice Enhances our Capacity to Navigate an Uncertain Future", Perrin Teal-Sullivan
- "Wood Ash to Glass: The History, the Science, and the Aesthetic", James Brashear
- "Illustrative Animations for Science and Math Education", Miho Aoki
- "The Merits of Drawing: An Essential Scientific Tool", Mareca Guthrie

3:50 p.m.

Break

4:00 p.m.

Keynote

Role of Mitochondria in the Oxidative Stress of Alzheimer Disease

George Perry, neuroscientist and Dean of the College of Sciences and Professor of Biology at the University of Texas at San Antonio

4:50 p.m.

Presentation of the Sven Ebbesson Award

5:00 p.m.

Poster Session and Reception

• *Arctic Division AAAS Meeting History* •

The Arctic Division of the American Association for the Advancement of Science (AAAS) has a long and illustrious history. Founded in 1951 as the Alaska Division, the Arctic Division was established to foster scientific communication in the then rather isolated Arctic territory. The name was changed to Arctic Division in 1982 to reflect the membership's growing interest in high latitudes outside of Alaska. Most of the Division members reside in Alaska and Canada's Yukon, Northwest Territory, and Nunavut, but any AAAS member who has an interest in the Arctic or Antarctic may join. More information about the Arctic Division AAAS can be found online at www.arctic.aaas.org.

Previous Arctic Division AAAS Meetings

No.	Dates	Year	Location	Chair	Theme
1	Nov. 9 - 11	1950	Washington, D.C.	John C. Reed	Science in Alaska
2	Sept. 4 - 8	1951	Mt. McKinley National Park	Laurence Irving, UA Biology Dept.	Science in Alaska
3	Sept. 22 - 27	1952	Mt. McKinley National Park	Laurence Irving, UA Biology Dept.	Science in Alaska
4	Sept. 28 - Oct. 3	1953	Juneau	Christian T. Elvey, UA Geophysical Inst.	Science in Alaska
5	Sept. 7 - 10	1954	Anchorage	Hugh A. Johnson, US Dept. of Agriculture	Science in Alaska
6	Jun. 1 - 4	1955	College	Neil W. Hosley, Univ. of Alaska	Science in Alaska
7	Sept. 27 - 30	1956	Juneau	Troy L. Pewe, US Geological Survey	Science in Alaska
8	Sept. 10 - 13	1957	Anchorage	Victor P. Hessler, Univ. of Alaska	Science in Alaska
9	Sept. 2 - 5	1958	College	Robert L. Rausch, Arctic Health Res. Cntr., US Public Health Svc.	Science in Alaska
10	Aug. 25 - 28	1959	Juneau	Norman J. Wilimovsky, Univ. of British Columbia	Science in Alaska
11	Aug. 30 - Sept. 2	1960	Anchorage	Roger R. Robinson, US Bureau Land Mgmt.	Science in Alaska
12	Aug. 28 - Sept. 1	1961	College	John P. Hannon, Arctic Aeromedical Lab	Science in Alaska
13	Aug. 22 - 26	1962	Juneau	James W. Brooks, AK Dept. of Fish and Game	Science in Alaska
14	Aug. 22 - 30	1963	Anchorage	Allan H. Mick, AK Agricultural Exp. Sta.	Science in Alaska
15	Aug. 31 - Sept. 4	1964	College	Charles J. Eagan, Arctic Aeromedical Lab	Science in Alaska
16	Aug. 30 - Sept. 1	1965	Juneau	Richard M. Hurd, Inst. Northern Forestry	Science in Alaska
17	Aug. 29 - Sept. 2	1966	Anchorage	William Davis, Alaska Methodist Univ.	Science in Alaska
18	Aug. 28 - Sept. 1	1967	College	Peter R. Morrison, UA Inst. of Arctic Biology	Science in Alaska
19	Aug. 26 - 30	1968	Whitehorse	Richard Hill, Dept. of Indian Affairs	Science in Alaska & Northern Development
20	Aug. 24 - 27	1969	College	Victor Fisher, UA Inst. Social & Econ. Res.	Change in the North: People, Petroleum & Environment
21	Aug. 16 - 19	1970	College	T. Neil Davis, UA Geophysical Inst.	Change in the North: UA Physical Environment
22	Aug. 17 - 19	1971	College	Laurence Irving, UA Inst. of Arctic Biology	Adaptation for Northern Life
23	Aug. 15 - 17	1972	Fairbanks	Gordon S. Harrison, UA Inst. of Social & Econ. Res.	Science and Policy in the North
24	Aug. 15 - 17	1973	Fairbanks	Gunter E. Weller, UA Geophysical Inst.	Climate of the Arctic
25	Oct. 18 - 20	1974	Anchorage	William Davis, Alaska Methodist Univ.	Behavioral Sciences in the North
26	Aug. 11 - 15	1975	Fairbanks*	Donald W. Hood, UAF Inst. of Marine Science	Third International Conference on Port & Ocean Engineering Under Arctic Conditions (POAC)
27	Aug. 4 - 7	1976	Fairbanks	George C. West, UAF Inst. of Arctic Biology	Resource Development: Processes and Problems
28	Sept. 22 - 24	1977	Anchorage	David M. Hickok, UA Arctic Environ. Info. & Data Center	Science Information Exchange in Alaska
29	Aug. 15 - 17	1978	Fairbanks	Donald H. Rosenberg, UA Alaska Sea Grant	Alaska Fisheries: 200 Years & 200 Miles of Change
30	Sept. 19 - 21	1979	Fairbanks	Daniel B. Hawkins, UAF Geophysical Inst.	Science for Alaska
31	Sept. 17 - 19	1980	Anchorage	E. Lee Gorsuch, UAA Inst. of Social and Econ. Res.	Agenda 80S
32	Aug. 25 - 27	1981	Fairbanks	John Bligh, UAF Inst. of Arctic Biology	Life Sciences in the Service of Alaska
33	Sept. 16 - 18	1982	Fairbanks	Vera Alexander, UAF Inst. of Marine Science	Science in the North
34	Sept. 28 - Oct. 1	1983	Whitehorse	Arthur Pearson, Rampart Dev. Corp.	Alaska/Canada North: Neighbours in Science
35	Oct. 2 - 5	1984	Anchorage	John Davies, UAF Geophysical Inst.	Science in Public Policy
36	Sept. 27 - 29	1985	Fairbanks	Robert G. White, UAF Inst. of Arctic Biology	Technology and the Scientist

No.	Dates	Year	Location	Chair	Theme
37	Jun. 8 - 13	1986	Vancouver**	Richard Bushey, Yellowknife, NWT	All Disciplines
38	Sept. 24 - 26	1987	Anchorage	Thomas Morehouse, UA Inst. of Social and Econ. Res.	Alaska's Resources, Alaska's Future
39	Oct. 7 - 10	1988	Fairbanks	Neal B. Brown, UAF Geophysical Inst.	Science Education
40	Sept. 14 - 16	1989	Fairbanks	Francis Williamson, UAF Inst. of Arctic Biology	Global Change
41	Oct. 8 - 10	1990	Anchorage	Thomas Newbury, US Minerals Mgmt. Svc.	Circumpolar Perspectives
42	May 16 - 18	1991	Fairbanks***	Neal B. Brown, UAF Geophysical Inst.	Circumpolar Modeling of Climate Change
43	Sept. 8 - 12	1992	Valdez	Kenneson Dean, UAF Geophysical Inst.	Environmental Change: Natural and Man-Made
44	Sept. 15 - 18	1993	Whitehorse	Arthur Pearson, Rampart Dev. Corp.	Circumpolar Information Exchange: Shrinking the Circumpolar Community
45	Aug. 25 - 27 Aug. 29 - Sept. 2	1994	Anchorage Vladivostok	Rosa Meehan, US Fish and Wildlife Serv.	Bridges of Science Between North America and the Russia Far East
46	Sept. 19 - 21	1995	Fairbanks	Robert G. White, UAF Inst. of Arctic Biology	Landscapes
47	Sept. 19 - 21	1996	Girdwood	Jack Kruse, UA Inst. of Social and Econ. Res.	Shaping an Unpredictable Future: Science and Communities
48	Sept. 24 - 27	1997	Valdez	R. Ted Cooney, UAF Inst. of Marine Science	Arctic Science and Resource Management: Exploring the Issues
49	Oct. 25 - 28	1998	Fairbanks	Syun-ichi Akasofu, UAF Geophysical Inst.	International Cooperation in Arctic Research: Detecting Global Change and its Impacts in the Western Arctic
50	Sept. 19 - 22	1999	Denali National Park & Reserve	Claus-M. Naske, UAF History Dept.	Science in the North: 50 Years of Change
51	Sept. 21 - 24	2000	Whitehorse	Joan Eamer, Yukon Science Inst.	Science and Community Crossing Borders - Arctic Science 2000
52	Sept. 12 - 15	2001	Anchorage****	Don Spalinger, AK Dept. of Fish and Game	2001 Arctic Science Odyssey: Exploring New Technologies and Methodologies for Arctic Science Management
53	Sept. 18 - 21	2002	Fairbanks	Terry Whitedge, UAF Inst. of Marine Science	Connectivity in Northern Water: Arctic Ocean, Bering Sea, and Gulf of Alaska Interrelationship
54	Sept. 21 - 24	2003	Fairbanks	John C. Eichelberger, UAF Geophysical Inst.	Extreme Events: Understanding Perturbations to the Physical and Biological Environment
55	Sept. 14 - 16 Sept. 26 - Oct. 1	2004	Vladivostok - 1 Anchorage - 2	Craig E. Dorman, VP Research UA Statewide System	1 - Bridges of Science 2 - Human Dimensions of the Arctic Environment
56	Sept. 27 - 29	2005	Kodiak	Scott Smiley, Fishery Industrial Technology Center, UAF	Consequences of Arctic and Sub-Arctic Environmental Variation
57	Oct. 2 - 4	2006	Fairbanks	John Walsh, Center for Global Change and Arctic Systems Research, UAF	State of the Arctic: Current State of the Arctic Observations and Evaluations of Arctic Change
58	Sept. 24 - 26	2007	Anchorage	John Kelley, School of Fisheries and Ocean Sciences, UAF	Partnering for Northern Futures: Science, Policy, Education, and Learning in the International Polar Year
59	Sept. 15-17	2008	Fairbanks	S. Craig Gerlach, UAF Anthropology Dept.	Growing Sustainability Science in the North: Science • Policy • Education • Legacy In the International Polar Year
60	Sept. 14-16	2009	Juneau	Brian Edmonds, UAF Dept. of Chemistry and Biochemistry	Impact of Environment on Human Health: Interdisciplinary Science and Education
61	Sept. 13-15	2010	Anchorage	Lillian Alessa, Chair, UAA Resilience and Adaptive Management Group	Water: Integrating Health, Habitat and Economy
62	Sept. 21-24	2011	Dillingham	Todd Radenbaugh, Director Bristol Bay Environmental Science Lab, UAF Bristol Bay Campus	Ecosystems: Understanding the Cycles.
63	Aug. 5-10	2012	Fairbanks	*Held jointly with the International Congress on Circumpolar Health's 15th annual meeting	Circumpolar Health
64	Sept. 26-28	2013	Kodiak	Brian Himelbloom School of Fisheries and Ocean Sciences UAF	Fisheries and Watersheds: Food Security, Education and Sustainability

*Arctic Division co-sponsored the International Port and Ocean Engineering Under Arctic Conditions (POAC) Conference

**joint with the Pacific Division

***Yukon College cancelled; conference moved to Fairbanks

****Not held due to the tragic events of Sept. 11, 2001 at the World Trade Center and the Pentagon

2014 Arctic Science Conference Abstracts

Abstracts are listed alphabetically according to first author.

