



UNIVERSITY  
of ALASKA  
*Many Traditions One Alaska*

**UA Research Update: Statewide Programs and UAF  
for the UA Board of Regents, Academic and Student Affairs Committee  
April 2014**



*Members of the 2013 IARC NABOS and Summer School collaborative expedition to the Arctic Ocean. (Photo by I. Colfescu)*

This report is provided as an update to the “Research in the UA System” report, which was presented to the Academic and Student Affairs Committee of the UA Board of Regents in December, 2012. The reporting cycle for this quantitative research performance assessment, including peer comparisons, is two years, so the next full report will be presented in April 2015.

## **I. University of Alaska-Wide Programs**

### **Alaska National Science Foundation (NSF) EPSCoR**

The Experimental Program to Stimulate competitive Research ([EPSCoR](#)) is a nationwide research funding program administered by the National Science Foundation. States and territories which in recent years have received less than 0.75% of the NSF's total national funding are eligible for EPSCoR funding. Alaska NSF EPSCoR funds basic university research and supports public education and outreach efforts. The organization is based at UAF and includes efforts at all main University of Alaska campuses and at rural and community campuses. Alaska NSF EPSCoR has been funded by the National Science Foundation since 2001 and is midway through the second year of its fourth “Track-1” award. The five-year award (2012-2017) is funded at \$4 million a year from the NSF plus an \$800,000 state match. The current Track-1 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. During year one of the project (2012-13), EPSCoR researchers focused on identifying and recruiting local partners; deploying localized systems of biophysical sensors to supplement and enhance existing networks; collecting initial data; and creating a comprehensive system for data storage and access. In year two (2013-14) biophysical data collection is being coordinated with a ramp-up of social science activity, as research teams conduct community interviews and surveys to better understand how people perceive changes to their environments.

In September, members of the NSF EPSCoR leadership team conducted a successful presentation to a National Science Foundation review panel. The team received positive feedback and several follow-up questions that have since been addressed and submitted for review. Subsequently, the team met in Anchorage with a pair of external review panels - an External Experts Advisory Council and a Program Advisory Committee - to discuss the progress of the overall program and the continued evolution of the conceptual framework that guides EPSCoR research. Finally, Alaska NSF EPSCoR hosted a meeting in conjunction with the Sustainable Development Working Group of the international Arctic Council to discuss future connections between the science of Alaska EPSCoR and a large-scale community data portal under development by the Council.

Additionally, Alaska NSF EPSCoR recently received a 3-year (2014-16), \$750,000 “Track-3” award in partnership with Alaska Upward Bound and the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI); the award funds a program to use unmanned aerial vehicles as the basis for education efforts at high schools in Bethel, Nikiski, Seward, and Shishmaref. Also, in January Alaska NSF EPSCoR collaborated with Montana NSF EPSCoR to submit a 3-year, \$6 million (\$3 million per state)



“Track-2” proposal to the NSF. If funded, the project would use case studies of communities on the Yellowstone and Yukon rivers to examine and quantify the difference between instrument-measured environmental change and people’s perceptions of it.

### **Alaska Department of Energy (DOE) EPSCoR**

Alaska’s DOE EPSCoR program has been funded since 2010 and is just beginning a 2-year renewal phase titled *‘Sustainable Village Energy: Integration of Renewable and Diesel Systems to Improve Energy Self-Reliance for Remote Rural Alaska Communities’*. This program focuses primarily on engineering challenges associated with rural power systems and integrating intermittent renewables into a diesel microgrid, including power stability, energy storage, and advanced control strategies. With a new energy laboratory at UAF capable of recreating an entire village energy grid, we are able to address these challenges not only in isolation or through modeling, but also through full-power and real-world testing and analysis. DOE EPSCoR is managed through the Alaska Center for Energy and Power (ACEP, UAF). The current program includes participants from ACEP, the Institute of Northern Engineering (INE, UAF), the Institute of Social and Economic Research (ISER, UAA), and the School of Engineering (SOE, UAA). Results from the program to date include:

- Data Management: First systematic and comprehensive effort to manage and make readily accessible Alaska energy data through the Alaska Energy Data Gateway. This work, which is a joint effort between ISER and ACEP, is now being expanded and is receiving long-term funding support from the Alaska Energy Authority.
- Product and systems testing: As an outcome of DOE EPSCoR, ACEP has received several additional contracts to test and develop energy products and systems in collaboration with private industry. Examples include several industrial battery systems, new inverter technology, and a high performance flywheel. This is resulting in substantial investment in UAF and Alaska by developers and manufacturers.
- To date, DOE EPSCoR has supported 14 students, mostly at the MS and PhD level. It has also funded 8 early career faculty members, and several visiting researchers that have helped build an internationally recognized research program. In addition, UA researchers involved with EPSCoR have visited, collaborated, and conducted research with over 40 communities and 35 industry partners throughout the state.

### **Alaska NASA EPSCoR**

In the past year Alaska NASA EPSCoR completed the previous 5-year research infrastructure development (RID) grant (\$700k NASA, \$350k cash match UAF, \$300k in-kind match). The previous RID grant supported 19 faculty through one-year seed grants, which resulted in 19 peer reviewed articles, 20 published conference proceedings, 24 conference presentations, and 1 patent application. We supported the submission of 10 NASA EPSCoR 3-year research (CAN) proposals, of which 4 were awarded (3 to UAF, 1 to UAA). Two of the funded CAN’s were developed out of RID one-year seed grants. A total of, 31 proposals were submitted for follow-on research of which 13 were funded (a 42% success rate) with an economic impact to the state of \$5,349,190. Note that the follow-on funded proposals amount to a 16-fold return on cash investment!

In 2013 Alaska NASA EPSCoR Program was awarded a new 3-year RID grant (\$375k). This grant focuses on supporting Alaska’s Science and Technology Research Priorities and NASA’s strategic Goals by growing research in the following three areas: (i) Earth System Science; (ii) Technologies for Space and Extreme Environments; and (iii) Aeronautics Research.

## **National Institutes of Health programs: IDeA Network for Biomedical Research Excellence (Alaska INBRE)**

The goals of Alaska INBRE are to expand the capacity of Alaskan researchers to conduct biomedical research appropriate to Alaska. INBRE funds the development of biomedical professionals through support for university researchers, focusing on environmental agents of disease and basic cellular biology, and also supports active outreach and K-12 education efforts. INBRE is based at UAF and works at all three main UA campuses.

INBRE is in the final year of a five-year, \$12.5 million NIH award, its third such award. The current award focuses on the impacts of climate change on contaminant transport and the emergence and movements of infectious pathogens at high latitudes. This includes research into molecular toxicology of subsistence species, infectious agents, zoonotic disease, and the cellular and molecular bases of disease. The Alaska INBRE network links UA biomedical research to state-wide concerns about environmental agents and disease and to translational and clinical applications. The central questions include: 1) What agents are threats to health? 2) Where are these agents and how are they dispersed? 3) How do they inflict damage? 4) What are the cellular and molecular defenses to stress and to insults from the environment? 5) How can this knowledge inform and guide local medical and public health practices in Alaska? 6) How can our Alaska experience provide models for other sites in the nation and in the circumpolar north and in the seven other Arctic nations?

UA researchers submitted a proposal for a further five-year period of NIH funding in June 2013. That proposal is still under review, but a decision is anticipated soon.

## **II. University of Alaska Fairbanks Research**

### **Overview**

UAF is a nationally ranked research university. UAF's research is largely federally funded (rather than funded by state or local government or private sources), and it ranks #106 overall and #69 among public universities on that measure (*The Top American Research Universities*, 2012 Annual Report, The Center for Measuring University Performance, Arizona State University and the University of Massachusetts, Amherst). There are a total of about 740 U.S. colleges and universities that receive some level of federal research funding, so UAF is in the top 15% of that group. UAF is a RU/H institution (Research University, High Research Activity) according to the widely recognized Carnegie Classification of colleges and universities (<http://classifications.carnegiefoundation.org/>). For comparison UAA is classified (based on 2008-2010 data, before they began granting doctorates) as Master's L: Master's Colleges and Universities (larger programs), and UAS is classified as Master's S: Master's Colleges and Universities (smaller programs).

UAF's research focus is on Alaska and the circumpolar north. UAF is the world leader in both Alaska and arctic research, in terms of publications and citations of those publications (See "America's Arctic Experts: The University of Alaska Fairbanks", report to the UA Board of Regents, January, 2014). Publications are a commonly used indicator of research productivity, as well as being the primary means of communicating research findings to the scientific community. From 2011 through 2013, UAF led all other single institutions (universities, research institutes and government laboratories) in the number of



arctic publications, with 380 total. UAF also led all single institutions in citations to its arctic publications, with more than 1,800 in the past three years. UAF not only publishes more arctic research than other institutions, but that research is used by other scientists to inform their work.

Supporting these rankings and classifications, UAF has a vibrant and diverse research enterprise. This can be seen from the list of “Top Fifty” recent research grant and contract awards on the following pages. These include projects of immediate practical interest to Alaskans, such as those seeking to develop affordable energy solutions for rural communities, discover the reasons for declining returns of Chinook salmon, or study potential treatment approaches for the sulfolane contaminated groundwaters in the North Pole area. There are also many cutting edge research projects that advance fundamental knowledge in areas such as the interactions between the nervous system and metabolism of hibernating ground squirrels; foraging and paleoenvironments at the Upward Sun River (Xaasaa Na'), a terminal Pleistocene archaeological site in central Alaska; or atmospheric turbulence in the mesosphere-lower thermosphere. UAF has particular strengths and opportunities in interdisciplinary research, for example, research on water energy, and food security in the north, which aims to build community capacity for sustainable futures. Altogether, UAF has 269 new research funding awards since Dec. 2012. UAF researchers had a total of 730 publications indexed by Science Citation Index in 2013, a 19% increase over the number in 2012.

UAF restricted research expenditures for FY13 totaled \$114,487,748 (See section III). UAF research continues to be supported by a variety of federal, state, and private industry and foundation sources. As has been true for many years, the National Science Foundation (NSF) is the largest single source. The National Aeronautics and Space Administration (NASA), the U.S. Department of Interior (including the National Park Service, the U.S. Geological Survey, and the Bureau of Ocean Energy Management), and State of Alaska agencies plus capital research appropriations each provided more than \$10 million in funding. Private business and industry is an increasing funding source, accounting for 7.6% of research expenditures in FY13.

UAF has experienced an \$8 million (6.6%) decline in restricted research expenditures (including ICR) since the peak of \$122 million in FY11. This is predominantly due to the loss of Department of Defense funding of the Arctic Region Supercomputing Center, which had restricted expenditures of \$9.2 million in FY11, but only \$2.1 million in FY13. The capital research expenditures that peaked in FY09 at \$4 million were associated with the stimulus funding that was temporarily available under the American Recovery and Reinvestment Act (ARRA). The funds shown in the graph do not include the large ARRA capital award associated with the construction of the *R/V Sikuliaq*, but rather only the funds that were used similarly to operating funds, to support research projects.

For the next several years, funding is likely to be a pressing constraint on UAF research. Non-ICR unrestricted funding of research has increased at an average of about 3.7%/year for the past five years, which mainly represents the increased costs of salaries and benefits. A specific financial challenge is that it appears that we will need to reallocate internally to meet the \$500K/year match commitment for operations of the *R/V Sikuliaq*. UAF faculty secure about 1.7X more research grant and contract \$ per capita than the average of faculty at UAF's peer institutions (Research in the UA System, report presented to the UA Board of Regents in December 2012). It will be difficult to maintain the level of research expenditures if the UAF budget and faculty numbers shrink, as appears likely. UAF research space is currently at capacity, especially in the field of engineering and the Alaska Center for Energy and Power. This could lead to difficulty in accommodating funded research if a major building, such as the

Elvey Building, must be closed for renovations. Many of UAF's major research facilities are in the 25-50 year age range where major renovations are needed.

Yet, there are many opportunities for UAF ahead. The arctic is a national research focus, both because of the likely major impacts of climate change and its increasing strategic importance as the polar ice cap retreats. The major U.S. investment in the ice-capable research vessel, *R/V Sikuliaq*, will provide a platform for a wide range of research programs in the western arctic. National funding agencies increasingly direct their funding toward interdisciplinary research, particularly in areas like impacts of climate change in northern communities. The State of Alaska has been willing to make operating and capital investments in research areas that have important payoffs for Alaska, such as energy, unmanned aerial vehicles, and fisheries, including impacts of ocean acidification. UAF intends to invest as much as possible in our areas of research strength, to remain competitive at the national level for research funding and to provide the knowledge that Alaskans need for community and economic development.

### **Recent Developments (since the December 2012 Research Report)**

#### ***New Research Centers:***

**The Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)** is a research center at the University of Alaska, Fairbanks for small, unmanned aircraft systems, providing integration of unique payloads and supporting pathfinder missions within government and science communities, with a special emphasis on the Arctic region. It was approved by the UA Board of Regents in December 2012. In December 2013 the Federal Aviation Administration (FAA) announced that the University of Alaska will serve as one of six official unmanned aircraft system test sites. The Pan-Pacific UAS Test Range Complex will be managed by the University of Alaska Fairbanks and includes partners in Oregon and Hawaii. The complex, with its diversity in landscapes and climates, will allow equipment to be tested in the Arctic, the tropics and arid environments.

The UA Board of Regents approved the **Center for the Study of Security, Hazards, Response and Preparedness (C-SSHRP)** in September 2013. C-SSHRP is housed within the School of Management and works in partnership with the College of Natural Science and Mathematics (CNSM), Geophysical Institute (GI) and the International Arctic Research Center (IARC). C-SSHRP aims to create new knowledge that reduces uncertainty in decision making, provide world leading education and research opportunities, train the next generation of emergency managers, responders and policy makers, and improve resilience should a disaster occur.

#### ***Major Research Accomplishments during the Past 18 Months:***

Only a few selected examples can be provided here. Each year UAF has close to 1000 active research grants or contracts, and many faculty engage in research and creative activity without external funding. The following are brief descriptions of some important activities and accomplishments.