1. **Illustrative Animations for Science and Math Education**

Miho Aoki and Jumiah Johnston
University of Alaska Fairbanks

Data visualizations is well recognized in science and mathematics, but illustrative works are critical in these fields, especially in educational settings too. Visual images, such as illustrations and animations can communicate the ideas visually and convey information crucial to understanding scientific and mathematical concepts. This presentation discuss the importance of illustrative works and present examples of animations and illustrations for mathematics and arctic science.

2. **ECG of Hibernating Arctic Ground Squirrels**

Zeinab Bahareh Barati, Tulasi Jinka, and Kelly Drew
University of Alaska Fairbanks, Institute of Arctic Biology

Hibernation is a physiological adaptation to periods of seasonal resource limitation. Hibernators undergo several bouts of torpor during a hibernation season. Torpor in hibernation is a period of profound bradycardia, metabolic suppression and decreased core body temperature (T_b). Each torpor bout consists of entrance, steady-state, and arousal phases. Cardiac arrhythmia – i.e. bradycardia or erratic heartbeats - are observed during hibernation with no ventricular fibrillation or heart failure and the heart remains functional even at a T_b of 0oC. In contrast, therapeutic hypothermia for patients with cardiac arrest is not without complications. The mechanisms that protect the hibernating species against lethal cardiac arrhythmias at reduced T_b are not fully understood. However, evidence suggests that the effect of adenosine A1 receptor agonists within the central nervous system contributes to cardiac stability in hibernating species at cold temperatures¹. Moreover, skipped beats during onset of torpor are thought to result from increased parasympathetic tone to the heart because they are blocked by atropine². More recently, adenosine A1 agonist-induced torpor applied to the nucleus tractus solitarius (NTS) of the rat induced torpor-like effects including evidence of increased parasympathetic tone³. Here, we describe the occurrence of skipped beats and other cardiac arrhythmias in relation to T_b from qualitative analysis of the ECG during phases of successive torpor bouts in the arctic ground squirrel (AGS), a hibernating species. We examined the ECG data from AGSs during phases of successive torpor bouts. Steady-state phase of hibernation at a T_b of 4oC was characterized by bradycardia, whereas a gradual progressive increase in heart rate was noticed through arousal phase until a T_b of 37oC. Skipped beats and bradycardia followed as the animal prepared to enter into another torpor bout at a T_b of 36oC and mid-entrance phase at 15oC. A brief pause in heart beats was a characteristic finding during the last stage of entrance phase at a T_b of 8oC. This qualitative analysis will be followed by future heart rate variability analysis (HRV) to better understand the autonomic regulation during spontaneous torpor in AGS as well as adenosine A1 agonist-induced torpor in AGS and rats. Understanding the central nervous system control of cardiac arrhythmia in hibernators will guide the translation of these mechanisms to non-hibernating animals, including humans for management of cardiac function during therapeutic hypothermia and therapeutic hibernation

Reference: 1. Miyazawa S, Shimizu Y, Shiina T, Hirayama H, Morita H, Takewaki T. Central A1-receptor activation associated with onset of torpor protects the heart against low temperature in the Syrian hamster. *Am J Physiol Regul Integr Comp Physiol.* 2008; 295(3): R991-6. 2. Lyman CP, O'Brien RC. Autonomic Control Of Circulation During The Hibernating Cycle In Ground Squirrels. *J Physiol.* 1963; 168: 477-99. 3. Tupone D, Madden CJ, Morrison SF. Central Activation of the A1 Adenosine Receptor (A1AR) Induces a Hypothermic, Torpor-Like State in the Rat. *J Neurosci.* 2013; 33(36): 14512-25.

3. Targetted Temperature Management with Full and Partial A1 Adenosine Agonists

Isaac Bailey, Lori Bogren, Carl Murphy, and Kelly Drew
University of Alaska Fairbanks

Background and Objective: N6-cyclohexyladenosine (CHA), a full A1 adenosine receptor (A1AR) agonist, is studied as a pharmacological adjunct for therapeutic hypothermia based on efficacy to induce hibernation. Full A1AR agonists carry cardiovascular risks. Capadenoson (CAP) a partial A1AR agonist carries lower cardiovascular risk. We tested the hypothesis that CAP would decrease Tb in rats in a manner similar to CHA. Methods: IACUC approved procedures were used to instrument adult, male Sprague-Dawley rats (n=10), with IP iButton dataloggers (Maxim Integrated, San Jose, CA). Tb was monitored at 10min intervals, HR was monitored every 2h using a Littmann© Model 4000 electronic stethoscope (3M, St. Paul, MN) and Beat Counter app (<http://vetapps.co.uk>). Treatments (vehicles, 1mg/kg CHA; 1 and 2 mg/kg CAP, IP) were administered per a balanced block design with 1 week between tests. Results: A single injection of CHA decreased Tb by 1°C to 17°C and HR by 12 to 80% with effects lasting from 1 to 24h. CAP gave more consistent but modest responses with Tb and HR drops of 1.3 and 1.6°C and 24 and 30% for 1 and 2mg/kg doses. All rats returned to baseline levels without evidence of stress indicated by porphyrin accumulation around the eyes. Discussion and Conclusions: In contrast to expectations, full and partial A1AR agonists differed significantly in effects on Tb in rats.

4. Ischemic Injury Monitored with a Novel Microper Fusion Device Unveils the Role of pH in I/R Injury

Saurav Bhowmick, Jeanette Moore, and Kelly Drew
University of Alaska Fairbanks, Institute of Arctic Biology

Background: Ischemia and reperfusion (I/R) causes neuronal injury due to disruption in ion homeostasis including acidosis. Low pH modulates NMDAR, AMPAR and acid sensing ion channels (ASIC). This study tests the hypothesis that mild acidosis protects against I/R injury via modulation of NMDAR, but produces injury via activation of AMPAR and acid sensing ion channels (ASIC1a). To test this hypothesis we monitored the time course of cerebral I/R injury using a novel microperfusion system to define the role of pH in neuronal injury and protection. Methods: Hippocampal brain slices (400 micron) from rat were subjected to conditions that mimicked I/R in vivo. Perfusates were collected every 15min and analyzed for glutamate efflux and neuronal injury (LDH release). Role of pH was deciphered by treating the slices with pH=6.4 with and without ASIC, NMDAR antagonists or AMPAR agonists. Results and conclusions: Results show that low pH has both protective and damaging effects through modulation of ASIC, NMDAR and AMPAR. Discussion: Understanding the time course of effects of loss of ion homeostasis will guide treatment of I/R caused by stroke and cardiac arrest.

5. Dynamical Downscaling of ERA-Interim for Alaska

Peter Bieniek, Uma Bhatt, John Walsh, Scott Rupp, Jing Zhang, and Jeremy Krieger
University of Alaska Fairbanks

The climate of Alaska is experiencing dramatic changes that have been enhanced by Arctic amplification. Understanding the mechanisms of change is necessary to better assess potential impacts. Due to sparse station observations in the vast state, dynamical downscaling of coarse resolution reanalysis/global climate model data using a regional climate model may be especially valuable to better understand the local climate. In this study we downscaled the ERA - Interim reanalysis data set 1979-2013 using the Weather Research and Forecasting (WRF) model to a 20km grid centered on Alaska. The results of the downscaling were compared to the original reanalysis to determine the value added by downscaling temperature and precipitation. Owing to the complex topography of Alaska, the more realistic topography of WRF compared with the more smoothed topography of ERA - Interim allows for a better representation of the effect of terrain on the local climate. Preliminary results indicate warmer temperatures over higher elevations in winter relative to the reanalysis with cooler temperatures in summer. Lower elevations also tended to be cooler in winter in the downscaling. The downscaling tended to be wetter when compared to the original reanalysis. When compared locally with station data, the Fairbanks downscaling was warmer than observations while the Juneau downscaling, being in more complex terrain, tended to follow the station observations more closely than the reanalysis. This demonstrates that, with the added detail of topography and mesoscale processes, dynamical downscaling enhances the local information of temperature and precipitation in Alaska.

6. Arctic Policy Development – Domestic and Foreign Stakeholder Influences

Troy Bouffard and Anupma Prakash
University of Alaska Fairbanks

The Arctic is defined by a consistent and distinct set of criteria. The populations and actors who claim ties to the region, much like people everywhere, strive to control, or at least participate in, their destinies. Stakeholders, such as the public and private sector, economic industries, as well as social and indigenous groups, understand that it is necessary to be politically organized in order to influence policy. The interdisciplinary nature of integrating stakeholder concerns into the policymaking process is critical for regions such as the Arctic. A diversity of input and influence on policy is demonstrably requisite considering the number of impacted nations and their demographics. Domestic counsel usually provides the primary perspectives responsible for internal policy development and application. However, foreign collaboration can allow for diverse and overlooked – even undiscovered – perspectives. Throughout 2014 the University of Alaska Fairbanks continued to increase of its participation in diplomatic and policy efforts that pertain to the Arctic. This is directly in anticipation of the upcoming rotation of the Arctic Council Chair to the United States in April 2015. In 2017, Finland will become the Chair. While the U.S. is well into planning for its tenure, Finland is just starting to plan, consequently the Finnish have a direct interest in how the U.S. transitions into and conducts its leadership role. During a trip to northern Europe with an delegation of Alaskans (organized by the Institute of the North) representing the public and private sectors, two UAF representatives, Anupma Prakash and Troy Bouffard, were exposed to many foreign perspectives from a variety of stakeholders in Finland, with much emphasis placed on the importance of access to the policy-making process. This presentation will endeavor to share a selection of the ongoing nuanced and explicit aspects, both domestic and foreign, involved in supporting efforts behind the development of Arctic strategies. The lessons learned have a broad relevance for the research and education community in its role as advisor to and analyst for policy-making entities.