#### **College of Liberal Arts**

Associate Professor Dr. Ben Potter of Anthropology and Archaeology received a National Science Foundation grant in the amount of \$706,029 for the project titled, "Exploring Intrasite Variability at Upward Sun River (Xaasaa Na')". This project includes summer archaeological field school to train technicians. Political Science Professor Amy Lovcraft, IARC researchers Hajo Eiken and John Walsh



received \$954,290K from the National Science Foundation for their project, "The North Slope Arctic Scenarios Project (NASP): Envisioning Desirable Futures and Strategizing Pathways for Sustainable Health Communities". In July 2013 Anthropology Professor David Koester received over \$100K from the National Science Foundation for his work on the "Comprehensive Itelmen Dictionary".

CLA creative activities highlights include:

- BFA Student, Ian Wilkinson Exhibition titled, "Spheres of Influence". He sold 1,200 bowls that he crafted and raised \$35,000 for the Fairbanks Food Bank in April 2013.
- Annie Duffy, Art faculty member, was awarded the 2013 Rasmuson Individual Artist Fellowship.
- Art Professor David Mollett and Jessie Hedden created a stained glass installation, a Percent for Art commission, for the Margaret Murie Life Sciences Building.
- History Assistant Professor, Diane Di Stefano's book, "Encounters in Avalanche Country: A History of Survival in the Mountain West, 1820-1920" was published by University of Washington Press.
- Assistant Professor of English, Dr. Jennifer Schell published her book, "A Bold and Hardy Race of Men".
- Dr. Morris Palter, Music, performed at the Open Ears Festival in Kitchener/Waterloo and with the percussion section of the Toronto Symphony Orchestra in January and March 2013.
- Associate Professor of Music and soprano, Jaunelle Celaire, gave a recital and public master class on Negro Spirituals at the University of Manitoba Winnipeg, Canada, and performed at the Guest Faculty Recital at Texas A&M University (Amarillo) in March 2013.
- Maya Salganek, Film Studies Director, produced a theatre and full-length feature film production in Fairbanks during summer 2013: "Mining for Ruby", in association with Lock & Monkey Productions. This was partially supported by a State of Alaska, Film Reel Alaska Mentoring Experience (FRAME) grant.

#### Geophysical Institute and College of Natural Science and Mathematics

- Poker Flat Research Range (PFRR) launched two sounding rocket experiments to investigate physical processes in the aurora. Mark Conde successfully launched a small rocket from PFRR to provide risk reduction for future NASA and NSF sounding rocket and satellite payloads. This new technology is owned by the GI.
- The Alaska Satellite Facility (ASF) signed a 5-year renewal contract with NASA for satellite downlink and data processing and signed a contract with Planet Labs to downlink data from their polar orbiting nanosatellites. In addition, ASF received a \$3.4M gift of a 9m satellite dish.
- Bill Bristow of the Space Physics and Aeronomy Group completed installation of a NSF Superdarn radar array at the South Pole.
- The Snow, Ice and Permafrost Group (with IARC) worked with the National Research Council of the National Academies to hold a workshop on "Opportunities to use Remote Sensing in Understanding Permafrost Related Ecological Characteristics".
- The GI worked with the National Research Council of the National Academies on a workshop entitled "Opportunities for High-Power High Frequency Transmitters to Advance Ionospheric/Thermospheric Research", in support of the HAARP facility in Alaska.
- The Alaska Earthquake Center (ACE) and the Seismology Group received funding from the NSF EarthScope Project to provide technical assistance and outreach for a massive effort to install ~250 new seismic stations across Alaska.
- The Seismology Group hosted the largest Seismology conference ever held in Fairbanks.

- A collaboration between UAF, DGGs, and Apache Corporation was established in order to share Apache-collected seismic data in Cook Inlet. The Cook Inlet data set is collected at an unprecedented high resolution scale and provides a new opportunity for investigating earthquake processes and earth structure in Alaska.

#### Institute of Arctic Biology and College of Natural Science and Mathematics

Suicide prevention in Alaska Native communities through community-based participatory research, improving food security and diet quality for Alaskans using a fisheries-to-schools approach, and seeking better understanding of the movement of sulfolane contamination in North Pole groundwater formed a significant and important cluster of Alaska-centric research projects by Institute of Arctic Biology scientists in 2013 - 2014. The suicide prevention project is led by IAB and Center for Alaska Native Health Research Assistant Professor Dr. Stacy Rasmus, who along with community co-researchers Billy Charles and Tara Ford, was invited by the Alaska legislature to present their research in Juneau in February 2014. A KTVA news story reported on their research and presentation:

<http://www.ktva.com/culture-and-tradition-the-antidote-to-suicide/> . The fisheries-to-schools USDA funded project, which seeks to incorporate high quality, culturally important foods into school meals, is led by IAB and CANHR Assistant Professor Dr. Andrea Bersamin in collaboration with UAF Cooperative Extension Service faculty member Dr. Bret Luick, Marine Advisory Program faculty member Dr. Quentin Fong, and researchers from Portland State University (OR) and Morrisville State College (NY). IAB Associate Professor Dr. Mary Beth Leigh is a co-investigator on the project investigating the movement and biodegradation potential of sulfolane contamination in North Pole groundwater, which is led by UAF Institute of Northern Engineering scientist Dr. David Barnes. Drs. Leigh and Barnes were invited to present their findings at the Fairbanks Economic Development Corporation in March 2014 and presented at a UAF URSA seminar in February 2014. Seminar video: <http://bit.ly/sulfolane>

The University of Alaska Fairbanks Toolik Field Station (TFS) is located in the northern foothills of the Brooks Range, 254 km north of the Arctic Circle and adjacent to the Dalton Highway. TFS is managed and operated year-round by IAB and provides housing, meals, laboratory and science support for the research and education programs of 300-400 scientists and students each year. The National Science Foundation has been funding a major capital improvement program. It includes a combination of housing, science and support facilities. Work began in summer 2013 and it is anticipated that funding will be provided over a two to four year period. Several years ago, TFS was selected as a core site for the National Ecological Observatory Network and there is a need for additional facilities for that research.

The \$107 million Margaret Murie Building was completed in April, 2013 and officially dedicated in August. The state-of-the-art, energy-efficient, 100,000-square-foot structure integrates research labs and classrooms into a single building. Both biology faculty researchers and the nearly 600 graduate and undergraduate students in biological sciences now have modern facilities that are well-suited to using modern approaches and technologies, in a field that has undergone revolutionary change in the past 40 years.

#### Institute of Northern Engineering and College of Engineering and Mines

The Alaska Center for Energy and Power (ACEP) Pilgrim project was active in fall 2013 and continued through the winter. Pilgrim Hot Springs, located 60 miles northeast of Nome, is the hottest resource in the state not directly associated with a volcanic system. It has a long history of local use, and is currently



listed on the national historic register. This project involves testing an innovative remote sensing technique developed by researchers at UAF's Geophysical Institute. This technique, based on aerial infrared imaging, was originally used to map underground coal fires and subsurface movement of magma. However, by creating an accurate estimate of the natural heat flux at the surface, it also has the potential to significantly reduce the cost of geothermal exploration, especially in inaccessible areas. <http://acep.uaf.edu/projects/pilgrim-hot-springs-geothermal-assessment.aspx>

Hatch Associates Consultants, Inc., and Oceana Energy Company have both contracted to test new technologies in ACEP laboratories. These are both examples of private sector testing in University labs. Hatch will be testing a fly-wheel energy storage device in the Power Systems Integration Lab and Oceana will be testing a hydrokinetic device in the Alaska Hydrokinetic Energy Center test facility in Nenana, Alaska.

Current research also includes:

- UAF overwhelmed the competition in the National Science Foundation Arctic SEES (Science, Engineering, and Education for Sustainability) program recent funding opportunity. UAF received the majority of the awards made; two of those went to researchers with the Water and Environmental Research Center of INE.
- A team led by University of Alaska Fairbanks scientists, including Nicole Misarti of the Water and Environmental Research Center and Link Olson of the University of Alaska Museum of the North, has been awarded a \$1.7 million National Science Foundation grant to study long-term and ongoing population trends in the Pacific walrus. The project brings together scientists with expertise in genetics, archeology, chemistry, ecology and ethnohistory. Thousands of walrus samples, some thousands of years old, housed at the University of Alaska Museum of the North are a key resource for this work.
- Yuri Shur of the Civil & Environmental Engineering department and Donald Walker (IAB) are working on a project titled "Cumulative Effects of Arctic Oil Development – Planning and Designing Sustainability." Developing arctic oil and gas resources requires extensive infrastructure. The cumulative environmental and social effects of that are difficult to assess and predict, but this project aims to improve that situation.
- Jenny Liu with the Alaska University Transportation Center was awarded the RITA Grant for \$3 million over two years. UAF is partnered with Montana State University and Washington State University. The goal is "to systematically engineer environmentally sustainable transportation infrastructures in cold climates, considering the entire life cycle of transportation planning, design, materials selection, construction, maintenance and operations, preservation, and recycling through the collaboration of academia, industry and other stakeholders."
- The Petroleum Development Laboratory (PDL) established a state-of-the-art oil, gas and geothermal well cementing technology testing facility. This \$300,000 facility was paid for by a grant from the US Department of Energy (2010-2013). The project leads are Santanu Khatanar, Shirish Patil, Abhijit Dandekar, and Matthew Bray.
- A non-disclosure agreement was signed with ConocoPhillips for conducting permafrost subsidence research. A \$300K ConocoPhillips donation will be used to jump start this research by Shirish Patil, Abhijit Dandekar, Yuri Shur, and Matthew Bray.
- Mohabbat Ahmadi and Dare Awoleke of PDL secured a grant from the Alaska Department of Natural Resources for research in shale oil and gas development.

## International Arctic Research Center

IARC scientists have produced a new Digital Sea Ice Atlas, covering 160 years of historical data. A web-based interactive map, the first of its kind, the atlas allows users to simultaneously view multiple sources of historical sea ice data in the Beaufort, Chukchi and Bering seas. With funding from the Alaska Ocean Observing System, IARC's John Walsh and Sarah Trainor (IARC/ACCAP) worked in partnership with the National Snow and Ice Data Center and the University of Illinois at Urbana-Champaign. IARC's Scenarios Network for Alaska and Arctic Planning maintains the data behind the sea ice atlas. The atlas uniquely provides digitized historical sea ice data compiled from more than 10 sources, including the satellite record (1979 to present), various U.S. Navy and National Ice Center compilations (1950s to 1990s), Canadian records (1950s to 1980s), Danish and Norwegian ship records (mid-1800s to 1970s), and whaling ship reports (1850 to 1900).

IARC Nansen and Amundsen Basin Observational System (NABOS) researchers and IARC Summer School participants spent a month aboard the Russian research vessel *Akademik Fedorov* in the Arctic Ocean during late summer 2013, enabled by funding from the National Science Foundation. Every year since 2002, the NABOS researchers conducted expeditions in the Arctic Ocean, deploying buoys and moorings to record year-round observations that have since been used in oceanographic, atmospheric, ice, biological, and geochemical studies.

Other accomplishments, in brief, include:

- A new study published in *Nature Geoscience* (Nov. 2013) shows that large amounts of methane, more than twice the amount previously estimated, are escaping the East Siberian Shelf in the Arctic Ocean. The research was conducted by an international team of scientists including the lead author Natalia Shakhova and Igor Semiletov, both of IARC.
- For the first time since the 1980s the State of Alaska has started to successfully tackle creating updated and consistent maps for Alaska, and IARC's Geographic Information Network of Alaska (GINA) is a key collaborator in this effort.
- The Geographic Information Network of Alaska (GINA) has launched Puffin Feeder. This is a website where anyone can access near real-time Arctic webcam, radar, GeoTIFF, and MODIS imagery.
- A special issue, entitled "JAMSTEC-IARC international collaboration enhancing understanding of the Arctic climate system," a compilation of selected research conducted in the past five years, was published in the journal *Polar Science* 7, 2013.
- IARC's research unit, the Scenarios Network for Alaska & Arctic Planning (SNAP), has released a new set of historical and projected research data developed for a broad scale model coupling project, the Integrated Ecosystem Model for Alaska and Northwest Canada.
- Sixteen IARC researchers and one IARC affiliate contributed to The United States National Climate Assessment: Alaska Technical Regional Report (released by the U.S. Geological Survey), one of eight regional reports that will provide input to the 2013 National Climate Assessment.

## School of Fisheries and Ocean Sciences

SFOS faculty published 97 research papers for calendar year 2013 and their research was supported by over 300 active research grants from a multitude of local, regional, and national funding agencies. In addition to the research papers, faculty published books including: *Fishing Peoples of the North*, by Courtney Carothers, Keith Criddle, and Paula Cullenberg; *King Crabs of the World*, by Gordon Kruse and Stephen Jewett, and *Fisheries Techniques*, by Trent Sutton. Stephen Okkonen made a film about



oceanography and bowhead whales, and Andres Lopez digitized the invertebrate photo and data collections at the University of Alaska Museum of the North. SFOS researchers remain very involved in international partnerships, collaborations and working groups, including: Ecosystem Studies of Subarctic Seas, co-chair Franz Mueter; International study of trace elements in the ocean (GEOTRACES), Ana Aguilar-Islas; Arctic Council Circumpolar Biodiversity Monitoring Program, Plankton Network, Russell Hopcroft; and IASC International Arctic Science Committee Marine Working Group, Rolf Gradinger. Five SFOS faculty received awards at the annual Alaska Marine Science Gala, Alaska SeaLife Center: 2013 – Katrin Iken, Brenda Konar, Bodil Bluhm and Russell Hopcroft. For Arctic Marine Life Bio-Diversity; 2014 – Tom Weingartner for Arctic Oceanography.

SFOS research has considerable relevance to industries. For example, SFOS researchers are conducting studies of ocean circulation that will help in the containment and cleanup of any future oil spills, ecological impacts of nearshore oil development in the Arctic, and environmental impacts in the near shore environment off Nome. Industry funds some of the research, and the Pollock Conservation Cooperative research support exceeds \$13 million. Also, an SFOS researcher, Alex Oliveira, recently developed commercial products, nutraceutical pollock oil supplements and salmon-based pet treats.

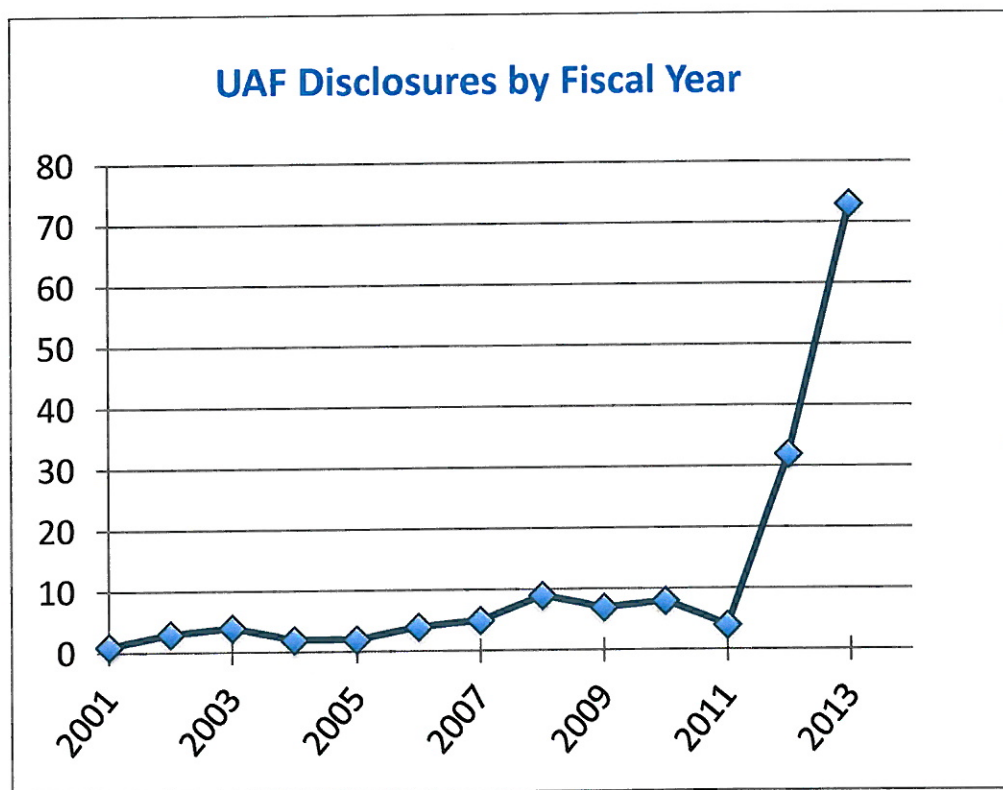
The ice-capable research vessel *R/V Sikuliaq*, which was launched in Marinette, Wisconsin in October, 2012, was completed and outfitted over the past year and has been undergoing acceptance trials for the past month. Many aspects of the vessel have operated very well, but unfortunately the A-frame failed during load testing and will require replacement. Also, one of the Z-drives failed and that will require a return to dry dock. We are looking forward to the arrival of the *Sikuliaq* in Alaska in 2015, following the necessary repairs and sea trials.

#### School of Natural Resources and Extension

- The Boreal Alaska — Learning, Adaptation and Production (BAKLAP) project researchers, led by Professor Glenn Juday, are studying the value of Alaska's forests in meeting the demand for wood biomass energy in a changing environment. An outreach component is developing and implementing model K-12 curriculum based on hands-on inquiry learning about the Alaska boreal forest through science and art.
- Professor Pat Holloway received awards of appreciation from the Alaska Peony Growers association in Feb. 2013. The APGA honored Dr. Holloway for the research she has conducted on peonies, which has assisted the new industry. Holloway has been growing peonies at the Georgeson Botanical Garden since 2000.
- The Eighth Circumpolar Agricultural Conference and UArctic Inaugural Food Summit was held Sept. 29 - Oct. 3, 2013 in Girdwood. It brought together world leaders to discuss agricultural issues and challenges in the circumpolar north. The scientists, farmers, policymakers and others who attended will work to strengthen, support and expand food resources and northern community development. The event was hosted by the University of Alaska Fairbanks, the Circumpolar Agricultural Association, UArctic and the Organisation for Economic Cooperation and Development.

### ***Office of Intellectual Property and Commercialization:***

Commercializing University of Alaska Fairbanks' (UAF) intellectual property is an opportunity to increase economic development for our interior Alaska communities and benefit the UAF bottom line. UAF reorganized its Office of Technology Transfer in 2010 to create the Office of Intellectual Property and Commercialization (OIPC). The goal was to create an office that would work with UAF inventors, private companies and entrepreneurs to identify, develop, market and license University inventions, proprietary software, and new technologies. That goal is being realized. The obvious first step is getting inventions identified and "disclosed" to the office. Office of Intellectual Property and Commercialization (OIPC) has implemented an aggressive outreach campaign, leading to all time high levels of engagement. In FY 2013 alone, 73 new inventions were disclosed by University faculty, staff and students. For the first time UAF is producing invention disclosures at rates greater than or equal to other universities with a similar amount of research expenditures.



In 2012, the Nanook Innovation Corporation (NIC) was created to assist UAF in getting new technologies into the hands of businesses that will develop those technologies into products. NIC is a non-profit supporting organization with a sole focus on commercializing intellectual property generated from research conducted at UAF. NIC has licensed roughly 33 pieces of intellectual property so far on behalf of the University.

Start-up companies are all different and developed with different levels of staffing and capital. For start-up companies that do not have capital to pay license fees for the technology, the lean start-up model offers a solution. This model relies on an entity to take equity in the start-up company in place of most of the license fees. To facilitate the lean start-up, the for-profit company Nanook Tech Ventures (NTV)



was created in 2013. NTV can license UAF technology in exchange for equity in a new company. Although both NIC and NTV are associated with UAF, each is a separate Alaska corporation with its own board of directors. NTV so far has taken equity in one start-up company, to which it has licensed UAF intellectual property. Two new start-ups are in the works. UAF is actively maturing its IP development and commercialization enterprise. The first revenues have been distributed to inventors and new licenses are in process.

**Major new external research funding awards, December 2012 to date:**

**Top 50 (in dollar amount) UAF Grants  
December 1, 2012 - Present**

| <b>Project Name</b>  | <b>Total Award*</b> | <b>Number of Years of Award</b> | <b>Proposal Type</b> | <b>Agency</b>                                     | <b>PI/Unit</b>  |
|--|---------------------|---------------------------------|----------------------|---|---|
| RFP: Synthetic Aperture Radar (SAR) Distributed Active Archive Center (DAAC) for Earth Observing System Data and Information System (EOSDIS) | \$ 5,358,390        | 5.0                             | New Non-competitive  | DCAA Pacific Branch Office- AK SubOffice (NASA)   | LaBelle-Hamer, Annette L/Geophysical Institute                                  |
| ACEP Partnership to Development Statewide Energy Solutions (CIP)   | \$ 2,500,000        | 3.0                             | New Non-competitive  | Alaska State Legislature Senate Finance Committee | Holdmann, Gwen Pamela/Alaska Center for Energy and Power, INE                   |
| Pilgrim/Elim project   | \$ 2,444,202        | 1.7                             | New Non-competitive  | Department of Energy                              | Holdmann, Gwen Pamela/Alaska Center for Energy and Power, INE                   |
| JAMSTEC JFY2013  | \$ 1,871,312        | 1.0                             | New Non-competitive  | Japan Marine Science & Technology Center          | Hinzman, Larry D/International Arctic Research Center                           |
| WALRUS - Walrus Adaptability and Long-term Responses; Using multi-proxy data to project Sustainability                                       | \$ 1,707,331        | 4.0                             | New Competitive      | National Science Foundation                       | Misarti, Nicole/Institute of Northern Engineering                               |
| Dark Energy Biosphere Initiative - Subsurface Life Characterization Tool (DEBI-SELECT)   | \$ 1,667,715        | 3.0                             | Other                | Marine Science and Technology Foundation          | Wheat, Charles Geoffrey/School of Fisheries and Ocean Sciences                  |
| The Cooperative Institute for Alaska Research 2013-2018  | \$ 1,470,029        | 1.0                             | New Competitive      | Nat'l Oceanic & Atmospheric Administration        | Sugai, Susan F/International Arctic Research Center                             |
| Tier 1 University Transportation Center: Center for Environmentally Sustainable Transportation in Cold Climates                              | \$ 1,414,100        | 4.0                             | New Competitive      | US Department of Transportation                   | Liu, Juanyu/Institute of Northern Engineering, College of Engineering and Mines |



|  |              |     |                     |                                    |  |
|--|--------------|-----|---------------------|------------------------------------|--|
| Cumulative Effects of Arctic Oil Development - Planning and Designing for Sustainability   | \$ 1,402,992 | 5.0 | New Competitive     | National Science Foundation        | Walker, Donald Arthur/Institute of Arctic Biology, College of Natural Sciences and Mathematics   |
| Collaborative Research: Water, Energy, and Food Security in the North: Synergies, tradeoffs, and building community capacity for sustainable futures (Sustainable Futures North) | \$ 1,227,445 | 3.0 | New Competitive     | National Science Foundation        | Loring, Philip Allen/Institute of Northern Engineering   |
| Operation IceBridge Alaska: University of Alaska LiDAR, temperate ice radar depth sounding, and DMS  | \$ 999,008   | 3.0 | New Competitive     | NASA Shared Services Center (NSSC) | Larsen, Christopher F/Geophysical Institute  |
| IOS: Cross Talk between Metabolism and the Nervous System via NMDAR Initiates Interbout Arousal in Hibernating Ground Squirrels  | \$ 963,029   | 5.0 | New Competitive     | National Science Foundation        | Drew, Kelly/Institute of Arctic Biology, College of Natural Science and Mathematics              |
| The North Slope Arctic Scenarios Project (NASP): Envisioning Desirable Futures and Strategizing pathways for Sustainable Healthy Communities                                     | \$ 954,290   | 3.1 | New Competitive     | National Science Foundation        | Lovecraft, Amy Lauren/College of Liberal Arts  |
| Collaborative Research: Dynamics of subglacial erosion of soft sediments and its consequences for glacier evolution  | \$ 847,030   | 3.2 | New Competitive     | National Science Foundation        | Truffer, Martin/Geophysical Institute  |
| Collaborative research: What role do glaciers play in terrestrial sub-arctic hydrology?  | \$ 844,653   | 3.2 | New Competitive     | National Science Foundation        | Liljedahl, Anna Katarina/Institute of Northern Engineering, International Arctic Research Center |
| JAXA JFY2013   | \$ 792,682   | 1.0 | New Non-competitive | Japan Aerospace Exploration Agency | Hinzman, Larry D/ International Arctic Research Center   |
| Stereo-Derived Topography for the Last Frontier and the Final Frontier   | \$ 745,447   | 3.0 | New Competitive     | NASA                               | Thorsen, Denise Lorraine/Geophysical Institute, College of Engineering and Mines                 |

|  |            |     |                     |  |   |
|--|------------|-----|---------------------|--|---|
| Control of Boreal Forest Soil Decomposition Processes by Plant Secondary Defense Compounds       | \$ 692,977 | 3.0 | New Competitive     | National Science Foundation              | Leigh, Mary B/Institute of Arctic Biology, College of Natural Science and Mathematics               |
| FY14 Toolik Field Station User Days  | \$ 692,937 | 1.0 | New Non-competitive | CH2MHill                                 | Bret-Harte, Marion Syndonia/Institute of Arctic Biology, College of Natural Science and Mathematics |
| Alaska Chinook Salmon Production and Decline   | \$ 625,532 | 5.0 | New Non-competitive | Alaska Dept. of Fish and Game            | Adkison, Milo D/School of Fisheries and Ocean Sciences  |
| Mesosphere-Lower Thermosphere Turbulence Experiment (MTeX)                                       | \$ 617,305 | 3.0 | New Competitive     | NASA                                     | Collins, Richard L/Geophysical Institute, College of Natural Science and Mathematics                |
| Arctic Tracer Release Experiment (ARCTREX) Applications for Mapping Spilled Oil in Arctic Waters | \$ 589,906 | 3.0 | New Competitive     | Bureau of Ocean Energy Management (BOEM) | Winsor, Peter Rolf/School of Fisheries and Ocean Sciences   |
| The diversity, seasonality and function of parasitic fungi in Arctic sea ice                     | \$ 550,738 | 3.0 | New Competitive     | National Science Foundation              | Gradinger, Rolf R/School of Fisheries and Ocean Sciences  |
| Qasgiq (Communal House): Dissemination Using Yup'ik Indigenous Implementation                    | \$ 542,357 | 1.8 | New Competitive     | National Institutes of Health            | Rasmus, Stacy Michelle/Institute of Arctic Biology  |
| Alaska Volcano Observatory 2013  | \$ 513,074 | 1.0 | New Competitive     | USDI Geological Survey                   | Freymueller, Jeffrey/Geophysical Institute, College of Natural Science and Mathematics              |
| Alaska Sea Grant Omnibus 2014-2018   | \$ 500,000 | 4.0 | New Non-competitive | Nat'l Oceanic & Atmospheric Admin        | Cullenberg, Paula J/School of Fisheries and Ocean Sciences  |
| Cook Inlet Circulation Model Calculations  | \$ 499,528 | 1.9 | Other               | Bureau of Ocean Energy Management (BOEM) | Danielson, Seth L/School of Fisheries and Ocean Sciences  |
| CR: Impacts of local oceanographic processes on Adelie Penguin foraging ecology                  | \$ 460,818 | 3.6 | New Competitive     | National Science Foundation              | Winsor, Peter Rolf/School of Fisheries and Ocean Sciences   |



|  |            |     |                     |   |  |
|--|------------|-----|---------------------|---|--|
| Transport, Biodegradation, and Treatment of Sulfolane-contaminated Groundwater in North Pole, Alaska   | \$ 460,807 | 1.0 | New Non-competitive | AK Department of Environmental Conservation | Leigh, Mary B/Institute of Arctic Biology, College of Natural Sciences and Mathematics               |
| Collaborative Research: P2C2: Contributions of northern cold-climate peatlands and lakes to abrupt changes in atmospheric methane during the last deglaciation       | \$ 459,801 | 3.0 | New Competitive     | National Science Foundation                 | Walter Anthony, Katey Marion/Institute of Northern Engineering, International Arctic Research Center |
| Exploring intrasite variability at Upward Sun River (Xaasaa Na'), a terminal Pleistocene site in central Alaska: foraging behaviors and paleoenvironmental contexts. | \$ 456,856 | 2.7 | New Competitive     | National Science Foundation                 | Potter, Ben Austin/College of Liberal Arts   |
| Targeting Central A1 Adenosine Receptors Induces Hypothermia for Stroke  | \$ 448,500 | 3.0 | Renewal Competitive | National Institutes of Health               | Drew, Kelly/Institute of Arctic Biology, College of Natural Science and Mathematics                  |
| In-Depth Understanding of Development Challenges in Unconventional Shale Reservoirs  | \$ 441,378 | 2.0 | New Competitive     | Alaska Department of Natural Resources      | Ahmadi, Mohabbat/Institute of Northern Engineering, College of Engineering and Mines                 |
| MRI: Acquisition of a hyperspectral imaging system to support scientific research, applied studies, and education in the state of Alaska                             | \$ 427,770 | 2.0 | New Competitive     | National Science Foundation                 | Prakash, Anupma/Geophysical Institute, College of Natural Science and Mathematics                    |
| Field Research Equipment and Instrument System to Facilitate Research on Hydrokinetic Power Generating Devices and Fish Stocks in Alaska                             | \$ 425,000 | 2.1 | New Competitive     | M.J. Murdock Charitable Trust               | Johnson, Jerome Ben/Institute of Northern Engineering  |
| Meteorological and Hydrological Monitoring and Analysis Program for the Ambler Corridor, South Slope of Central Brooks Range: Phase 2                                | \$ 413,324 | 5.0 | New Non-competitive | AIDEA (Ak.Ind.Dev&Export Auth.)             | Kane, Douglas L/Institute of Northern Engineering  |