7. Wood Ash to Glass: The History, the Science, and the Aesthetic

James Brashear and Mark Wipfli
University of Alaska Fairbanks

Three to four thousand years ago glass was discovered in Eastern cultures through the process of firing pottery kilns with wood as fuel. The glass or glaze developed on the wares came from the wood ash deposited on the pottery during the firing process. The design of the kilns led to intense temperatures of over 2400 degrees. In this atmosphere the chemical composition of the wood ash, to a large extent the silica present acting as the glass former combined with the fluxing agents in the wood ash melts to create a true glass. This process was a huge technological advance that gave way to a aesthetic that lives on today. As an Art faculty I am fascinated by the technology and aesthetics of these cultures kilns and processes. But it is the science of this subject the organic nature of trees and wood and how it contributes to the inorganic nature glass and the ephemeral process in between. What is the chemical composition of wood- ash and how does each element of this composition contribute to the formation of a glass? Why do organic trees draw these inorganic elements or chemicals into their structure? How do they benefit the tree? To what extent does the chemical composition of wood ash vary from species to species, does it vary from region to region, or tree to tree?

8. Preparing Future Arctic Scientists: A Field Excursion to the North Slope to Study Arctic Environmental Change

Amy Breen, Donald Walker, Martha Reynolds, Ronald Daanen, Mikhail Kanevskiy, Gary Kofinas, Yuri Shur, and Bill Streever
International Arctic Research Center, University of Alaska Fairbanks

We developed and implemented an interdisciplinary 15-day field course to introduce future scientists to the Arctic environment in northern Alaska, including an in-depth examination of the physical, biological, and human responses and adaptations to ongoing climate change. The course begins with 3 days of preparatory lectures, local field trips, and field safety training in Fairbanks. The instructors and students then depart on a 10-day field excursion along the Dalton Highway traveling from the boreal forest through the Brooks Range to the Arctic Coastal Plain. The class camps in these ecosystems, introducing students to the climate, geology, permafrost, soils, vegetation, and local people along

the latitudinal transect. Highlights of the excursion include visiting with researchers at their field sites including the Institute of Arctic Biology's Toolik Field Station, visiting with locals in Wiseman, and visiting the oil fields at Prudhoe Bay. Students are required to develop a research topic that fits within the scope of the excursion. During the final 2 days of the course upon return to Fairbanks, students prepare and present oral summaries of their field observations, focusing on their research topics. We will present the field course curriculum, give a summary of past student projects, and share lessons learned from the first two years of implementing the course.

9. Project STEAM: Integrating Art with Science to Build Science Identities Among Girls

Laura Carsten Conner, Carrie Tzou, Stephen Pompea, and Mareca Guthrie
University of Alaska Fairbanks

Research suggests that girls who gravitate towards art may have strong visual-spatial abilities that would also serve them well in science careers. However, in contrast to boys, most girls with such ability do not go on to enter STEM careers. We launched a series of interventions to counteract this trend, using an interdisciplinary, arts-based approach to attract art-interested girls to STEM careers. The primary intervention is a 2-week summer academy that explores the biology and physics of color through the lens of art. We offer this academy annually in Tucson, AZ, and Fairbanks, AK. Project research uses a participant-observer approach to study the outcomes of our summer academies. Data sources include daily, videotaped observations, pre/post interviews and surveys, and science/art notebooks. Our analysis focuses on three main indicators: 1) evidence of increased identification with science and art; 2) evidence of overlapping science/art practices; and 3) positionality of youth during STEAM instruction. To date, we have seen that our approach results in increased interest in STEM careers, increased science knowledge, a sense of agency with respect to these practices, and new ideas about the overlap of science and art. Our results indicate that there is great potential for art to support identity shifts and to engage learners in interdisciplinary science practices.

10. Alaska Adapting to Changing Environments (ACE)

Tania Clucas
Alaska EPSCoR

Alaska EPSCoR conducts biological, physical and social research into the adaptive capacity of Alaskan communities: the mechanisms that enable communities to effectively respond to environmental and social changes. Research includes new sensors to monitor biophysical changes coupled with social science approaches to measure community responses. EPSCoR research is organized around three regional test cases. The Southeast test case focuses on changes to ecosystem services brought on by glacial recession in Berners Bay, near Juneau. The Southcentral test case examines the effects of hydrological and landscape changes on communities in the Kenai River watershed. The Northern test case studies how permafrost thaw and land cover change affect subsistence resources around Interior and Arctic villages, with a current focus on the North Slope village of Nuiqsut. Results from the test cases are used by a statewide Coordination, Integration and Synthesis (CIS) Working Group to answer larger scientific questions about adaptation and to create decision-support tools for land and resource managers. An Education, Outreach and Diversity (EOD) Group works to involve students and the public in EPSCoR research and to keep them apprised of results. Project data acquired by Alaska EPSCoR, as well as relevant data compiled from other agencies and organizations, can be accessed at Alaska EPSCoR's statewide data portal.

11. Weight Gain, Conditioning and Metabolic Syndrome: A Sled Dog Model

Aline Collin, Shannon Jimmie, Arleigh Reynolds, Lawrence Duffy, and Kriya Dunlap
University of Alaska Fairbanks

Type II diabetes (T2D) and insulin resistance are growing national health concerns. Obesity is a risk factor for developing T2D and is associated with a chronic and systemic inflammation. Exercise on the other hand has shown to improve glucose metabolism and improve insulin sensitivity. Among the biomarkers that are commonly measured to assess metabolic syndrome and insulin resistance are tumor necrosis factor (TNF), glycated hemoglobin (GHbA1c), and adiponectin. TNF is an inflammatory cytokine, which inhibits the insulin-signaling pathway and adiponectin secretion amongst other effects. Adiponectin is an adipocytokine with insulin-sensitizing effects. GHbA1c forms when hemoglobin joins glucose molecules providing an average of blood sugar levels over several weeks. Individuals with insulin resistance

and the metabolic syndrome have higher levels of tumor necrosis factor and glycated hemoglobin and lower levels of adiponectin. To assess the effects of conditioning/exercise and weight gain, we measured the levels of these three biomarkers in racing, sedentary, and overweight sled dogs. Our results indicate that weight gain is a stronger predictor of metabolic syndrome and insulin resistance than physical activity.

12. Greenland Ice Microbiome Project

R. Eric Collins

University of Alaska Fairbanks

In the century since Fridtjof Nansen's audacious 1888 ski expedition there have been few scientific crossings of the Greenland ice cap. Of those that have been completed -- notably by Carl Benson (Prof. Emeritus, University of Alaska Fairbanks) in the 1950's -- most have been mechanized treks or fly-overs, and none have been focused on the microbial realm. The "Greenland Ice Microbiome Project" (GrIMP) is an ambitious project that will travel to both coasts of Greenland and utilize human power to travel 540 km over the 2500 m high Greenland Ice Sheet on skis, collecting microbiological samples and acquiring environmental knowledge along the way. The aim of this project is to probe the diversity and functionality of cold-adapted microbes -- the most diverse inhabitants of Greenland from coast to coast. The sampling sites for the 2014 GrIMP expedition include: Kobbefjord, West Greenland; Kulusuk, East Greenland; Daneborg, East Greenland; and a traverse across the ice cap from Kulusuk to Kangerlussuaq. The primary goal of GrIMP is to provide the first comprehensive metabarcoding survey of the microbial diversity of Greenland's ice, including sea ice, glacial ice, and snow. In this study DNA will be extracted from Bacteria, Archaea, and microbial Eukaryotes for amplification of the 16S or 18S ribosomal RNA genes for Illumina sequencing. The unparalleled geographic extent and intensive depth of sequencing acquired during this project will permit a reconstruction of the microbial community present in snow and ice and facilitate determinations of the origin and distribution of microbes across Greenland.

13. Determining Viable Locations for Wind Farms in Alaska

John Cooney, Hannah Ross, Nicole Mölders, and Gerhard Kramm

Texas A&M University

Various locations in Alaska are assessed to find out optimum sites for installing wind farms for producing electricity. Wind farms seem to be advantageous because currently Alaska lacks an infrastructure of transmission lines that span the entire state. Also, the weather conditions during the winter months cause the sparse road net to become impassable making it difficult to distribute so-called fossil fuel for generating electricity and heating homes and business facilities absolutely essential to survive in cold climate areas. Thus, daily wind data sets from twenty first-order stations for the cold season ranging from October 1, 2008 to April 1, 2009 were analyzed for figuring out which locations received sufficient and reliable wind power to support a wind farm indispensable for cost-benefits analyzes. This period was chosen because of the availability of model data for Interior Alaska provided by the Weather Research and Forecasting (WRF) model. The results of our investigation indicate that only four locations may be assessed as suitable candidates for wind farms: St. Paul Island, Cold Bay, Bethel, and Kotzebue. As required by any kind of energy conversion, we also assess the impact of wind farms on the natural environment, for instance, on endangered species, avian migrations/habitats, and if there are wetlands/protected areas around the location.

14. Long-term Planning for Healthy Sustainable Communities: A Focus on Risks, the Process of Learning and Education

Doug Cost and Berill Blair

University of Alaska Fairbanks

This research is an overview of the gaps in the literature concerning the role and importance of education in risk mitigation and community resilience. Resilience is a process of continual learning, taking responsibility and making better decisions to improve the capacity to handle hazards (Cutter et al. 2008). A resilience approach to sustainable futures does not prescribe to any one specific method for risk management, rather it aims to ensure that a system is able to absorb shocks and risks. Unlike traditional risk management tools that are mainly concerned with risk prevention, avoidance, reduction, and transference, resilience theory calls for the evaluation of the states, processes, relationships,

vulnerabilities and capacities within the system at study. This process is an important part of sustainability-minded future planning; making ways of learning and knowing a meaningful subject of study for Arctic communities that are concerned with sustainability and education. Indeed, while working with community residents across four U.S. and Canadian Arctic communities, researchers found that education of younger people in both traditional knowledge and Western science and education of the outside world of community goals and ways of living, was in the top five sustainability goals of these communities (Kruse et al. 2004). Other research identified the link between lower suicide rates among young Native Alaskan men and the combination of good economic opportunities and strong traditional presence (Berman 2014), supporting further research into effective education methods that offer these communities a balanced education for the job market as well as for the successful continuation of traditional ways of life. Tidball et al. (2010) note that collective learning via social and ecological memories has been a well-researched component of adaptive capacity. And yet formal education methods such as K-12, outreach programs, and environmental education programs that may likely also increase the social flexibility and adaptive learning required for adaptive management, have not been extensively studied. We start with a brief overview of risk typologies that illuminate the interplay between hazards, exposure, vulnerability and risk, from the viewpoint of community preparedness. This section is a discussion of slow and fast onset hazards, actualized risks and the interplay between risk potential, risk events, and community learning. We continue with an overview of existing literature on the role of education in resilience as governance and as a continual learning process, and recommendations for further research. We argue that because school systems create and maintain various forms of capital – human, social, built, environmental – that alter their social and ecological environments, they are especially important for the study of connections between learning, risk governance, and resilience.

15. Hair and Bone as Predictors of Tissular Mercury Concentration in the Red Fox *Vulpes vulpes*

Bonita Dainowski

Institute of Arctic Biology, University of Alaska Fairbanks

We evaluated if total mercury (THg) concentrations of keratin-based and bone-based tissues can predict THg concentrations in skeletal muscle, renal medulla, renal cortex, and liver. The THg concentration in matched tissues of 65 red foxes, *Vulpes vulpes* (Linnaeus, 1758), from western Alaska was determined. Hair THg concentration had a significant positive correlation with liver, renal medulla, renal cortex, and muscle THg concentration for males and females. We observed that hair is moderately predictive of THg concentration in the renal cortex and liver for these foxes based on R2 values (R2 = .61 and .63, respectively). Bone is weakly predictive of THg concentration in muscle (R2 = .40), but not a reliable tissue to predict THg concentration in liver (R2 = .24), renal cortex (R2 = .35), or renal medulla (R2 = .25). These results confirm the potential use of trapped animals, specifically foxes, as useful Arctic sentinel species to inform researchers about patterns in THg levels over time as industrialization of the far North continues.

16. Can Humans Hibernate?

Kelly Drew

University of Alaska Fairbanks

Hibernation is a physiological state of energy conservation associated with a decrease in core body temperature (Tb) and oxygen consumption (Vo2). Space travel is limited by the capacity to carry food. To address if an energy conserving, hibernation-like state may be attainable in humans we discuss the safety and metabolic conserving efficacy of A1 adenosine receptor agonists in laboratory rats. Principles of hibernation: A1 adenosine receptors (A1AR) within the CNS regulate onset of hibernation or torpor in ground squirrels, hamsters and mice. Agonist administration inhibits thermogenesis and produces an initial decrease in VO2 with a subsequent decrease in Tb that outlasts the duration of drug action. Stimulating A1AR within the brain is hypothesized to trigger a coordinated autonomic nervous system response that inhibits thermogenesis similar to the process that occurs during spontaneous hibernation. Metabolic suppression may be enhanced and sustained by direct effects of cold on physiological and biochemical processes as well as by decreased perfusion of the extremities and inferior portions of the body, evidenced by an increase in total peripheral resistance. Strategies to minimize Vo2 while avoiding side-effects of A1AR agonists, low Tb and peripheral perfusion. A1AR agonists inhibit thermogenesis, suppress VO2 and lower Tb in rats, however, application of the suite of mechanisms proposed to contribute to overall energy savings in hibernating species may be limited in humans by side effects of A1AR agonists and limited tolerance for reduced perfusion of peripheral tissues and cold tissue temperatures.

Humans and most other mammals are vulnerable to J-waves and other cardiac arrhythmias when body temperature falls below 30°C. Hypothermia can also produce hypotension. Moreover, restricted perfusion of inferior portions of the body including the lower abdomen can produce necrosis, systemic inflammation and multi-organ failure. Finally, A1AR agonists produce strong, negative inotropic and chronotropic side effects on the heart. Enhancing cold tolerance to achieve deep hypothermia (20-25°C) may be the most feasible approach to suppress VO₂ in nonhibernating species. Cold-induced cardiac arrhythmias may be minimized by stimulating A1AR within the CNS[12]. Direct effects of these agonists on the heart and other peripheral tissues may be attenuated by combining a centrally acting agonist with an adenosine receptor antagonist that does not penetrate the blood brain barrier, such as 8-SPT. Use of partial A1AR agonists, including Capadenoson (Bayer) or NNC 21-0136 may also attenuate cardiovascular side-effects without compromising metabolic suppression. The role of heterogenous blood flow in energy savings in hibernating species remains a matter of debate, however, even if heterogeneous perfusion is found to contribute to energy savings nonhibernating species tend to be more vulnerable to restricted perfusion than hibernating species. Resistance to ischemia/reperfusion injury is a characteristic of hibernating species, however it remains unclear if this resistance to injury plays a role in successful hibernation. Cardiac output will decrease due to hypothermia-induced bradycardia, but given that metabolic rate also decreases the balance between supply and demand may be maintained or improved. Finally, global downregulation of cellular metabolism may minimize damage caused by limited peripheral perfusion if mechanisms regulating this process in hibernating species are identified and replicated in humans. Ultimately a clear understanding of the relationship between A1AR agonist-induced cooling, VO₂ and cardiovascular side-effects and the brain circuits and mechanisms controlling this response will facilitate development of means to induce and sustain human hibernation.

17. Increasing Understanding of Local Social-Ecological Systems through Research in Post-Secondary Classrooms

Cindy Fabbri

University of Alaska Fairbanks

Being able to adapt to a changing environment requires fundamental knowledge about social-ecological systems. Institutions of higher education, in partnership with local communities, can conduct research and generate information required for informed decision-making. Engaging graduate and undergraduate students in research provides even more opportunities to generate locally relevant information. This work provides a model that institutions of higher education can use to integrate research into (under)graduate coursework.

18. Examining Place-Based Socio-Ecological Education through an Interdisciplinary University Honors Seminar

Carie Green

University of Alaska Fairbanks

The goal of this session is to present preliminary findings of a mixed-methods case study examining undergraduate honors students' experiences participating in a field-based Honors Seminar exploring local socio-ecological systems. Through field-based excursions, the students engaged with eight socio-ecological researchers involved in the Idaho EPSCoR Managing Idaho's Landscape for Ecological Services (MILES) project and three community members to learn about patterns of ecosystem service change and the societal drivers associated with development in the local region (i.e. water quality and quantity, governing sanctions and local policies, culture and indigenous perspectives, and historical decisions and future modeling). Specifically, the goal was for the honors students to not only gain understanding of complex socio-ecological systems, but to also reflect on the personal and public sustainable actions that they would take in response to their learning. Furthermore, the field-based excursions were also intended to enhance students' connections to place. The outcome of this project will be discussed in light of the themes of the Arctic Science Conference, including community engagement, interdisciplinary research and resiliency and adaption in an evolving landscape.

19. The Merits of Drawing: an Essential Scientific Tool

Mareca Guthrie
 University of Alaska Museum of the North

Drawing may seem at odds with the accuracy and precision of modern scientific observation and it is frequently considered an outdated skill that belongs to the naturalists of the 1800s. In the 21st century, with the ease of digital high-resolution photography, a drawing created by a researcher may appear to be a cumbersome and inaccurate means of recording imagery. However, while it is undisputed that photography is a valuable tool for science, there are occasions where a drawing has potential to convey more information than a photograph. For example, drawing can: 1) accommodate for complex relationships among multiple planes of a subject; 2) record subtle surface quality characteristics and textures that are either not captured in a photograph or are lost in output; and 3) compensate for complex coloration that can become visual “noise” in a photograph and obscure vital information. The act of drawing also enhances opportunity for focused observation and discovery. The demonstrated merits of drawing as a tool for scientific observation, documentation, and communication render it as an indispensable skill that should be valued as an essential part of the education of scientific researchers.

20. A Synthesis of Existing, Planned, and Proposed Infrastructure and Operations Supporting Oil and Gas Activities and Commercial Transportation in Arctic Alaska

Kevin Hillmer-Pegram
 University of Alaska Fairbanks

Previous research has identified the need for information that can contribute to comprehensive planning of oil and gas activities in Arctic Alaska. Unfortunately, there is still a shortage of regional-level studies that present information about oil and gas development and other types of industrial activities in a useable manner for a wide audience of stakeholders and in support of an integrated approach to planning and management. This report is designed to fill that gap by integrating a variety of data that have not been previously assembled, compiling a region-wide vision of these industrial activities that has not previously existed. Until now the quantification and qualitative description of existing, planned, and proposed infrastructure in Arctic Alaska was largely piecemeal. The author examined relevant documents—including environmental impact statements, planning documents, and industry reports—and extracted pertinent data about industrial activities by adapting tables, text, and maps. This report is intended as a factual and unbiased reference for the wide range of stakeholders interested in such industrial activities. Taken as a whole, the report provides readers with an overview of the history, current conditions, and plausible future extent of industrial infrastructure in Arctic Alaska.

21. Characterizing the in vitro Debromination of PBDE-99 in Staghorn Sculpin and Starry Flounder Derived Hepatic Microsomes

Lisa Hoferkamp, Honalee Elkan, and John Kenneke
 University of Alaska Southeast

Characterizing the in vitro Debromination of PBDE-99 in Staghorn Sculpin and Starry Flounder Derived Hepatic Microsomes Hoferkamp, L.*, University of Alaska Southeast, Juneau, AK Elkan, H. H., University of Alaska Southeast, Juneau, AK Kenneke, J. F., Ecosystems Research, US-EPA, Athens, GA The reductive capacity of hepatic microsomes derived from southeastern Alaska forage fish toward polybrominated diphenyl ethers (PBDE) was investigated as a possible biotransformation pathway for brominated flame retardants. Hepatic microsomal fractions derived from fish liver tissue were characterized and used in assays designed to measure debromination of a pentabrominated PBDE (PBDE-99). PBDE-99 is a particularly prevalent environmental contaminant and it, in conjunction with its tetrabrominated analogue, PBDE-47, was measured in tissue surveys of staghorn sculpin (*Leptocottus armatus*) and starry flounder (*Platichthys stellatus*) collected from southeastern Alaska estuaries.

While the majority of PBDE production and use in the US and Europe has been either banned or severely restricted since 2004, their environmental persistence and tendency for long-range atmospheric transport is made apparent by survey

results of Arctic matrices reported throughout the literature. Moreover, the relative amounts of PBDE congeners (i.e. PBDEs with varying degrees of bromination) measured in biota are typically found to deviate significantly from the congener distributions measured in abiotic matrices. The PBDE levels in various fish species typically tend towards larger proportions of the lower brominated congeners. PBDE levels were measured in tissue from staghorn sculpin and starry flounder collected from an urban estuary in Juneau, AK and exhibit disproportionately higher amounts of PBDE-47 relative to PBDE-99 when compared to the 47/99 ratios found in abiotic matrices collected from the same and similar estuaries. Liver tissue was harvested from the same two fish species, microsomal fractions isolated, characterized and used in enzyme assays with PBDE99. Survey, microsomal assay results and evidence linking biotransformation of PBDE99 to PBDE47 in the presence of sculpin microsomes to the deiodinase enzyme is presented as well as implications for biotransformation of replacement flame retardants.