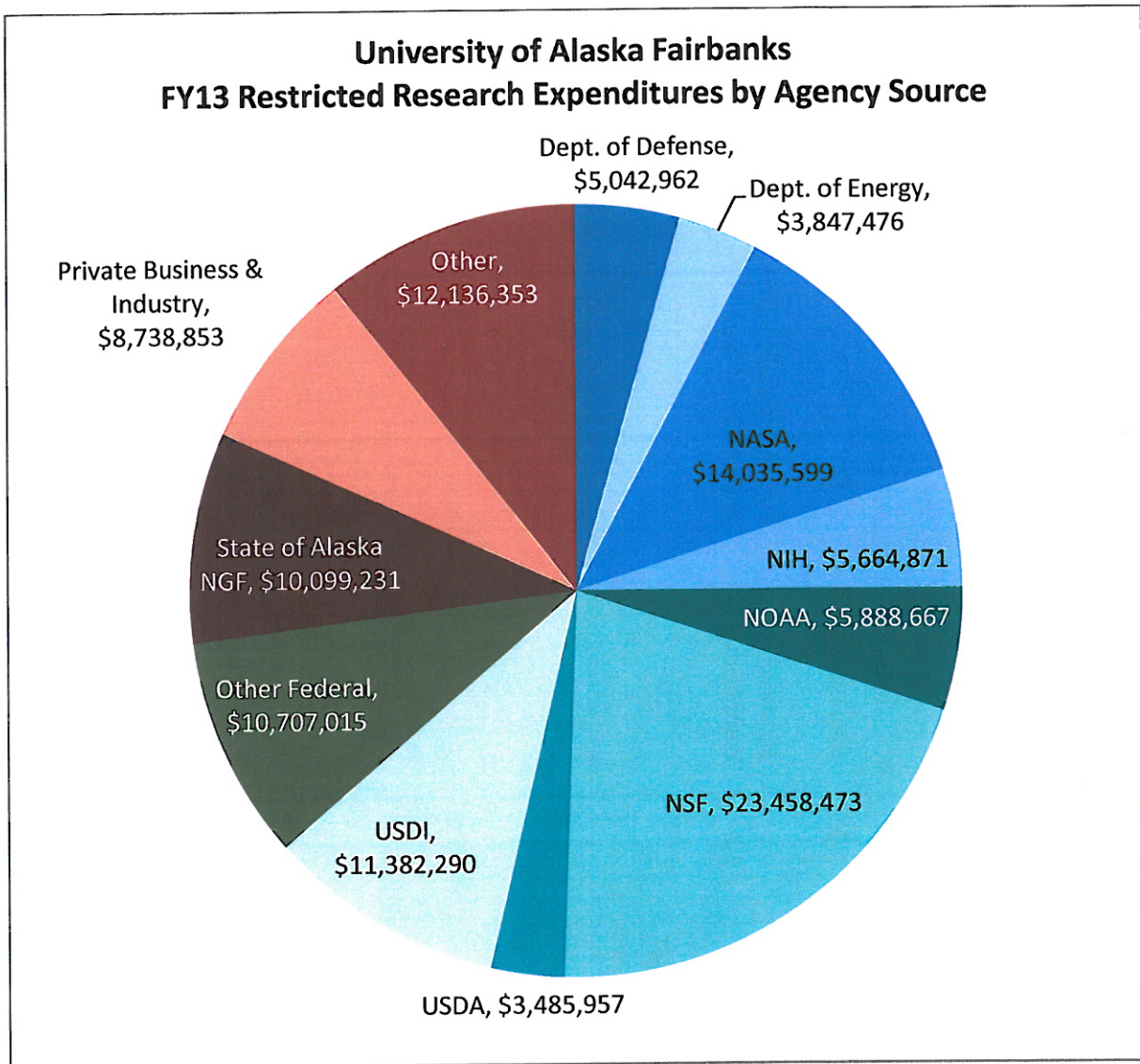
|  |            |     |                     |  |   |
|--|------------|-----|---------------------|--|---|
| Oceanic Dispersal and Behavior of Chinook Salmon in the Bering Sea   | \$ 396,125 | 2.8 | New Competitive     | Bering Sea Fisherman's Association       | Seitz, Andrew<br>Christopher/School of Fisheries and Ocean Sciences                                 |
| Arctic Landscape Conservation Cooperative: Response of an Arctic Freshwater Ecosystem to Climate and Land-use Change   | \$ 394,059 | 4.2 | New Non-competitive | U.S. Fish & Wildlife Service             | Arp, Christopher<br>Douglas/Institute of Northern Engineering                                       |
| Development of an Accurate Model of the Beaufort & Chukchi Ice Drift & Dispersion for Forecasting Spill Trajectories and Providing Decision Support for Spill Response | \$ 359,078 | 3.1 | New Competitive     | Bureau of Ocean Energy Management (BOEM) | Kulchitskiy, Anton<br>Vladimirovich/Institute of Northern Engineering                               |
| Collaborative Research: Extinction of Mammuthus primigenius on St. Paul Island, Pribilof Islands, Alaska: Paleoclimate, Paleoenvironment and/or Island Size?           | \$ 343,044 | 3.0 | New Competitive     | National Science Foundation              | Wooller, Matthew John/<br>Institute of Northern Engineering, School of Fisheries and Ocean Sciences |
| USARC Intergovernmental Personnel Agreement- C Rosa  | \$ 343,021 | 1.7 | New Non-competitive | U.S. Arctic Research Commission (USARC)  | Myers, Mark D/Vice Chancellor for Research  |
| Geochemical constraints on the source, flux, migration, and seismic signature of volcanic fluids, Katmai Volcanic Cluster, Alaska                                      | \$ 303,607 | 2.1 | New Competitive     | National Science Foundation              | Lopez, Taryn M/ Geophysical Institute   |
| Progestogens' Non-classical Effects and Mechanisms for Social & Mood Processes   | \$ 302,940 | 2.0 | Other               | National Institutes of Health            | Frye, Cheryl Anne/Institute of Arctic Biology/College of Natural Science and Mathematics            |
| Benthic Communities of the Burger, Klondike, and Statoil Survey Areas in the Chukchi Sea   | \$ 300,000 | 1.2 | New Non-competitive | Olgoonik Fairweather LLC.                | Blanchard, Arny L/School of Fisheries and Ocean Sciences  |
| Confirmation Drilling at Pilgrim Hot Springs to Determine the Economic Viability of Supplying Geothermal Power to Nome   | \$ 300,000 | 1.5 | New Non-competitive | City of Nome                             | Holdmann, Gwen<br>Pamela/Alaska Center for Energy and Power, Institute of Northern Engineering      |



|  |                     |     |                     |   |  |
|--|---------------------|-----|---------------------|---|--|
| 2013 Debris Characterization for AEA   | \$ 299,999          | 1.5 | New Competitive     | Alaska Energy Authority                   | Johnson, Jerome Ben/Institute of Northern Engineering  |
| CR: GEOTRACES Pacific section: Collection and analysis of atmospheric deposition                           | \$ 299,042          | 3.0 | New Competitive     | National Science Foundation               | Aguilar-Islas, Ana Maria/School of Fisheries and Ocean Sciences                              |
| Biological and physical oceanography of the Chukchi Sea  | \$ 298,754          | 3.8 | New Non-competitive | North Slope Borough                       | Pinchuk, Alexei Ilich/School of Fisheries and Ocean Sciences                                 |
| Recovery and Archiving of Key Arctic Alaska Vegetation Map and Plot Data for Long-term Vegetation Analyses | \$ 283,383          | 3.0 | New Competitive     | NASA                                      | Walker, Donald Arthur/Institute of Arctic Biology/College of Natural Science and Mathematics |
| Tsunami Inundation Modeling and Mapping for Alaska Coastal Communities (RUNUPDHS12)                        | \$ 275,000          | 1.0 | New Non-competitive | Department of Military & Veterans Affairs | West, Michael E/Geophysical Institute  |
| <b>TOTAL of Top 50</b>   | <b>\$41,526,315</b> |     |                     |   |  |
| <b>TOTAL of 269</b>  | <b>\$58,464,397</b> |     |                     |   |  |

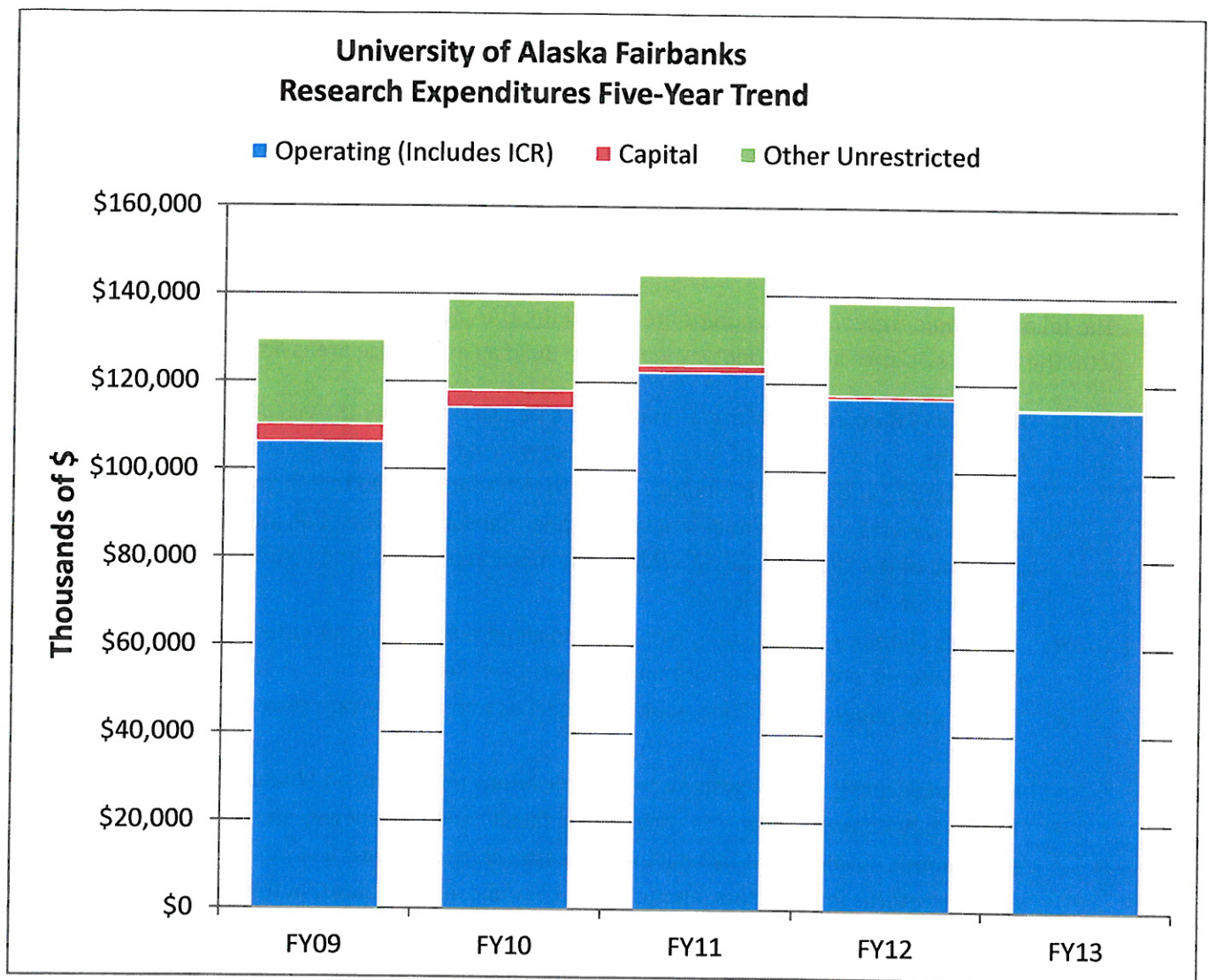
\*Total amount if a multi-year award, not the annual amount.

### III. UAF Restricted Research Expenditures



Abbreviations in the graph include: NASA = National Aeronautics and Space Administration; NIH = National Institutes of Health; NOAA = National Oceanic and Atmospheric Administration; NSF = National Science Foundation; USDA = U.S. Department of Agriculture; USDI = U.S. Department of Interior, which includes the U.S. Geological Survey (USGS), National Park Service (NPS), and the Bureau of Ocean Energy Management (BOEM); NGF = non General Fund.





Note: These numbers represent research expenditures, including Indirect Cost Recovery (ICR), and not the awarded revenue amount. Grant-Funded Research Expenditures are defined as the amount of grant-funded operating and capital research expenditures, including both direct research expenditures as well as ICR from restricted research grants spent on research and administrative support. This includes externally sponsored research grants booked on the capital budget, a significant portion of which represents State of Alaska funded research. Other unrestricted funds are defined as general fund revenue with a NCHEMS code of research.