22. Alaska Native Place Names Research: Current Status and Future Prospects

Gary Holton, Lawrence Kaplan, and James Kari
Alaska Native Language Center

Alaska is home to more than twenty Indigenous languages, each of which has left its traces on the landscape through place names which pre-date European contact. Some of these names are reflected in the official place name record, such as the Susitna River from Dena'ina Athabascan Susitnu or the town Sitka from Tlingit Sheet'ká. However, the vast majority of Native Alaskan place names are absent from the official record, found only in academic survey lists and in the memories of a dwindling number of Native speakers. As Native languages fall into disuse owing to the dominance of English, there has been a resurgence in language revitalization efforts. In particular, there is increasing awareness and use of Native place names in Alaska in semi-official settings such as buildings, museum exhibits, tourist brochures, park names, and wayside vistas. In this presentation we describe the current status of Alaska Native place name documentation and ongoing work to consolidate that documentation. Collaborations with local communities and government agencies facilitate an integrative approach to place names research. Rather than viewing place names as lists of disassociated points, this approach reveals connections between configurations of named places and socio-ecological dimensions of landscape, providing insights into biological and cultural diversity, adaptation and resilience, and cultural values and ecosystem services within the context of environmental change. This in turn provides a foundation for biocultural diversity research at the local level, avoiding subjectively-defined ethnic and linguistic boundaries. By comparing current and traditional resource use, ecosystem services can be understood, helping to inform policy and management decisions.

23. When Muskox Come to Town – Seeking Solutions for an Escalating Problem

Claudia Ihl
University of Alaska Fairbank North West Campus

In recent years, the city of Nome in northwestern Alaska has increasingly faced troubles created by the close proximity of muskoxen to houses and residences during the summer. While muskox populations on the Seward Peninsula overall are on the decline, muskox numbers in and near Nome have increased. Dog mushers are particularly troubled as several dogs have been gored or killed by muskoxen. Muskoxen have blocked the runway at the airport, been hit by cars and camped out in the harbor. Opinions in Nome about muskoxen are becoming more polarized, with some people enjoying the opportunity to view nearly-tame muskoxen and others living in terror for the safety of their pets and families. Many methods have been applied to deter the muskoxen, but none have been successful. Muskoxen near Nome show no fear of humans and are now behaving more like captive than wild animals. This makes them potentially dangerous to people as well as pets. We will explore possible reasons why muskox stay near town, such as avoidance of predation by bears and humans and discuss how characteristic aspects of muskox behavior add to the problem. We will draw comparisons to the situation in Mekoryuk on Nunivak Island, where muskoxen introduced in the 1930ies were also initially a nuisance before they became wary of people and stayed away from the village. Like Mekoryuk of the 1930ies, today's Nome is facing the task of altering the behavior of an entire muskox population in order to allow humans and muskoxen to coexist peacefully.

24. Sociohydrological Modeling: Local Knowledge and Hydrologic Data Provide Insight on Harvesting Driftwood from Rivers in Alaska

Chas Jones, Knut Kielland, and Larry Hinzman
University of Alaska Fairbanks, International Arctic Research Center

The integration of local knowledge and science represents an opportunity to enhance the understanding of interrelations among climate, hydrology, and social-economic systems while providing mutual benefits to scientists and rural communities. In this project, insight from rural Alaskans helped to identify a threshold used to model potential driftwood harvest from the Yukon River. Economic information from residents of Tanana, Alaska was combined with hydrological data to model driftwood harvest rates. Modeling results estimate that between 1980 and 2010 hydrologic factors alone were responsible for a 29% decrease in the annual wood harvest, which approximately balanced a 23% reduction in wood demand due to a decline in number of households. The community's installation of wood-fired boilers in 2007 created a threshold increase (76%) in wood demand that is not met by driftwood harvest. Modeling analyses of numerous climate scenarios illustrates that increases in hydrologic variability would decrease the reliability of future driftwood harvest. Economic analyses demonstrate that increased climatic variability could have serious economic consequences for subsistence users, while demanding more of their time. Lost time is very important because it reduces the time available for other subsistence activities. This research may benefit communities by providing a tool that can be used to predict the timing and duration of driftwood runs. Information gathered from discussions with local stakeholders provided critical information for model development and thus provided a better understanding of regional social-ecological dynamics. This project also illustrates the potential for regional-scale adaptations to limit the social-ecological impacts of extreme events, while encouraging economic growth and energy independence that decreases vulnerability to climatic extremes.

25. The NANANordic Ski Program and Sleep Quality in Alaska Native Children

Tyler Keshel, Ross MacDougall, and Robert Coker
University of Alaska Fairbanks

Background: Inadequate sleep quality represents a risk factor in the development of obesity. Physical activity can influence sleep quality and this relationship is further complicated by the changing light/dark cycle that accompanies the change in seasons within Alaska. The NANANordic ski program promotes healthy lifestyles in children from kindergarten to 12th grade by providing coaches and equipment for cross-country skiing and running program in remote villages throughout Alaska. Therefore, we hypothesized sleep duration and efficiency would increase during the instruction period of the NANANordic ski program. Methods: A total of 15 children (n=15; 7 males, 8 females) ages 10-15 were recruited from Shungnak (262 total residents). The GT3X+ ActiGraph accelerometers were worn six nights prior to the arrival of the NANANordic instructional staff and four nights during the ski program for comparison. Average minutes in bed, sleep time, efficiency, wake after sleep onset, and number of awakenings were calculated using the Sadeh algorithm for sleep within the ActiLife v6 software. Results: There were no changes observed among any sleep variable following the acute reoccurrence of the NANANordic ski instruction. However, significant differences were observed for total sleep time (p<0.05) between males and females. Conclusions: It seems, as sleep quality was unchanged, we likely underestimated the chronic value of the ski program, which may have a permissive influence on maintaining sleep quality. However, sleep duration is lower than that recommended by the Center for Disease Control (CDC) and compared to other children of similar age. Other variables, such as light/dark cycle, may also influence this sleep quality observed, and will be included in future assessments.

26. Assessing the Wind Power Potential in Interior Alaska

Gerhard Kramm, Hannah Ross, John Cooney, Megan Hinzman, Samuel Smock, Gary Sellhorst, Ralph Dlugi, and Nicole Mölders
University of Alaska Fairbanks, Geophysical Institute

The wind power potential at three different sites in Interior Alaska (Delta Junction, Eva Creek, and Poker Flat) is assessed by considering the results of wind field predictions for the winter period October 1, 2008, to April 1, 2009 provided by the Weather Research and Forecasting (WRF) model to avoid time-consuming and expensive tall-tower observations in Interior Alaska. To predict the average power output we use the Weibull distributions derived from the predicted wind

fields for these three different sites and the power curves of five different propeller-type wind turbines with rated powers ranging from 2 MW to 2.5 MW. These power curves are represented by general logistic functions. The predicted power capacity for the Eva Creek site is compared with that of the Eva Creek wind farm established in 2012.

27. Inhibition of Thermogenesis in Mammals and Resultant Arrhythmia via Pharmacologically Induced Hypothermia by Adenosine A1 Receptor Agonist

Bernard Laughlin and Kelly Drew
University of Alaska Fairbanks

Pharmacologically induced hypothermia is an innovative treatment modality for various life threatening conditions such as cardiac arrest, traumatic brain injury, neonatal encephalopathy and potentially cerebrovascular accidents. Shivering is the most common complication in non-pharmacologically induced hypothermia treatment. It is a physiological response to maintain body temperature by thermogenesis. Adenosine A1 receptor agonists inhibits thermogenesis, thus potentially reducing time and energy expenditures to induce and maintain hypothermic therapy. The mechanism of thermogenesis during induced hypothermia is not well characterized. Varying gradients of temperature in body regions such as the brain, abdominal cavity, and skin contribute to the net loss or retention of heat. This study utilizes thermal imaging combined with quantitative data obtained from thermocouple implantation in the brain and abdominal cavity of a rat to access the effects of N6-cyclohe xyladenosine (CHA), an adenosine A1 receptor agonist, on temperature differences in various body regions. Bradycardia is a well-known side effect in induced hypothermia via external cooling (current standard of care treatment). Heart rate and rhythm characteristics during pharmacologically induced hypothermia and subsequent rewarming period are not as well known. This study also examines the resultant cardiovascular effect of CHA by recording heart rate and rhythm data obtained from an implanted telemetry transmitter. The information obtained from this study will provide further insight into the physiological mechanism and side effects of drug induced hypothermia in an animal model. The data obtained from this study has the potential to be utilized in future translational studies in humans where current hypothermic therapy has been shown to be ineffective in disease models such a strokes possibly secondary to the inability to regulate thermogenesis.

28. Scenarios as an Interdisciplinary Approach to Explore Future Resource Extraction Activity on the North Slope in the Context of Climate Change and Socio-Economic Uncertainties

Olivia Lee, Hajo Eicken, John Payne, and Dennis Lassuy
University of Alaska Fairbanks

The North Slope of Alaska is experiencing rapid changes in response to interacting climate and socioeconomic drivers. The North Slope Science Initiative (NSSI) is using scenarios as a tool to identify plausible, spatially explicit future states of resource extraction activities on the North Slope and adjacent seas through the year 2040. The objective of the scenarios process is to strategically assess research and monitoring needs on the North Slope. The participatory scenarios process involved stakeholder input (including Federal, State, local, academic, industry and non-profit representatives) to identify key drivers of change related to resource extraction activities. While climate change was identified as a key driver in the biophysical system, economic drivers related to oil and gas development were also important. Expert-reviewed informational materials were developed to help stakeholders obtain baseline knowledge and stimulate discussions about interactions between drivers, knowledge gaps and uncertainties. Map-based scenario products will allow mission-oriented agencies to jointly explore where to prioritize research investments and address risk in a complex, changing environment. Scenarios consider multidecadal timescales. However, tracking of indicator variables derived from scenarios can lead to important insights about the trajectory of the North Slope social-environmental system and inform management decisions to reduce risk on much shorter timescales. The inclusion of stakeholders helps provide a broad spectrum of expert viewpoints necessary for considering the range of plausible scenarios.

29. Alaska Native Perceptions of Food, Health, and Community Well-Being

Melanie Lindholm
University of Alaska Fairbanks

Since statehood, Alaska Native populations have undergone relatively rapid changes in nearly every aspect of life. Overall

lifestyles have shifted from subsistence-based to wage-based, from Traditional to Western, and from self-sustainability to dependency. My research specifically investigates the effects of these changes on health and well-being. I conduct interviews with Alaska Native participants in an effort to document their perspectives regarding these changes. Many themes emerged from the data related to subsistence, dependency, and adaptation. Alaska Natives have witnessed what Western researchers call a "nutritional transition." However, Alaska Native participants in my research describe this transition akin to cultural genocide. Cut off from traditional hunting and fishing (both geographically and economically), Alaska Natives recognize the damage to individual and community health. Rising rates of cancer, heart disease, diabetes, obesity, and mental illness are being attributed to the loss of culture attached to subsistence lifestyles and subsistence foods themselves. Alaska Natives report a decrease in cultural knowledge and traditional hunting skills being passed to the younger generations. Concern for the future of upcoming generations is a reoccurring theme, especially in regard their dependency on market foods. When asked what changes should be made, nearly all respondents emphasized education as the key to cultural sustainability and self-sufficiency. The changes sought include means and access to hunting and fishing. This is seen as the remedy for dependency on outside resources. From a traditional Alaska Native perspective, food security cannot be satisfied with Western industrial products. Food is not only connected to physical and cultural health, but also has a connection to social health. Alaska Native participants express concern for community well-being because social roles and attitudes have changed - the most prominent being the shift from cohesive group cooperation to a more individualistic mentality. This shift dismantled traditional roles and responsibilities. Community members are no longer expected or required to contribute to survival. Now one can live on government subsidies, food stamps, and church programs. This dependency, and the effects of alcohol and television, are cited by respondents as major contributors to social break down in Native communities. When considering Arctic community health and cultural sustainability, food security must be considered in both Western and Indigenous Ways. Control over local availability, accessibility, quality, and cultural appropriateness is imperative to Native well-being. Many participants point to differences in Western and Native definitions of what is acceptable nourishment. Imported processed products simply cannot meet the needs of Native people. Reasons cited for this claim include risky reliance on a corporate food system designed solely for profit with its inherent lack of nutrient-dense, culturally-appropriate, locally controlled options. Respondents are concerned that often junk food is the only dependable, affordable, available, and accessible sustenance. A desire to return to sustainable and self-sufficient subsistence diets with their cultural, emotional, social, spiritual, and physical benefits continues to be expressed. Although concern is raised regarding climate change and environmental pollutants, the significance of country foods is not diminished. My research aims to document the aforementioned changes in diet, health, and community well-being from the perspective of Alaska Native peoples' resilience and adaptation. Regardless of climate changes, historical trauma, globalization, and the resulting damage to Native communities, it is clear that Indigenous cultures will continue to evolve and adapt. The persistence of Native values, worldviews, identity and spirit, despite Western assaults, is testament to its power. Researchers and advocates may lend valuable support, but the keys to health and well-being are in the hands of Native communities themselves. There appears to be a lack of concern for and documentation of Native peoples' perceptions of the changes in food systems and effects on their communities. Additionally, there is a lack of studies specific to Alaska Native individual perceptions of health and well-being. Therefore, my research aims to help identify social patterns about changes in the food that individuals and communities eat and possible effects the changes have on all aspects of health; it aims to help document how Alaska Native individuals and communities are adaptive and resilient; and it aims to honor, acknowledge, and highlight the personal perspectives and lived experiences of respondents and their views regarding food, health, and community well-being.

30. The NANANordic Ski Program and Physical Activity in Alaska Native Children

Ross MacDougall, Tyler Keshel, and Robert Coker

University of Alaska Fairbanks

Background: The incidence of obesity has risen in conjunction with decreased levels of physical activity in Alaska Native children living in remote villages. NANANordic seeks to address this problem by supporting cross-country skiing and running programs that include instruction and equipment in the Nana region of Alaska. We hypothesized that the biannual instruction provided in the spring of 2014 would further promote an increase in the activity levels of children living in Shungnak, AK, a village with an affiliation to the NANANordic program. Methods: Children (n=15; 7 males, 8 females) ages 10-15 were recruited from Shungnak (total of 262 residents), Alaska. Multiple variables related to physical activity were monitored using GT3X+ ActiGraph accelerometers. In particular, the accelerometers were worn six days prior to the

coaches' arrival, and four days during the instruction period. The ActiLife v6 software was then used to calculate energy expenditure (algorithm: Freedson VM3 Combination, 2011) and vigor of movement (algorithm: Pulsford Children, 2011). Results: Energy expenditure from physical activity decreased significantly ($p < 0.05$) from a daily mean of 1763 (± 194) to 1472 (± 261) kilocalories. Exercise intensity lessened, with time spent both in sedentary and light activities significantly increasing ($p < 0.01$ and < 0.05 , respectively). There was no significant change in vigorous and moderate activity, nor total step counts. Conclusions: Our data shows that total activity, as well as the intensity of activities, actually decreased or remained the same during the instruction period. This reduction highlights the influence of the overall program on physical activity from a chronic perspective. While we anticipated that the instructional period would increase activity, our findings show that we may have underestimated the chronic influence of the program on overall physical activity.

31. Investigation and Quantification of Water Track Networks in Boreal Regions Using Remote Sensing and Geophysical Data

Uyanga Mendbayar and Debasmita Misra
University of Alaska Fairbanks

When there is a constraining subsurface boundary such as permafrost, clay, and bedrock, surface runoff water forms rudimentary channel networks, known as "water tracks," through the soil. Due to the extensive presence of continuous and discontinuous permafrost in the polar environments, water tracks are the dominant drainage pathways, and impose significant control on the arctic and subarctic hydrology and ecology. Water tracks distribute at least four times more solutes and nutrients than stream flows (Levy et al., 2011), thus are a major hydrological, hydrogeological, and geochemical connectivity in the polar ecosystems. Despite their importance, much of the behavior and characteristics of water tracks remains relatively unexplored (Levy et al., 2011; O'Connell, 2013). Existing literature consists of a small body of studies, mostly focused on the morphological characteristics and physical properties of water tracks. McNamara et al. concluded that water tracks do not possess the characteristics of mature channel networks, and they do not consistently connect to the channels in the valley bottom (1999). Some studies have investigated soil nutrients and geochemical characteristics of water tracks. Recently, Frontier Scientists has commissioned a team of researchers to study the coupled hydrology and biogeochemistry of water tracks in the arctic Alaska (O'Connell, 2013). However, there has yet to be enough interest and funding invested in the investigation of interactions of water tracks with existing infrastructure and new construction. This is a pertinent research need due to the continuing threats that the warming climate is posing on the stability of permafrost and water tracks, and the possible severity of the consequent changes (McNamara et al., 1999). An undergraduate research proposal to investigate water track interactions with a local Goldstream Road in Fairbanks, Alaska was submitted to The Global Change Student Research Grant Competition in February of 2014. It was notified on April 23rd, 2014 that the proposal was approved for a full funding, and the study is scheduled to start in July of 2014. The first objective of this study is to develop a methodology to delineate water tracks in the subarctic using remote sensing imagery. Particularly, it is proposed to remotely extract the water tracks from a drainage network around the Goldstream Road in Fairbanks, Alaska using high-spatial-and-spectral-resolution imagery. Given that the study area is within close proximity and is accessible by road, the field component of the research makes it easier to validate the output map of water track distribution. Water tracks are easier to detect in the Arctic tundra than in the subarctic borealis due to the thick vegetation cover of the taiga. Nonetheless, water tracks can still be observed in the Interior Alaska from Google Earth virtual map as patches of different vegetation types, resulting from their higher moisture content. The main hypothesis to be addressed in this study is to assess if the interception of water tracks and infrastructure intensify the damage to the infrastructure. It is suspected that the shallow-subsurface water movements of water tracks when intercepted by roads or other infrastructure could cause extensive subsidence and may intensify the road damages; the blockage of the water flow by the infrastructure would result in accumulation of water around the intersection, which then would thaw the permafrost beneath the road faster. The approach that will be used to test this hypothesis is by overlaying the output map of water track distribution near the Goldstream road with its ground penetrating radar (GPR) data from a recent study by the Alaska Department of Transportation (AKDOT) in 2012. The GPR data was released by the Principal Investigator of this study, and it contains the data of the depths of permafrost table beneath the road, and the locations of extensive subsidence. In this way, we can investigate the correlation between the water track distribution and areas of severe road damage, from the GPR data, and the local water track distribution map. At the AEG's 2014 annual conference, findings from this study will be presented.

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32. Alaska EPSCoR: Interdisciplinary Research and Outreach Across Alaska

Tom Moran
Alaska EPSCoR

Alaska NSF EPSCoR (The Experimental Program to Stimulate Competitive Research) is a university-state partnership supported by the National Science Foundation and dedicated to building Alaska's research capacity. EPSCoR supports a variety of research, outreach and educational activities, including providing funding for K-12 and university students and for faculty members at all levels and across all UA campuses. The organization's current research project, entitled "Alaskans Adapting to Changing Environments," uses biophysical and social science approaches to examine the mechanisms by which communities adapt to environmental and social change. The project is composed of three regional test cases focused on Berners Bay near Juneau; on communities in the Kenai River watershed; and on the North Slope village of Nuiqsut. These efforts are linked together by a statewide group that coordinates efforts, synthesizes results, and is working to establish a permanent entity to assist with adaptation decision-making in the North. Additionally, Alaska NSF EPSCoR is collaborating with Alaska Upward Bound to administer a program that uses unmanned aerial vehicles as the basis for education efforts at high schools in Bethel, Chefornak, Nikiski, Seward and Shishmaref.

33. Molecular Imaging Capabilities at the University of Alaska Fairbanks

Carl Murphy
University of Alaska Fairbanks

The Molecular Imaging Core at the University of Alaska Fairbanks has two Nuclear Magnetic Resonance (NMR) spectrometers and a 1.5 Tesla Magnetic Resonance Imaging (MRI) spectrometer. These instruments are available for research and education. See (sites.google.com/a/alaska.edu/nmrfacility/) for information about how to access these instruments for courses, pilot or funded research projects. The primary research instrument is a 600 MHz Bruker Avance-III equipped with either a broadband liquids probe or a 1H-13C HR-MAS tissues probe. The broadband probe has been used for experiments over a wide range of elements: 1H, 13C, 15N, 31P, 33S, 51V, 125Te, and 127I. The system also has a 60 position sample changer for automated experiments, and a temperature controller good for 0-100 degrees Celsius. The 300 MHz Varian/Agilent NMR has been the primary NMR instrument for courses for years. The liquids probe is a quad-nucleus probe capable of running 1H, 19F, 13C, and 31P NMR experiments without having to change the probe tuning. Current NMR research endeavors include metabolomics analysis of plasma and tissues in the study of arctic adaptation of both arctic ground squirrels and some species of fish. MRI works on many of the same principles as NMR, but is known best for image acquisition. The Toshiba, 1.5 T Vantage is equipped with a short, 1.4 m Magnet with a 65.5 cm aperture large enough to accommodate black bears, muskox and large dogs. The instrument acquires images of high homogeneity (<2ppm, 50cm FOV) and is capable of multiplanar imaging, direct visualization of arterial anatomy with quantification of blood flow and hydrogen MRS. Current MRI applications include the study of hibernation in black bears and metabolism and diet effects in humans. This work showcases the biomedical research projects going on at UAF. Results are shown for the metabolomics analysis of plasma and tissue, detection of different sugars in beverages, steroid analysis, structural confirmation of novel drug compounds, and, and preliminary images from the MRI.