Source: Data supplied by MAUs via UA Information Systems: UA Decision Support Database (RPTP.DSDMGR) FY09 - FY13.

Compiled by UA Institutional Research and Analysis

**Report to the Board of Regents**  
**April 2014**  
***University of Alaska Anchorage Research***

**I) OVERVIEW**

**A) Major focus areas**

The following *major research focus areas* are part of the UAA Strategic research Plan, and are aligned with the Alaska's Science and Technology Plan – "To Build a Fire." These areas are:

- ***Health and Biomedical Sciences*** – as Alaska's Health University UAA is focusing on improving the health and well-being of Alaskans through translational and clinical research on resuscitation, infection/immunology and research that will lead to improved medical services, medical devices, and potential therapeutic pharmaceuticals. This is an interdisciplinary focus across all of the UAA Colleges WWAMI – the medical program, and institutes such as the Institute for Circumpolar Health.
- ***Climate Change*** – in particular, responses to climate and environmental changes – e.g., changes in ecosystems, physiology, environmental agents and disease.
- ***Energy and mineral extraction*** – new approaches to mining of rare resources and extracting reserves.
- ***National Security*** – Cyber systems with applications to security and human cognitive processes.
- ***Technology Commercialization*** – leveraging faculty and student research at UAA to contribute to economic development by building successful start-ups domiciled in Alaska, achieving above average returns for investors, and using successful commercialization to attract innovation leaders, and corporations to Alaska and retaining talent in Alaska.

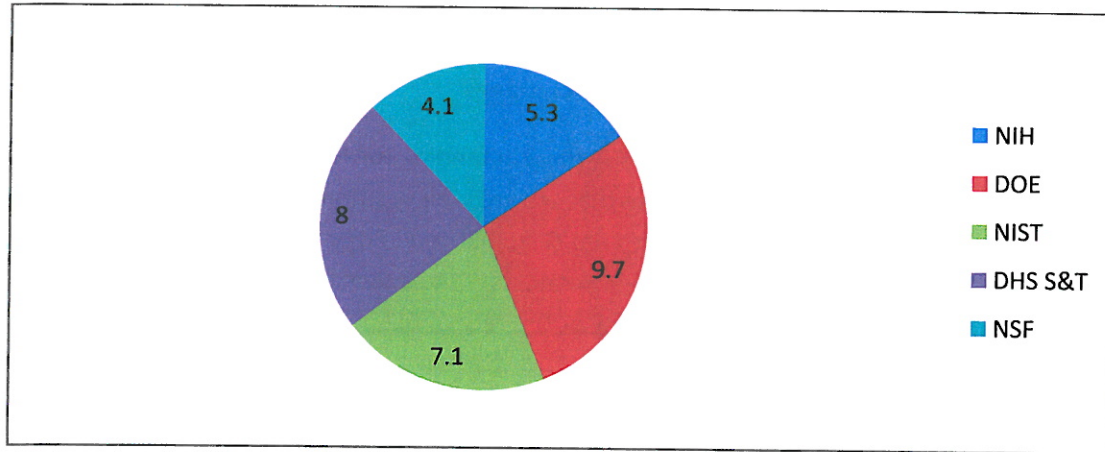
To provide incentives for research the VPRGS established the annual INNOVATE awards in 2012 providing initial funding for research and creative works that would lead to external research funding, publications in peer review journals or intellectual property (IP), which has provided significant returns on investment to the university. Also the VPRGS created the Patent Wall of Fame to recognize patent achievements.

**B) Discussion of recent trends in external research funding**

In the period of budget uncertainty and the sequestration during FY13, UAA submitted 329 proposals for \$70.89 Million vs. 375 submissions totaling \$89.4 Million in FY12 (numbers include multi-year funding). This selective reduction resulted in an increase in success rate by 22% to 0.897 vs 0.877 in 2012 and avoided a drop in the UAA research expenditures in FY13. To exploit the improved budgetary forecast in FY14 UAA ramped up its proposal applications to 189 in the first and second quarters of FY14 vs 162 proposals in the same period of FY13. The amount for proposals submitted is \$54.4M, versus \$43.4M for Q1&Q2 of FY 13. Awards for first two quarters in FY 14 were up slightly to 237 from 230 in FY 13. Most UAA proposals targeted areas and agencies with high increases in the FY14 appropriations – NIH, NSF,



DHS and DOE (see [Figure 1](#)). The FY 14 submissions included pursuing our strategy of multi-disciplinary federally funded centers of excellence, and we submitted a proposal for over \$17M to the Department of Homeland Security for a Center of Excellence – Center for Maritime Research as the Center Lead. One for over \$17M to be the lead for a Center of Excellence (COE).



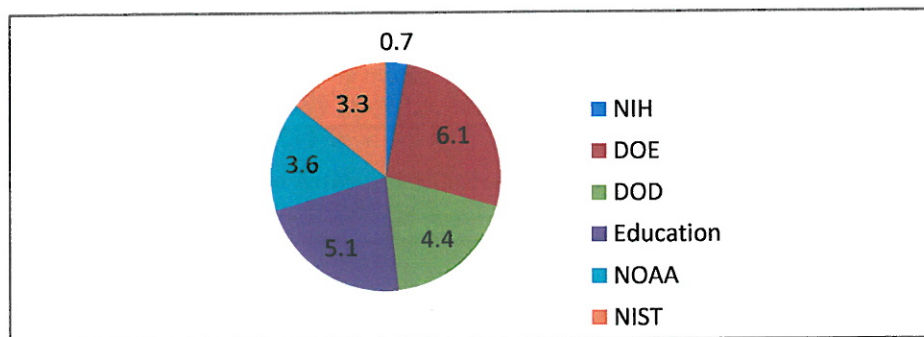
**Figure 1. Percent Increases in Federal Funding Agencies**

#### **Future Goals and Directions**

In the next two years we will pursue the goals in the UAA Strategic Research Plan by

- (i) Continuing to pursue additional externally funded centers of excellence;
- (ii) Targeting larger multidisciplinary grants that can involve partnerships with leading national and international institutions – universities and corporations. This will include submitting a proposal for the Multiple University Research Initiative.
- (iii) Building on our strength in commercialization to exploit the current financial climate: the agencies budget requests indicate that the increase of funding for development will grow at the rate of 6:1 compared to the increases of funding for pure research.
- (iv) Capitalizing on UAA's prime location by forming the U-Med District Research Alliance (UMEDRA) a collaborative group that UAA formed with investigators from UAA, the three Anchorage hospitals, and the CDC, to position for NIH funding.

We are positioning our proposal targets based on the opportunities presented in the FY15 presidential budget request for R&D aiming at the departments/institutes of strong increase see [Figure 2](#).



**Figure 2: FY15 vs FY14 Research budget increases in percentages**

Although the president's FY15 request indicates a 0.1% drop in funding for NSF sponsored-research there are areas within NSF that received an increase that we are well positioned to target as specific high value programs at NSF. Other targeted agencies are NIH, DOE, and Education. The current financial climate is very beneficial for the UAA commercialization efforts -- the agencies budget requests indicate that the increase of funding for development will grow at the rate of 6:1 compared to the increases of funding for pure research

## **II) Recent Developments (since December 2012 Research Report)**

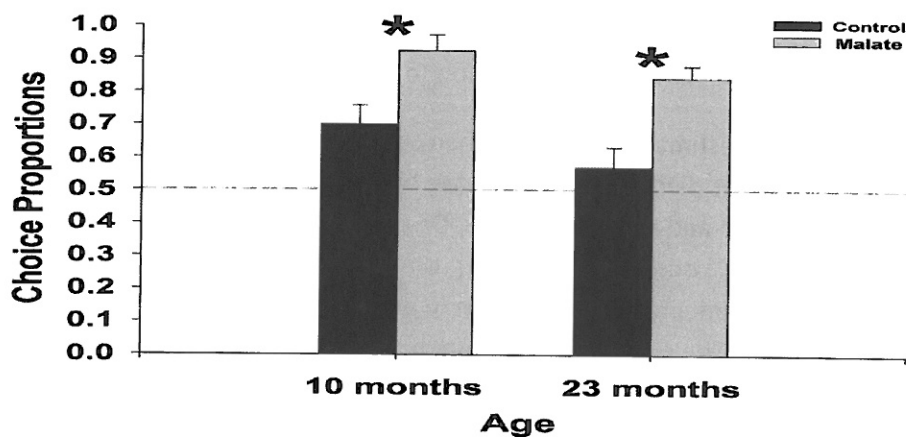
This is a time for enormous energy and growth in research, creative works, and commercialization at UAA. UAA is pursuing a strategic approach to fostering, supporting, and expanding its faculty research efforts and the overall research and commercialization enterprise. To incentivize research, projects are fund-seeded by the annual INNOVATE awards from the Vice Provost for Research funds promising new initiatives and projects. This approach has led to significant returns on investment (ROI) for example, the 2012 award resulted in a 3:1 ROI from external research funding, and a higher ROI is expected from the 2013 Innovate Awards. Additional success include publications in high impact peer-reviewed journals, presentations at international conferences, scholar in residence and creation of IP, which has led to invention disclosures, patents, and startups. The following are examples of major new research accomplishments since December 2012.

### **A) Biomedical Sciences - Potential therapeutic pharmaceuticals**

A.1) Dr. Collin McGill's research is focused on demonstrating that compounds from the Alaska bog blueberry have a beneficial role in ameliorating progressive loss of cognitive function in the aged. Currently there are more than 40 million older US citizens and the number is growing. A major disease is Alzheimer's disease (ALZ). The cognitive deficits of ALZ are the focus of McGill's concerns and his work on the Alaska bog berry has led to strong evidence that it contains compounds that can ameliorate age-related progressive loss of cognitive functions. Since December 2012 his initial research advanced from the bench top to successful testing in animals. A significant body of evidence established the benefits of whole blueberry supplementation for improving learning, memory, and neuronal function over a whole range of models. However, there was little understanding which specific compounds in the blueberry are responsible for these effects. In his initial work Dr. McGill was able to isolate the compound responsible. This compound is malate; it reduces free radicals in human body tissues. Consuming malate increases resistance to inflammation and cell death in the brain. Using the 2013 Innovate funding he, together with his colleague in the phycology department, Dr. Eric Murphy, completed testing in aged



rats and obtained statistically significant results. They discovered that malate is a potent dietary intervention for enhancing memory. Aged rats supplemented with malate showed a **statistically significant** improvement in memory tests when compared to aged rats fed a control diet. In addition, aged malate-supplemented rats performed equivalently to young, unimpaired rats. The results also indicate that the younger rats benefited from malate supplementation. Figure 3 shows the percentage of trials that a rat correctly remembered where they received food on the previous trial. Fifty percent is considered random (dashed line) and 100% indicates they remember the arm they previously visited every time. Most healthy rats will remember about 85% of the time. This work initially was assigned a US Provisional Patent, however, recently a non-provisional patent was filed #14/192,681. The impact of this work is a potential therapeutic pharmaceutical for improving the treatment of age-related memory loss, reducing ischemic trauma, and for improving insulin sensitivity.



**Figure 3. Aged Rat Memory Results**

A.2) Dr. Jocelyn Krebs' work is significant as it was the first to show a specific neural crest defect caused by loss of a gene deleted in Williams Syndrome. Williams Syndrome is a genetic disease caused by missing genes and among the effects are cardiovascular disorders, learning disabilities, and growth deficiencies. A important impact of this work is that this discovery can reveal some of the underlying causes of the symptoms of Williams Syndrome, which may in turn reveal novel therapeutic targets for dealing with some of these symptoms in patients. Her most recent findings have indicated a loss of Williams Syndrome Transcription Factor (WSTF) results in a failure of certain neural crest cells to migrate. These cells need to migrate to the sites where they will differentiate into adult tissues such as facial cartilage and bone, nerves, parathyroid, and other tissues. Failure to migrate leads to loss or malformation of the adult tissues they are meant to give rise too. She is currently studying the mechanisms by which WSTF loss leads to migration failure, specifically through changes in genes involved in migration, which is a step closer to finding a novel therapeutic target. Her initial work is published in *Mechanisms of Development*, and has been supported by the NIH (National eye Institute) and the Whitehall Foundation. Her student received the Western Association of Graduate Schools Distinguished Master's Thesis Award in 2013.

A.3) Anoxia related diseases (heart attacks and strokes) are prominent in the Western world. Cardiovascular disease is the primary cause of death for U.S. men and women and accounts for approximately 25% of total deaths. However, Dr. Jonathan Stecyk's research – "The Turtle Heart: a nontraditional model to understand and potentially treat human cardiovascular disease" and "Anoxia-tolerant Vertebrates Have Solved the Problem of Living Without Oxygen" – has advanced our understanding of the mechanisms and processes underlying vertebrate cardiovascular functions when subjected to oxygen deprivation. Some findings thus far indicate that specific components of the heart's pacemaker are modified with acclimation to low temperature and changes may pre-condition the heart to beat rhythmically without oxygen. The impact of this research is that it may open new possibilities for treating anoxia-related diseases including heart attacks and strokes. The preliminary results obtained with the support of an INNOVATE 2013 award provided the basis for research proposals to NSF and NIH submitted in Fall 2013 (the proposals are still pending), his findings to date were presented at 2 international scientific conferences, and he produced 5 manuscripts (3 published, 2 in review). It should be noted that INBRE funding provided him with a foundation to pursue research funding.

A.4) The Center for Disease Control estimates that more than one-third of US adults are obese, and that disease resulting from obesity such as diabetes, heart disease have associated medical costs exceeding \$150 billion annually. Dr. Duddleston and her team (co-PIs, Dr. Buck, Dr. Rainey and Tim Stevenson) have been studying the gut microbial community of arctic ground squirrels and they hope to shed light on human metabolic function by examining the potential role of gut bacteria in pre-hibernation fattening by arctic ground squirrels. The results of their work may lead to possible insights into the role of microbial communities in obesity and other disorders. It will also pave the way for a refined animal model of value, the arctic ground squirrel, in biomedicine and potential translational benefits for human research into obesity and related conditions. Leveraging her first Innovate Award she received NIH funding. Recently Dr. Stecyk and Dr. Duddleston received a 2014 Innovate Award to extend this research to obtain a broader understanding of how the vertebrate gut microbiota responds to environmental shifts and stress. Expected findings promise to expand the understanding of the complex interactions that occur between the gut microbial community and host physiology and have the potential for novel ideas and treatments for pathologies related to oxygen-starved and/or hypothermic human tissues.