34. "STEM" Education on the North Slope of Alaska

Linda Nicholas-Figueroa and Rebekah Hare
Ilisagvik College

Alaska Native students residing in "rural" villages are underrepresented in the fields of science, technology, engineering, and math (STEM) and have poor achievement series. Students can learn from local and visiting scientists, scholars, and Elders and can integrate scientific concepts with local heritage, and cultural experiences. The more students can

learn about STEM will help them to become active community members and leaders of a community located in an extreme environment, which now interacts with a growing technological world. Student engagement can be delivered by developing and incorporating place-based science modules with traditional ecological knowledge into local science camps that target different age groups equivalent to grades 7 - 12. In an effort to promote STEM career interests amongst secondary schools on the North Slope, Iḷisaġvik College located in Barrow, AK developed a “STEM” summer science camp. In addition, a partnership was formed with UAF and supporting partners (American Indian Higher Education Consortium, University of Illinois at Urbana-Champaign, and Smithsonian Institution’s National Museum of the American Indian) to develop a second summer science course, “Climate and Permafrost Changes on the North Slope in Cultural Context.” During these camps, local Elders shared their experiences and observations associated with subsistence living and climate change. A pre-assessment and post-assessment using the Student Assessment Learning Gains (SALG) was used as a means to measure the students understanding of the materials, as well as their interests. Information gained from this experience helped the students to develop and enhance their personal understanding of basic science concepts, the significant relationship and impact of changes in their environment on their local villages/ communities, and STEM career opportunities.

35. Modern Utilitarian Ceramic Interpretation of Traditional Northern Native Designs

Kirsten Olson
University of Alaska Fairbanks

My inspiration as a ceramic artist is strongly grounded in anthropology, particularly cultural customs, ceremonies and rituals. I create vessels that enable us to share in a nourishing and intimate interaction, whether it’s drinking coffee, tea, or sharing a meal. Handmade pottery serves as a reminder of the time-honored rituals, processes, and objects that embellish and enrich our daily lives.

36. Potential Bullfrog Homologue to the Chemosensitive Mammalian Retrotrapezoid Nucleus

Mitchell Reed, Kimberly Icceman, Michael Harris, and Barbara Taylor
University of Alaska Fairbanks

Vertebrate breathing is controlled by a highly conserved brainstem neural network. Air breathing is generally driven by elevated CO₂ in body tissues/fluids and is present in all vertebrate classes. Bullfrogs transition from water to air breathing during metamorphosis, and exhibit central CO₂ sensitivity throughout development. In mammals, many sites contribute to this process, and their relative contributions vary according to CO₂/pH level, arousal state, and development. Potential central CO₂ sensors have been extensively investigated and described in mammals but not amphibians. The retrotrapezoid nucleus (RTN) lies on the medullary surface near the facial nucleus and is crucial for chemosensitivity in developing mammals. The locus coeruleus and classical “rostral” and “caudal” medullary chemosensitive regions have been identified in frogs. Furthermore, the “rostral” and “caudal” sites correspond to the locations of the mammalian RTN and Pre-Botzinger Complex, respectively, suggesting potential homology. Immunohistochemical markers for the mammalian RTN include presence of Phox2b transcription factor and vesicular glutamate transporter 2 (VGLUT2), and absence of tyrosine hydroxylase (TH), the enzymatic marker of dopamine synthesis. We tested the hypothesis that a chemosensitive region homologous to the mammalian RTN is present in bullfrog. We identified this area by staining for RTN markers: presence of Phox2b and VGLUT2, and absence of TH. We describe this region in different developmental stages and identify metamorphic changes. We also assessed chemosensitivity of this region with cFos, a marker of neural activity. Establishing this as a homologous chemosensory site between amphibians and mammals provides insight into evolutionary origins of chemosensory development and function.

37. Fatty Acid Nutrition in the Subsistence- and Commercially Harvested California Sea Cucumber (Parastichopus californicus)

Charlotte Regula-whitefield, Sarah Hardy, and Alexandra Oliveira
University of Alaska Fairbanks

Population declines have been observed in the subsistence- and commercially harvested sea cucumber, *Parastichopus californicus*. Causes are unknown, but shifts in diet may play a role. Benthic deposit-feeders like *P. californicus* rely

on phytoplankton detritus. Phytoplankton are important sources of fatty acids (FAs) in marine ecosystems, yet phytoplankton species vary in FA composition. Thus, shifts in phytoplankton community composition resulting from climate-driven changes in oceanographic conditions may cause shifts in FA availability to consumers. FAs are particularly important for reproduction of marine invertebrates, which must supply their eggs with all nutrients required to sustain early embryonic development. Some FAs allocated to eggs cannot be synthesized by animals and must come directly from diet. I am examining the effects of dietary FAs on *P. californicus* reproductive fitness through captive feeding experiments. Body condition and reproductive output were measured in females fed one of two algal diets which differed in FA composition. The results of this work indicate how climate-related shifts in phytoplankton assemblages already observed in the North Pacific may be impacting this sub-Arctic marine resource.

38. Memory on Trial: The Story of Alaska's Deadliest Unsolved Mass Murder

Brittany Retherford
 University of Alaska Fairbanks

The fallibility and malleability of human memory played a confounding and troublesome role in the investigation of the 1982 murder of eight people on a fishing boat (the Investor) at Craig, Alaska, and subsequent trials of Alaska law enforcements' only suspect, John Kenneth Peel. Human memory — including its inherent subjectivity, persistence, and susceptibility to coercion and change — ultimately resulted in an unsatisfactory resolution for victims' families and friends, law enforcement, witnesses, and others associated with the events, investigation and legal proceedings. This thesis utilizes trial records, police investigation files, newspaper stories, and personal interviews to provide a summary view of the events surrounding the murders, including what is known about the murders, as well as, the subsequent investigation that led to the arrest, two civil grand juries, two jury trials, and eventual acquittal of John Kenneth Peel. Limitations of memory are analyzed in the context of this historical narrative, including a focus on eyewitness testimony and collective memory. Together these frayed cords of memory helped ensure that despite the millions of dollars and thousands of hours that have been devoted to it, the 1982 Investor tragedy remains the largest unsolved mass homicide in Alaska history, a cold case that has not been forgotten.

39. Assessing Hydrocarbon Sensitivity and Establishing Baselines of Current Exposure in Marine Birds of the Beaufort and Chukchi Seas

Ann Riddle-Berntsen, Tuula Hollmén, Robert Suydam, and Raphaela Stimmelmayer
 University of Alaska Fairbanks

The Beaufort and Chukchi Seas are important habitat for many marine bird species including those of subsistence importance and conservation concern. With prospects of increasing exploration of oil and gas resources and commercial shipping in the Beaufort and Chukchi seas, establishing baselines and assessing sensitivity of Arctic birds to hydrocarbon exposure will provide essential information needed for management and conservation for species potentially impacted by an oil spill or other sources of pollution. Using a broad selection of marine birds we are using species-specific cell culture to assess hydrocarbon sensitivity by measuring liver cytochrome P450 (CYP1A) activity using 7-ethoxyresorufin-O-deethylase (EROD). Currently, we have tested assay reagents (e.g. dimethyl sulfoxide) for non-specific toxicity and used positive control reference reagents (e.g., chrysene) to establish baseline responses for cell lines in selected arctic marine bird species and a control species (mallard, *Anas platyrhynchos*). EROD responses and cellular cytopathic effects for each species were measured after a reagent dose exposure time of 24 hours. Preliminary results indicate differences in species response to positive control reference reagents. Future laboratory work will expand to more species, dose concentrations, reagents and exposure times to evaluate the degree and duration of CYP1A induction. Additional ongoing work includes establishing baselines of current CYP1A activity in livers from three marine bird species of subsistence importance by validating field sample collection methods and using EROD. King eiders (*Somateria spectabilis*), common eiders (*Somateria mollissima*), and greater white-fronted geese (*Anser albifrons*) will be sampled by direct take or opportunistically from hunters near Barrow, Alaska during spring and fall hunts. Cell culture sensitivity and baseline exposure results from this project will provide valuable tools for monitoring marine bird populations, identifying sensitive species, and provide information for future Natural Resources Damage Assessment in the event of an oil spill.

40. The Importance of Cultural Values in Coping and Hope in Rural Yup'ik Communities

Inna Rivkin, Ellen Lopez, Samuel Johnson, and Eliza Orr
University of Alaska Fairbanks

Alaska Native communities have experienced historical trauma and rapid changes in culture and lifestyle patterns. As a consequence, these populations shoulder a high burden of stress. The Yup'ik Experiences of Stress and Coping Project originated from rural Yup'ik communities' concerns about stress. Its goals were to better understand stress and coping in Yup'ik communities, and the role of cultural values and practices in coping, to inform culturally based interventions. The project was a partnership between the University of Alaska Fairbanks' Center for Alaska Native Health Research and two rural Yup'ik communities in Southwest Alaska. Community guidance and participation was critical throughout the project. Sixty Yup'ik adults ages 18-84 (30 men and 30 women) participated in interviews in which they discussed their experiences of stress and coping, and shared the things that brought them hope and peace. Participants reported considerable trauma, day-to-day stress, and cultural change, including loss of loved ones, suicide, alcohol abuse, family issues, work and money problems. Stress affected not only the individual, but the family and community as well. Many participants discussed the importance of their cultural traditions in coping, including Yup'ik dancing and drumming, subsistence, intergenerational transmission of knowledge, and awareness of one's inter-relationships with others. They discussed turning to family for support, and seeking and following Elders' wisdom and guidance. Participants highlighted the importance of coming together as a community, building connections across generations, and transmitting cultural values for building sense of purpose and identity. People found hope and peace in spirituality, being there for their kids, spending time with family, helping others, and connecting with nature. Findings highlight the continued resilience and evolving strengths of rural Yup'ik communities facing a continually changing cultural landscape.

41. The Use of Digital Storytelling in Community Based Alcohol Abuse Prevention

Inna Rivkin, Ellis Ott, Amy Bollaert, Octavia Harris, Marylisa Huntington, and Spero Manson
University of Alaska Fairbanks

Digital storytelling combines multimedia elements such as music, photos, voice and video to communicate personal messages. Such messages can facilitate expression and empowerment, inform and inspire, raise public awareness, and create transformation. This tool was used by the Fairbanks Prevention Coalition, a coalition to develop and implement plans for an integrated approach to the prevention of alcohol abuse. Our team identifies, promotes, coordinates, and implements community-based prevention programs, pooling knowledge and resources from a variety of community agencies and perspectives to address alcohol abuse. This year, we implemented digital storytelling interventions to reduce alcohol abuse among youth and binge-drinking and alcohol-impaired driving among adults. We will share our experiences and learning from this process. We will also show digital stories created by participants in the digital storytelling interventions. Finally, we will share findings from surveys evaluating audience perceptions and awareness, and discuss how such stories can be used for communicating and addressing important community health issues in Fairbanks and beyond.