## **B) Response to climate and environmental change**

B.1) Dr. Jeff Welker's research is having transformative impact on the understanding climate change and the climate-animal-plant interactions in the dramatically changing Arctic. His research results are being integrated in the state of the art climatic models, applied to the study of migration ecology and the unraveling of fresh water sources. Since December 1, 2012 Dr. Welker has received two competitive grants from NSF to support his investigations. The impact of his work is further evidenced from the fact that he has two publications in the high impact journal *Nature Climate Change*, within six months and one was the lead article. For his contributions to science he was awarded a Fulbright Distinguished US Arctic Chair.



B.2) Dr. Jen Burns work focuses on marine mammals that inhabit high latitude environments have evolved unique mechanisms to execute a suite of energetically-costly life history events (CLHEs) within a relatively short timeframe when conditions are most favorable. Understanding the intrinsic and extrinsic factors that regulate CLHEs is particularly important in species such as Weddell seals, as both reproduction and molt are associated with large reductions in foraging effort, and the timing and outcome of each appears linked with the other. The proposed work will monitor physiological condition, pregnancy status, and behavior at various times throughout the year to determine if molt timing is influenced by prior reproductive outcome, and if it, in turn, influences future reproductive success. These data will then be used to address the demographic consequences of trade-offs between CLHEs in Weddell seals. The impact of environmental conditions and CLHE timing on population health will also be modeled so that results can be extended to other climates and species. An improved understanding of the interactions between CLHEs and the environment is important in predicting the response of organisms from higher trophic levels to climate change. Furthermore, the impact of environmental change on reproductive capacity of these organisms, because they are mammals can be eventually related to human health. Her work is funded by a large competitive NSF grant, and she is a co-author on a paper in Science (2013) both demonstrate the high quality of her work.

### **C) Computational and Human Cyber Systems**

C.1) Identity theft is one of the largest growing crime areas and Dr. Kenrick Mock's and Dr. Bogdan Hoanca's prior research on exploitation of human eye tracking had led to new applications for human authentication for security – Patent # 7986816. However, since December 2012, the impact of their work on eye tracking has been seen from its expansion to other important areas. For example, using eye tracking in the study of mental processes involved in making moral decisions (INNOVATE 2013 award) with a team that included colleagues from the psychology and philosophy departments. Another area is gauging the level of human expertise in sophisticated activities including assessing piano students music skill levels, which has a patent pending (#61945462) – Method and System for Evaluating Performance – with the head of the music department Professor Smith.

C.2) Dr. Frank Moore's ground breaking work on high accuracy image reconstruction from lossy-compressed data. The impact of Moore's evolutionary algorithms-based approach is evidenced by the fact that it reduces the reconstruction error by 8% in comparison to the state of the art wavelets-based algorithms used by NASA. Furthermore, the encoders/decoders built using his methods allow greater compression levels (about 6.4% smaller files) without additional loss of information. Dr. Moore has submitted an invention disclosure, which is the basis for a pending US patent application.

### III) Graph of patent disclosures and patents pending over time (since FY 11) and IP developments.

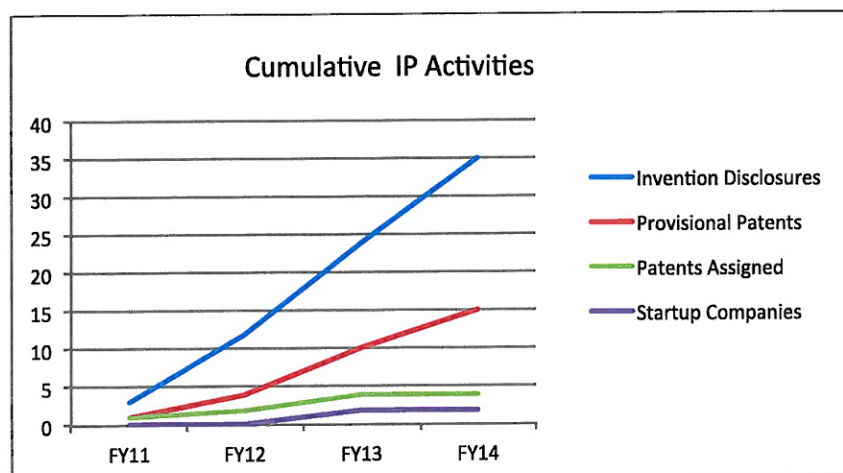


Figure 3. Cumulative IP Since FY 11

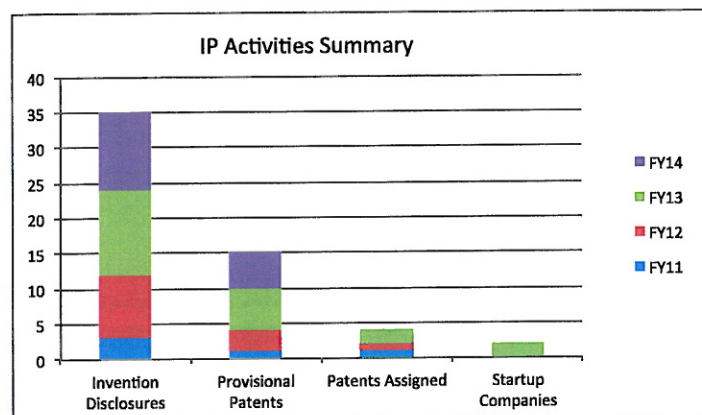


Figure 5. Stacked Column Chart of IP Activities Since FY11

**IP Developments** - The Technology Commercialization effort resides in the office of Research and Graduate Studies (ORGS), headed by the Vice Provost for Research and Graduate Studies (VPRGS) who devised the current commercialization infrastructure approved by the BOR in 2012. This includes Seawolf Holdings, LLC. and Seawolf Venture Fund, LP. Although the initial Board of Directors of Seawolf Holdings was in place in December 2012, new members were added in 2013 and in 2014. The Board includes the CEO of a company, which produces implantable medical devices, publically traded on the NYSE, a founding partner in a \$700M venture fund, the former CFO of America Online, serial entrepreneurs, and corporate executives. In 2013 the General Partner for the fund was recruited – Springwell Partners in CT that brings \$90B in experience in acquisitions and mergers and additional venture experience. This Infrastructure together with the efforts of the ORGS, and incentives from the Innovate Awards and the Patent Wall of Fame have resulted in a dramatic increases since FY2011: invention disclosures to 35 up from 3; patents pending to 14 up from 2; patents issued to 4 up from 1; and in 2013 UAA's first two startup companies – Zensor, LLC and CFT Solutions, LLC. A third of UAA's



invention disclosures have evolved into patents pending, and the Patent Wall of Fame received two new inductees in FY13.



UAA's first start-up company, *Zensor, LLC*, provides new generation of wireless sensors that do not use for remote monitoring, industrial control systems (SCADA), and asset management. The global wireless sensor devices market is expected to increase at a 43.1% annual growth rate (CAGR) to reach an estimated \$4.7 billion by 2016, according to market research firms such as BCC Research. The markets include: industrial installations, residential automation and energy management, ecology and agriculture, security and surveillance. Zensor meets those market needs. Its *capabilities*: No batteries required—solar energy coupled with a new ultra-capacitor; long lasting; Distributed Wireless Networked system for data receipt, transmission and storage; requires just one sensor to interrogate information about every device in the network. Each sensor collects data from all other sensors; Low Cost — less than \$40 per sensor — sold in kits of 25 for under \$1,000; current sensors collect and transmit data on: humidity, light intensity, temperature, color, sound, thermal images, vibrations, and the tilt of a stationary object. Additional capabilities can be added, including GPS and gas sensing. Currently testing in arctic to ensure reliability even under extreme environmental conditions. Zensor was formed in April 2013 by the VPRGS and the inventor Dr. Lund. His work was funded by a 2012 Innovate Award, which resulted in patent pending #61/645,356. Zensor was featured in the Alaska Business Monthly in July 2013.



**CFT Solutions, LLC** provides an innovative, cost-effective approach to snow removal and deicing using carbon fiber tapes embedded under the surface. Its advantages include: Easy installation at lower costs 40% the cost of a hydronic system; Significantly less expensive to operate than hydronic systems - 50% less - \$0.02/ft<sup>2</sup>/day; Self-monitoring – sensors control the on/off power based on the surface temperature and moisture; Durable – carbon fiber tapes have high strength and long term stability; Versatile – easily customized; Safe – Operates with 24 V AC; Alaska tested – successfully in Anchorage during a record snowfall in 2011-12. Applications include: High pedestrian traffic; Road intersections; parking lots; domestically in driveways/walkways; Bridges, roofs. Current Installations & Potential Customers – CFT is installed in a walkway on the UAA campus and is UL Site Certified for safety. CFT will begin other installations in the spring and has submitted invited commercial proposals for jobs starting in the spring. It was formed in May 2013 by the VPRGS and its inventor Dr. Yang. His work had been funded by a 2012 Innovate Award, which resulted in a Patent Pending#61/699,372.

**IV) Major new external research funding awards, December 2012 to date. We provided both competitive and non-competitive in two different charts, and have defined major as \$100,000 and over.**

**a) Table 1: Competitive Research Awards over \$100,000. December 1, 2012 – Present – Total \$9,877, 228.**

| Project Name  | Total Award*        | Agency                         | Principal Investigator  |
|---|---------------------|--------------------------------|-------------------------|
| Evidence based Ethics and Mental health Research with Prisoners   | \$2,660,452         | National Institutes of Health  | Eldridge Gloria D       |
| Mechanisms of Perchlorate-induced Disruption of Sexual Differentiation research   | \$2,611,061         | Institutes of Health           | von Hippel Frank A      |
| The Cost of a New Fur Coat: Interactions Between Molt and Reproduction in Weddell Seals   | \$1,249,867         | NSF                            | Burns Jennifer M        |
| Asynchrony in the Timing of Goose-Vegetation Interactions: Implications for Biogeochemical Cycling in Sub-Arctic Wet Sedge Tundra                       | \$785,503           | NSF                            | Welker, Jeffrey K       |
| Social Indicators for Rural Alaska Communities (SIRAC)  | \$582,610           | NSF                            | Berman, Matthew D       |
| Adaptation Research, a Transdisciplinary, transnational community and policy centered approach (ARTISTICC)  | \$356,271           | NSF                            | Berman Matthew D        |
| REU Site: Ecology and Physiological Ecology at the University of Alaska Anchorage   | \$349,720           | NSF                            | Duddleston, Khrystyne N |
| CR: Quantifying Changes in the Arctic Hydrological Cycle at the Landscape Scale using Advances in Water Vapor Isotope (18O & D) Techniques and Aircraft | \$209,997           | NSF                            | Welker, Jeffrey M       |
| Cooperative Plant Inventory Program - Invasives Impact on Wildfire Areas  | \$397,430           | Fed. Bureau of Land Management | Carlson Matthew L       |
| Evaluation of the Strategic Prevention Framework State Initiative Grant   | \$230,000           | Division of Behavioral Health  | Metzger, Jesse          |
| NIST/MEP Technical Assistance Planning for Alaska   | \$150,000           | NIST                           | Klouda, Nolan F         |
| <b>TOTAL</b>  | <b>\$9,877, 228</b> |                                |                         |



**b) Table 2: Non-Competitive Research Awards over \$100,000. December 1, 2012 – Present – Total \$2,620,15.**

| Project Name  | Total Award*       | Agency  | Principal Investigator           |
|---|--------------------|---|----------------------------------|
| FY13 PTAC   | \$445,540          | Defense Logistics Agency                            | Vanderburg, Isaac B              |
| FY13 PTAC   | \$231,376          | Defense Logistics Agency                            | Vanderburg, Isaac B              |
| UAA Reliability-Based Sea Ice Parameters for Design of Offshore Structures  | \$226,668          | Bureau of Safety & Environmental Enforcement (BSEE) | Metzger, Andrew Thomas           |
| Capacity Building for Autism Intervention FY14 (aka Develop Education & Training for Autism Workforce)  | \$322,500          | Division of Public Health                           | Kiefer-ODonnell, Richard Anthony |
| Promoting Health Among Teens (PHAT) Evaluation FY14   | \$157,488          | Division of Public Health                           | Martin, Stephanie L              |
| The Alaska Gatekeeper Suicide Prevention Training Grant (FY14)  | \$225,000          | Division of Behavioral Health                       | Cauble, Lisa Loi                 |
| FY13 ASSEC The Alaska Gatekeeper Suicide Prevention and Intervention: Training for Trainers   | \$122,215          | Division of Behavioral Health                       | Cauble, Lisa Loi                 |
| Determining the Magnitude and Social Context of Shorebird Hunting in French Guiana Using Potential Biological Removal Models and Hunter Surveys | \$100,849          | U.S. Fish & Wildlife Service                        | Taylor, Audrey R                 |
| Wildlife Diversity Research Collaborative between AKNHP and ADF & G Wildlife Diversity Program, Phase 3   | \$300,000          | Alaska Department of Fish & Game                    | Gotthardt, Tracey Ann            |
| Implementation of Joint Failure Analysis and Corrosion Testing (FACT) Program at UAA  | \$131,664          | AK Dept. of Environmental Conservation              | Cullin, Matthew Joseph           |
| Mat-Su Ecosystem Services   | \$121,715          | The Nature Conservancy - AK Field Office            | Schwoerer, Tobias                |
| UAA Support of Field Testing of Oceana HK device  | \$235,139          | Oceana Energy Company                               | Ravens, Thomas R                 |
| <b>TOTAL</b>  | <b>\$2,620,154</b> |   |                                  |

## V) Restricted Research Expenditures

FY14 UAA Restricted Research Expenditures by Agency (\$1,000s)

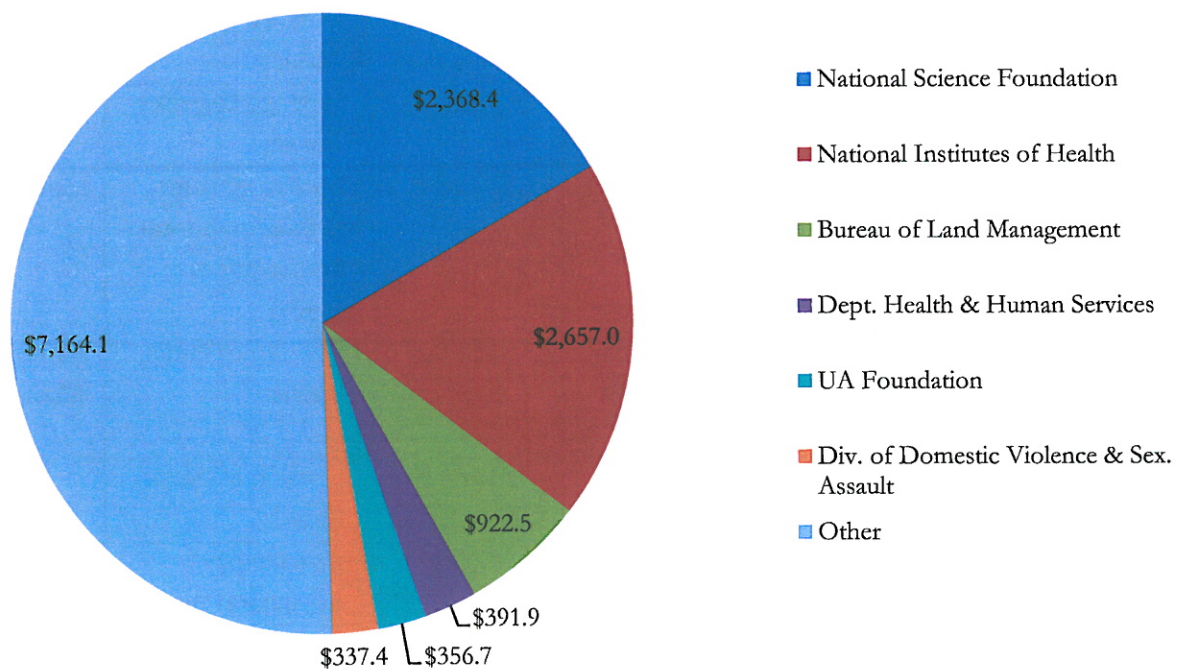


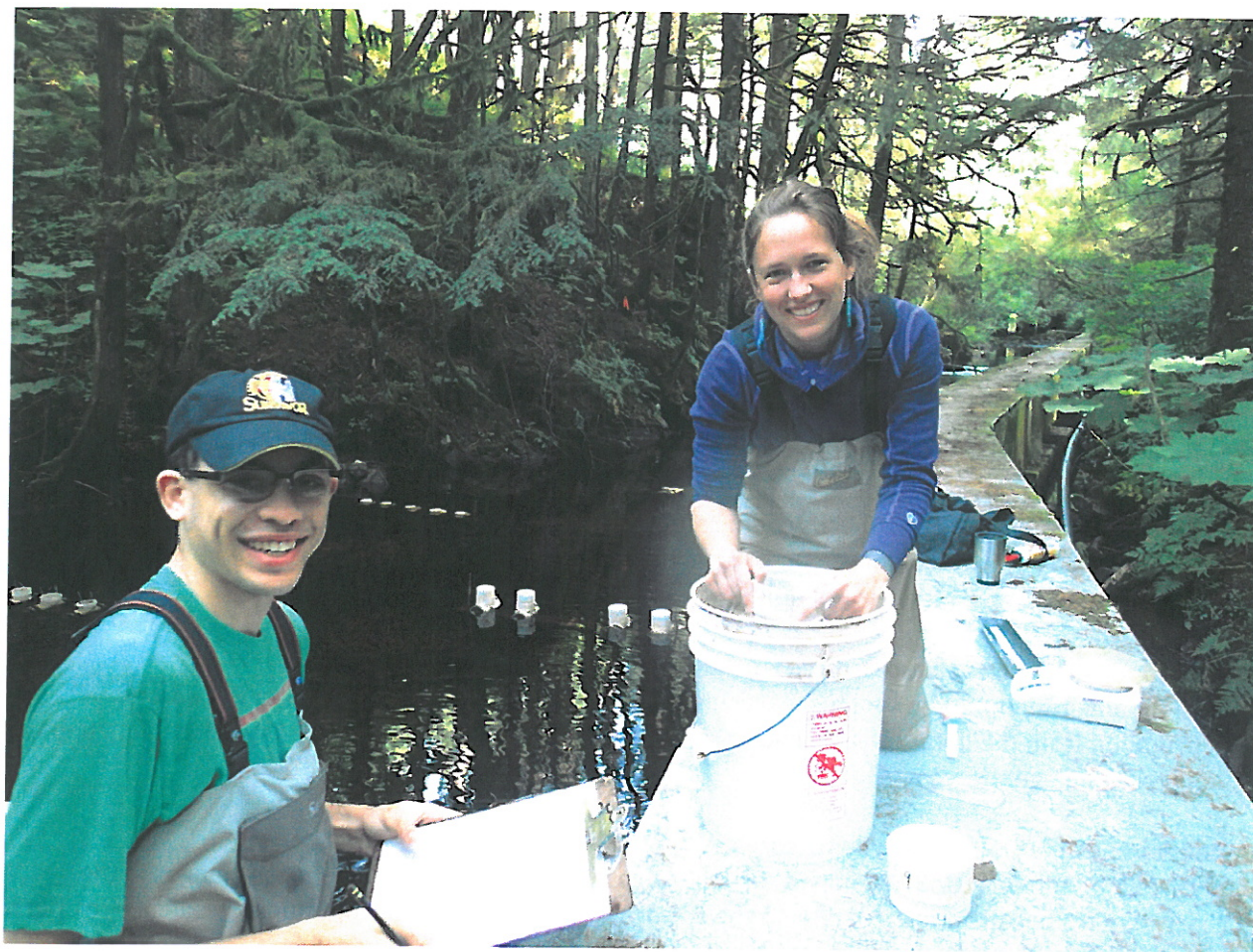
Figure 5: FY14 Restricted Research Expenditures



# RESEARCH AT THE UNIVERSITY OF ALASKA SOUTHEAST

DECEMBER 2012 – MARCH 2014

A Report for the UA Board of Regents  
Academic and Student Affairs Committee



## Overview

UAS engages in high quality research with a focus on the environment and cultures of Southeast Alaska. The School of Arts and Sciences conducts the majority of externally funded research at UAS. This School award undergraduate degrees in the humanities, social sciences, and natural science. No graduate degrees are offered in these disciplines at UAS. A natural outcome of this is our strong focus on including undergraduate students in our research efforts. Students engage in research by volunteering in faculty labs, working as paid research assistants on specific faculty-led projects, gaining funding through our URECA process for conducting their own research projects, and engaging in experiential learning in their coursework.

## Major areas of interest

### Climate-driven impacts on the ecosystem of SE Alaska

Faculty in the biological and environmental sciences collaborate with local, state, and federal agencies to conduct research related to the impacts of climate change on the environment of SE Alaska.

Particularly important projects include the following:

- Salmon run timing and genetics
- Forest-related resources and industries
- Prediction of outburst floods
- Socioeconomic impacts of climate change
- Landscape-scale disturbance interactions and policy responses

### Cross-boundary project development and data integration with British Columbia

Faculty at UAS and in British Columbia have worked together for the past 4 years to develop a rich, layered, GIS data base of use to ecosystem researchers in both SE Alaska and in British Columbia. Annual meetings and regular audio-conferences have helped create a collaboration that we believe will lead to increased funding opportunities and joint projects with our Canadian partners.

### GIS supported landscape assessments

With funding from multiple sources, particularly GINA, UAS supports the SE Alaska GIS library. Information from the library is available to researchers throughout Alaska. This is a critical function for university and agency researchers.

### Icefield to estuary ecosystem linkages

With EPSCoR funding, UAS developed the SE test case to examine biogeochemical changes in the ecosystem from icefield to estuary, and the socioeconomic impacts and community resilience related to those changes. Numerous projects with other sources of funding study individual aspects of the ecosystem. Examples include:

- Nutrient flux throughout the ecosystem
- Carbon cycling and sequestration
- Heavy metal and organic pollutants
- Dynamics of tidewater glaciers and glacier-ocean interactions
- Forest ecosystem ecology

### **Behavioral ecology of marine mammals and their role in maintaining healthy ecosystems**

In collaboration with UAF faculty, UAS researchers in both Sitka and Juneau examine the multiple roles of marine mammals in the ecosystem. Particularly significant to the local economy are the following examples of studies:

- Whale depredation on long-line fisheries
- Impact of sea otters on shellfisheries and kelp beds

### **Effects of environmental variability on marine species**

Several biologists examine the basic physiology and life history of marine species in Southeast Alaska. Examples of this work include:

- Growth and reproduction in crab species
- Effects of pollution and harvesting on seaweeds
- Phenotypic variability in marine species

### **Exploring and documenting the cultural and historical contribution of Alaska Native peoples**

UAS faculty in both Ketchikan and Juneau have a history of working with of working closely with the Alaska Native people to collect data and document the important contributions of Alaska Native people in this region. Many of the projects include field trips and archeological digs where UAS undergraduate students conduct field work.

### **Revitalization and documentation of Alaska Native languages**

An important part of our activity and our commitment to the people of Southeast Alaska is our work in documenting and revitalizing the Tlingit, Haida, and Tsimshian languages. Recordings, translations, and transcriptions of conversations with elders form the backbone of what we have done in the past two years. Expansion in this area will include translation and preservation of numerous written texts and a strong emphasis in teaching the language to all who are willing to learn.

## **Recent trends in external research funding**

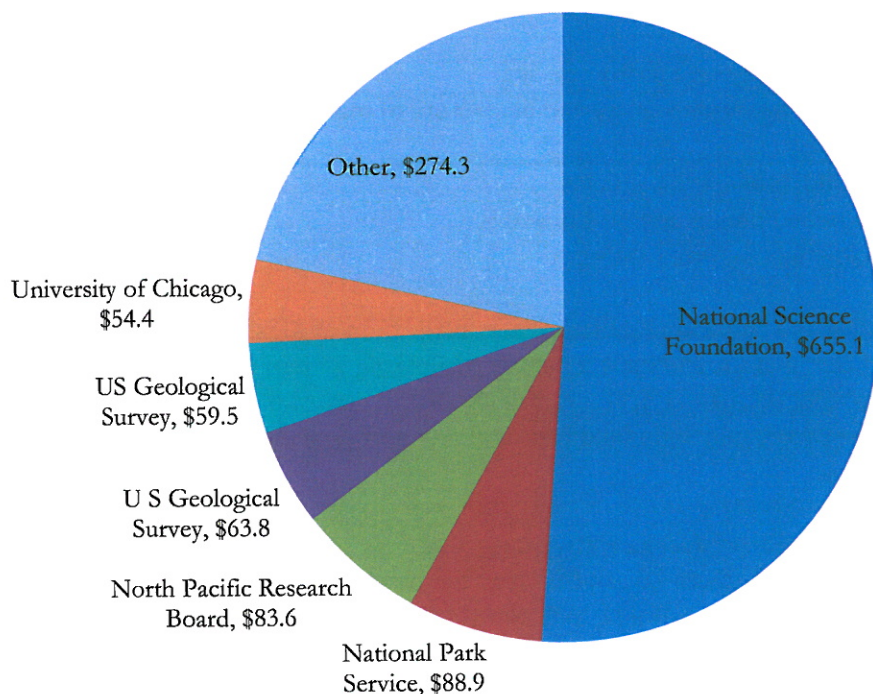
As a small University, small changes in grant funding cause big changes in our overall picture. Research funding was at a high of \$1.6M in FY 2009 and declined to a low of about \$1M in 2011. Funding is increasing at this time. However, for the past five years we have submitted about the same number of proposals annually, but the number of proposals successfully funded has decreased.

NSF is our primary source of funding, both through individual awards to faculty and through our EPSCoR collaborations. Others come from competitive awards through INBRE, Alaska Space Grant, and Alaska Climate Science Center. Many of our individual grants to faculty members come from cooperative agreements with agencies. We have added several new faculty members in the past four years, and lost one established faculty member who garnered particularly large grants. Most of our junior faculty members are successful in getting small grants while establishing their reputations, developing collaborations, and building their laboratory and field capacity.

The data included in the graphs below represent the efforts of approximately 14 faculty members. All but one of these faculty have tripartite appointments with only 20% of their workload devoted to research.



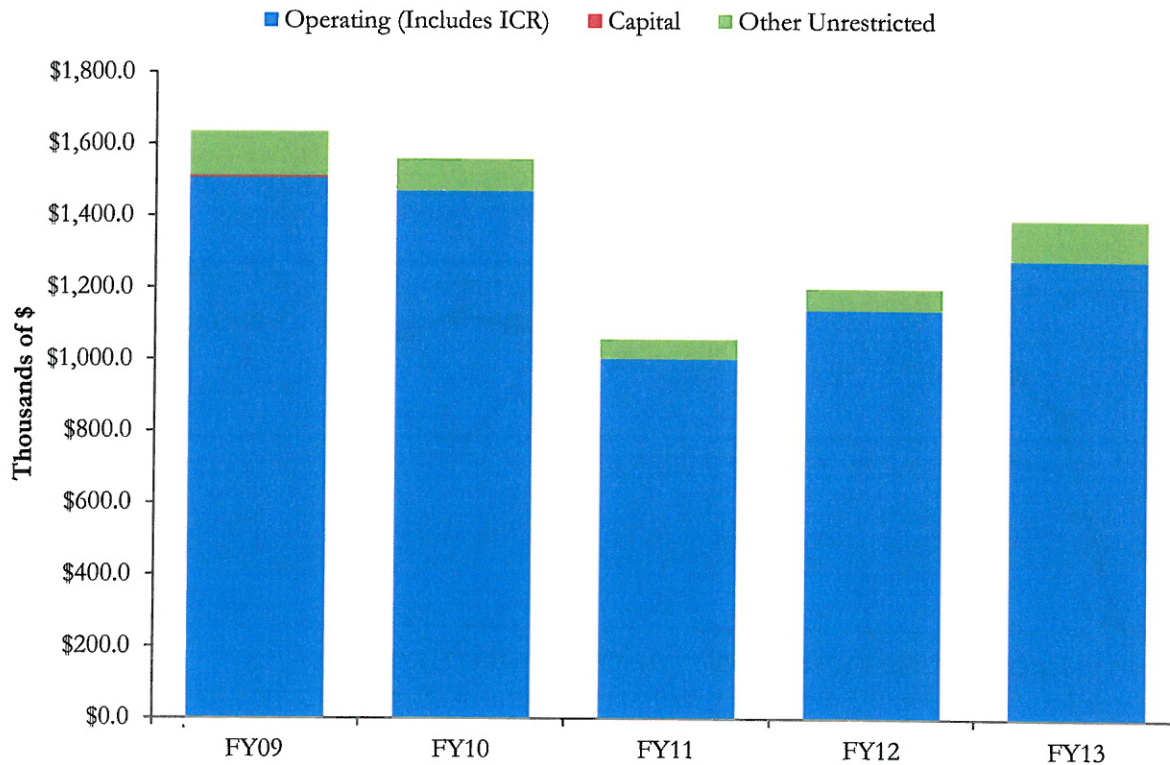
## FY13 UAS Restricted Research Expenditures by Agency (\$1,000s)



Note: These numbers represent research expenditures, including Indirect Cost Recovery (ICR), and not the awarded revenue amount. Grant-Funded Research Expenditures are defined as the amount of grant-funded operating and capital research expenditures, including both direct research expenditures as well as ICR from restricted research grants spent on research and administrative support. This includes externally sponsored research grants booked on the capital budget, a significant portion of which represents State of Alaska funded research. Federal research expenditures are defined as any expenditure with a channel of Federal/Direct, Federal/State, or Federal/Other. State research expenditures are defined as any expenditure with a channel of State/Direct. Expenditures with a channel of Other/Direct are broken into Business, Non-Profit, and Other based on their agency type.