42. The Evapotranspiration Cycles in High Latitude Agricultural Field

Watcharee Ruairuen, Gilberto Javier Fochesatto, Elena Sparrow, Mingchu Zhang, and William Schnable
University of Alaska Fairbanks

High latitude regions have been experiencing a rate of warming faster than elsewhere in the world. Agricultural systems in this region are not uncommon and this socio-economic activity is positively trending as global climate change proceeds, lengthening of the growing season, and enabling therefore favorable climatic regime for such economic growth. In Alaska, the predominant ecosystems are Arctic tundra and boreal forests whereas agricultural fields represent only a small fraction (~1%). Nevertheless, agricultural systems are positively trending providing significant possible changes in surface energetics and regional climate consequences. An evaluation of evapotranspiration (ET) cycles was conducted during the two summers (2012 and 2013) in a small subarctic agricultural farm representative of the interior of Alaska region. Results indicated ET played an important role in the energy balance, explaining 70% of net radiation. The cycles of ET verifies a median value more than 60% of the water balance. Evaluation of the energy cycles support evidence that high latitude agricultural systems are consistently an emerging feature in terms of surface-

atmosphere exchange when compared to existing natural Arctic ecosystems. Continuation of change in land-use with climate change favors an increasing agricultural activity. This will introduce a potential latent heat overturning that need to be considered in future climate change assessments.

43. Alaskan Botanicals' Influence on Neuronal Aging

Courtney Scerbak, Elena Vayndorf, Justina Lipscomb, and Barbara Taylor
University of Alaska Fairbanks

Aging is a major risk factor for many life-threatening disorders, including neurodegenerative and cardiovascular disease. Many genetic mutations and environmental factors that increase lifespan are also proposed to postpone these age-related diseases. The overall goal of this project is to examine the role of Alaskan botanicals on the aging nervous system, using the genetically tractable nematode model system, *Caenorhabditis elegans*. We tested the impact of crude extracts from three edible, medicinally beneficial Interior Alaskan botanicals (*Inonotus obliquus* [chaga], *Empetrum nigrum* [crowberry], *Vaccinium uliginosum* [bog blueberry]) on whole animal lifespan and markers of neuronal aging. Specifically, we studied changes in neuronal morphology and function of both mechanosensory and GABAergic motor neurons experienced with age and botanical treatment using fluorescently labeled *C. elegans* strains. We find that these botanicals are able to increase *C. elegans* lifespan, and preliminary results suggest that neuronal morphology and function are also affected. Future work will include a description of the mechanism of action of the tested Alaskan botanicals through extract biochemical composition determination and *in vivo* transcription factor mobility and gene expression assays. Through this botanical screen, we will scientifically validate and underscore the value of ecological resources endemic to the Arctic, elucidate the mechanism of changing neuronal morphology and functionality with age, and, perhaps, establish precedent for novel therapies for neurodegenerative diseases.

44. "We Account the Whale Immortal": Fantasies of Arctic Abundance in Herman Melville's Moby-Dick and Early American Whaling Narratives

Jennifer Schell
University of Alaska Fairbanks

Over the course of the nineteenth-century, the American whaling industry decimated global cetacean populations, hunting some species/subspecies to the verge of extinction and beyond. For some reason, nineteenth-century Americans—both whalers and those who wrote about them—refused to believe that human hunters were responsible for the growing scarcity of whales. My paper accounts for these beliefs by demonstrating that these individuals embraced a set of beliefs that I call "fantasies of arctic abundance." According to these beliefs, the Arctic was filled with an inexhaustible abundance of sea life, ready to be exploited by those humans rugged and determined enough to gain access to it. Although inaccurate and unrealistic, these ideas were quite compelling, especially to those individuals who sought to capitalize on the Arctic's natural resources. Through an analysis of several nineteenth-century whaling narratives, including Herman Melville's *Moby-Dick*, my paper shows that these fantasies began to circulate throughout American culture in the eighteenth and nineteenth centuries. As they did so, they became very popular and persuasive. They prevented Americans from understanding the impact of hunting on arctic cetacean populations, and they affected the way Americans thought about the sustainability of polar sea life. This, in turn, helps to explain why Americans did not become concerned about the potential extinction of cetaceans until the early twentieth century. By that time, whale populations had diminished so much that, for the most part, the American whale fishery was no longer an economically viable enterprise.

45. Creating Understanding through Public Performance: The Icon of Salmon as a Commonality for Alaska's Physical and Occupational Communities

Emilie Springer
University of Alaska Fairbanks

Salmon is a species with iconic significance across the state of Alaska with importance in subsistence, commercial and sport associations. Despite contemporary regional conflicts in policy transitions as a result of environmental concerns

such as the decline of Chinook salmon, there is a commonality across all user groups regarding the significance of the animal as a cultural feature. In dissertation research related to oral history in the Copper River commercial salmon fisheries, I'm developing a unexpected finding of communication opportunities in public, theatrical performances of local stories related to history and memories of salmon. This venue removes the dialogue from a direct informant and allows me to make the story independent from the original teller. The words, in my voice, allow audience members to provide feedback or argument in post-performance discussion sessions that help bring out both differences and similarities in political issues without necessarily staging biased testimony. Performance seems to offer a mediated venue for discussion which could be useful in informing policy makers about combined community interests in many of fields of debate related to Arctic issues and elsewhere in the state.

46. The Science Acceleration Strategy (SAS) for Research and Education

Derek Starkenurg, Laura Carsten Conner, Yekaterina Kontar, Anupma Prakash, and Gilberto Fochesatto
University of Alaska Fairbanks, Geophysical Institute

Here, we present sample illustrations, a 3D printed model, and a sample textbook page demonstrating the quality and capacity of materials that are being developed as a part of the Science Acceleration Strategy (SAS). SAS, initiated at the University of Alaska Fairbanks (UAF) from the merging of architectural skill sets with the processes of meteorology, will develop a series of innovative textbooks and an online repository of richly cued peer-reviewed diagrams and tangible 3D models to augment science education and outreach at all levels. The other facet of SAS will be a series of on-going workshops which use SAS materials to assist the imminent need for many businesses outside of science to understand climate processes and climate change in a more personal way that is dynamically integrated into their professional practices. Developing posters and graphics for presentations will also be a service of SAS, which should convolve the expertise of artists and crafts persons with the rigors of math and science to provide educational materials of unprecedented pedagogy and creativity. SAS responds in a timely manner to the urgent need for science education to adapt a leaner-involved approach that stimulates engagement and inquiry to achieve a layered and intuitive understanding of processes [McFarlane, 2013; Ainsworth et al., 2011; Hubber et al., 2010]. For young children, drawing is critical for attaining ownership of complex topics [Barraza, 1999]; it is also a universal language that transcends age and culture [Chambers, 1983], and thus has potential for attracting previously underrepresented groups to science. SAS will capitalize on this, bringing groundbreaking visualization materials to all ages. SAS materials are intended to serve a wide range of science outreach capacities, including for instance grants like those from the U.S. Department of Agriculture intended to provide curricula design coupled with student and staff training in the representation of geographical information. Learning software such as geographic information systems (GIS) expands students' and teachers' repertoires for conveying illustrative representations of their research in a form better suited for enhanced understanding by many audiences, both those in science and also policy decision makers. SAS will serve as an engine for taking novel results from such workshops like the recent DESU-GIS program held at UAF in 2013, and using them to develop high-end illustrations, and also 3D printable models, that will be available online for future workshops to use as tools for motivation and teaching.

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47. Art and Adaptation: How Creative Practice Enhances our Capacity to Navigate an Uncertain Future

Perrin Teal-Sullivan
University of Alaska Fairbanks

The arts develop our ability to operate nimbly and with confidence at the ever-shifting threshold between the known and unknown. In the process of creation we evaluate the present state and take action towards an ideal future state, over and over, constantly moving "what is" towards "what could be". Regardless of the work produced along the way, the

skills that we hone through such practice enhance our ability to successfully navigate an uncertain future in a rapidly changing world.

48. Promoting STEM Education among Elementary Students in Rural & Remote Urban Alaska Communities

Molly Tedesche

University of Alaska Fairbanks, International Arctic Research Center

Many elementary schools in the United States are not adequately preparing students for higher education science content, and in turn, for careers in science, technology, engineering, and math (STEM) disciplines. This may be especially true for underserved populations of students in rural and remote urban communities, such as those found in Alaska. Title I schools in urban Alaska, as well as some schools in rural Alaskan villages, might lack the resources necessary to reinforce foundational STEM concepts to students during the most formative years of their education. Also, conventional methods of elementary science education may be less effective for students with unique cultural backgrounds or for those living with fewer resources than their peers, as are many young students in remote arctic regions of the world, including in Alaska. As both a volunteer for the Girl Scouts of Alaska Rural Southwest program, as well as a CASE GK-12 (Changing Alaska Science Education) Fellowship recipient, I have worked to bring more science into classrooms, and more interest into the sciences, in both urban Alaska (Fairbanks), as well as in more rural settings in the YK Delta (Yukon-Kuskokwim) region of Alaska. I have found that using an interdisciplinary approach to the STEM disciplines, by integrating art, social science, traditional knowledge, and writing into lessons can often be an effective way to engage students and show them how science applies to their everyday lives, to their local communities, and to their environment. As a hydrologist, I have worked to teach the unique importance of water and climate for the people of Alaska to my young students, and they have taught me the importance of applying such knowledge to local issues and culture. I have done science learning activities with elementary school students that involve weather, hydrology, botany, physics, soil science, as well as field studies. A deeper understanding of the basics of math, physics, and natural science, as well as developing a passion for science, will help young students discover answers to questions about the world around them, as well as help them adapt to the changing social and natural environments of the Arctic and Alaska, in particular. Also, it is important to build confidence in young students, as well as develop critical thinking and leadership skills, so that they can be advocates for themselves and for their communities in the ever changing Arctic region of the world. It is my intent that these science education outreach activities will contribute in a small way to building the resiliency of young Alaskan students through education in the STEM disciplines.

49. Koval: Evaluation of Ursolic Acid from Vaccinium ovalifolium on Human Immunodeficiency Virus-1 Glycoprotein 120 Viral Ineffectivity

Mikes: Testing Primer Sets to Target Prey DNA in Lethenteron camtschaticum Stomach Contents

Roman: Identification and Phylogenetic Analysis of White Rot Fungi from Alaska

Rureup: Identification of Biodelignification Functional Groups in Pleurotus spa

Acord: Developing a New Detection Method for Adenosine: A Study Focused on Reaction Kinetics

Denise Wartes, David Koval, Monica Mikes, Melea Roman, Ronin Rueru, and Ruby Acord

University of Alaska Fairbanks, Rural Alaska Honors Institute (RAHI)

These five high school students participated in the six-week 2015 Rural Alaska Honors Institute Research Program. The five posters are a culmination of their efforts, as guided by UAF researchers. Should these RAHI students be considered to present their posters, I can contact each one individually to obtain an abstract for each poster.

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