Source: Data supplied by MAUs via UA Information Systems: UA Decision Support Database (RPTP.DSDMGR) FY13.  
Compiled by UA Institutional Research and Analysis.

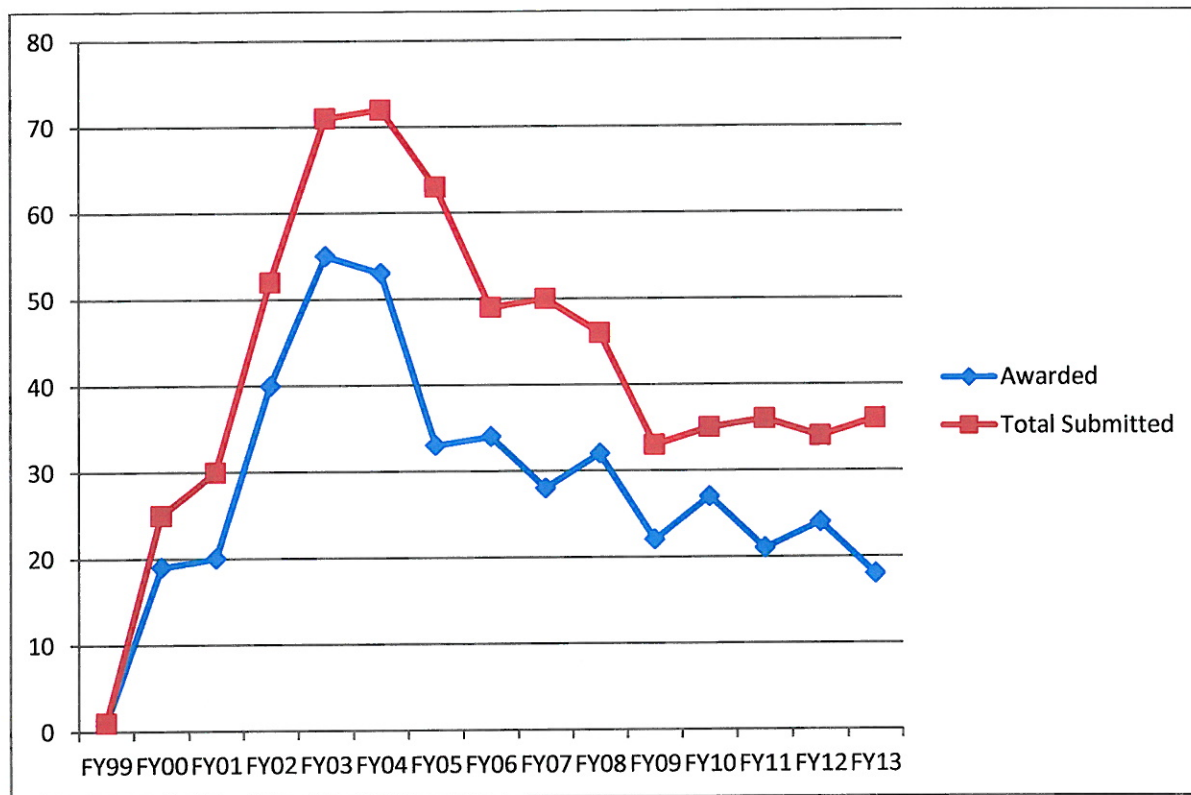
## UAS Research Expenditures



Note: These numbers represent research expenditures, including Indirect Cost Recovery (ICR), and not the awarded revenue amount. Grant-Funded Research Expenditures are defined as the amount of grant-funded operating and capital research expenditures, including both direct research expenditures as well as ICR from restricted research grants spent on research and administrative support. This includes externally sponsored research grants booked on the capital budget, a significant portion of which represents State of Alaska funded research. Other unrestricted funds are defined as general fund revenue with a NCHEMS code of research.

Source: Data supplied by MAUs via UA Information Systems: UA Decision Support Database (RPTP.DSDMGR) FY09 - FY13.

Compiled by UA Institutional Research and Analysis.



Data from UAS Grants and Contracts.

## Future goals or directions

The increased prominence of the Alaska Coastal Rainforest Center, the addition of several new faculty, and the initiation of the Southeast Test Case of EPSCoR are the primary drivers of the new few years. We continue to focus on the following efforts.

- Interdisciplinary work on the impacts of climate change in SE Alaska
- Continued work on climate change impacts to icefield-to-estuary system
- Forest ecosystem ecology in the temperate rainforest
- Transboundary research and data integration program expansion
- New timber products research and development such as yellow-cedar salvage and biomass
- Research infrastructure support and development at Héen Latinee Experimental Forest, Auke Creek Research Station, and other facilities
- Revitalization and documentation of Alaska Native languages
- Increased work in environmental impacts of pollutants and industrial and waste water contaminants
- Understanding and improving communication of science
- Exploring the potential for research as an economic driver in Southeast Alaska
- Increasing partnerships with local, state, and federal agencies and with non-profit groups



## Recent Developments (since December 2012 Research Report)

- The Alaska Coastal Rainforest Center continues to evolve and to develop productive partnerships. This venue for collaborative research across disciplines, across universities, and across borders was particularly successful this year in establishing a joint management agreement with the US Forest Service and Goldbelt, Incorporated, to manage the Héén Latínee Experimental Forest.
- Working closely with the Juneau Economic Development Council, we are exploring joint projects with business and industry significant in SE Alaska. Forest products and tourism are particular areas of interest.

## Major new research accomplishments

### Transboundary ecology and climate change research

The North Pacific coastal temperate rainforest ecosystem extends across the Alaska/Canada political border, as well as across the terrestrial/marine boundary, and many components of this complex system are tightly linked. Collaborations between researchers in Alaska and British Columbia have led to the development of integrated data layers, including watersheds, hydrology, land cover, yellow-cedar distribution, and climate. These integrated layers have allowed the creation of predictive regional models of hydrologic system dynamics, changes in the rain/snow threshold, salmon vulnerability, and yellow-cedar decline. Models such as these help resource managers in both countries plan for future change in fields ranging from freshwater and marine fisheries to forestry to hydropower.

### Ecosystem-level impacts of Glacier Change

Research at the University of Alaska Southeast by Associate Professor Eran Hood and postdoctoral researcher Jason Fellman has provided novel information about how runoff from glaciers, which is expected to change dramatically in coming decades, influences downstream freshwater and marine ecosystems. Their previous work has shown that glacier runoff can be an important source of phosphorus and iron, which are limiting to primary productivity (the growth of phytoplankton and algae) in many aquatic ecosystems. More recently, Hood and Fellman have been studying the influence of organic carbon released from glaciers on aquatic food webs. Their work using carbon-14 dating techniques has shown that the ancient organic carbon released in glacier meltwater is rapidly consumed by microbes living in freshwater ecosystems. In addition, this ancient carbon is being incorporated into the biomass of aquatic invertebrates and juvenile salmonids that live in streams and rivers receiving glacier meltwater. These findings suggest that glaciers are important drivers of ecosystem carbon cycling and that future decreases in glacial runoff could influence the productivity and food web structure of downstream ecosystems. This work has been funded by the National Science Foundation and the Department of Interior Alaska Climate Science Center.

### Woosh een áyá yoo ǵ'atudli.átk. (We're talking conversation.) Tlingit Conversation Documentation Project

Research Professor Alice Taff and her colleagues completed field work to record and annotate new Tlingit material that helps answer questions the questions: How do people talk with each other in daily interactions? How do they conduct their live in Tlingit? These questions, asked by language learners, social scientists and humanists, to different purposes, were addressed by carefully documentation, on

location, in a variety of seasonal settings, a large corpus of spontaneous Tlingit conversations among the Tlingit nation's fluent native speakers. This conversation documentation provides a link between deeply fluent speakers and generations of scientists and new language learners far into the futures. Thirty hours of unscripted Tlingit conversation was recorded and translated into English. Fifteen hours of the conversation was transcribed into Tlingit. Subtitles and transcribed video recordings have been securely archived and have also been made accessible ([http://www.uas.alaska.edu/arts\\_sciences/tlingit-talk](http://www.uas.alaska.edu/arts_sciences/tlingit-talk)) for language students, researchers, and the general public. Each streamed video conversation is accompanied by speaker, translator, and transcriber names in Tlingit and English, geographic location of the recording site, recording date, and detailed contents of the recording. This work was supported by the National Science Foundation.

### **Monitoring the Mendenhall Glacier**

Professors Eran Hood and Jason Amundsen have established a program to monitor the hazards associated with Glacial Melt at the Mendenhall Glacier in Juneau. In the summers of 2011 and 2012, Suicide Basin, located in the Juneau Icefield, filled with glacial melt under the ice and subsequently emptied rapidly raising water levels on Mendenhall River and Mendenhall Lake to near flood stage. "Jökulhlaup" is the Icelandic term for the drainage event, also known as a "glacier dammed outburst flood." It occurs when water fills up a glacial or subglacial lake basin to the point where the ice dam holding it back is forced aside. Partnering with the City and Borough of Juneau, the US Forest Service, the US Geological Survey, and the National Weather Service, UAS faculty and students installed equipment to monitor changes in the icefield, forecast, alert, and notify key personnel to better predict outburst floods.

### **Changes in salmon migration in response to temperature changes**

UAS Associate Professor David Tallmon, working with UAF graduate student Ryan Kovach, and colleagues John Joyce and Scott Vulstek (NOAA), Evan Barrientos (Cornell University), and several UAS undergraduate students, examined data that they and others have collected for the past 30 years at the Auke Creek Fish Weir. They found that both juvenile sockeye and coho biomass increased as freshwater temperatures warmed over the last 30 years; the increase in sockeye salmon biomass was greater than the increase in juvenile coho biomass. However, contrary to predictions and conventional wisdom, the proportion of outmigrating age 2 juveniles has increased and the proportion of outmigrating age 1 juveniles has decreased as temperatures have increased. The variation in how different salmon species respond to changes in the environment supports the idea that biocomplexity in salmon life histories is important for their resilience to changing conditions and should be maintained in order to ensure the long-term persistence of salmon for the people who depend upon them. This work was supported by the North Pacific Research Board, the Sustainable Salmon Fund (ADFG), and NSF EPSCoR. Student interns, supported by a grant from Icicle Seafoods, will continue collecting data on all immigrating and outmigrating salmon stock this summer.

**Major new external research funding awards  
UAS Grants, December 1, 2012 - Present**

| <b>Project Name</b>   | <b>Total Award</b> | <b>Number<br/>of Years<br/>of Award</b> | <b>Proposal<br/>Type</b> | <b>Agency</b>                | <b>PI</b>                                    |
|---|--------------------|---|--------------------------|------------------------------|--|
| Dynamics of Subglacial Erosion, Soft Sediments & Consequences for Glacier Evolution   | \$111,745          | 3.0                                     | New Competitive          | National Science Foundation  | Amundson, Jason M                            |
| Flux and fate of carbon in terrestrial and aquatic ecosystem at the ocean margin of the Alaskan perhumid coastal temperate rainforest | \$49,999           | 5.0                                     | New Non-competitive      | USDA Forest Service (Juneau) | Hood, Eran W                                 |
| A characterization of the specialty wood products market in Southeast Alaska  | \$49,929           | 5.0                                     | New Non-competitive      | USDA Forest Service (Juneau) | Bidlack, Allison Lynn<br>Johnston, Jeffery M |
| UAS Fisheries Support and Development   | \$49,500           | 2.5                                     |                          | UA Foundation                |  |
| Collaborative Research: Digitization TCN: Macroalgal Herbarium Consortium: Marine/Aquatic Environment                                 | \$26,502           | 1.4                                     | New Competitive          | University of Washington     | Stekoll, Michael S                           |
| QA/QC Officer for 2013 Cruise Ship Wastewater Sampling Program  | \$9,221            | 0.3                                     | New Non-competitive      | Admiralty Environmental, LLC | Hoferkamp, Lisa A                            |
| Reproductive biology & life history of the Northern Spot Shrimp   | \$4,689            | 0.5                                     | New Non-competitive      | Alaska Dept of Fish & Game   | Tamone, Sherry L                             |
| Collaborative Research: Representing Calving & Iceberg Dynamics in Global Climate Models  | \$1,000            | 4.0                                     | New Competitive          | NOAA NMFS                    | Amundson, Jason M                            |

Notes: Includes all active grants with an award date between December 1, 2012 and February 28, 2014 and a Grant Type of Research/Development.

Sources: Data supplied by MAUs via UA Information Systems: Live BANNER Data (as of 02/28/2014) from FRBGRNT and FRBPROP. Compiled by UA Institutional Research & Analysis. iData 5557