



The planned NW entrance of the New Engineering Building.

2012 Engineering Connections Dinner

The Engineering Connections Dinner, an event co-sponsored by the Society of Women Engineers (SWE) and the American Society of Civil Engineers (ASCE), was held September 18th at the Westmark Gold Room. The Connections dinner was part of the Energy Week and provided everyone with a great opportunity to start networking and connect with future employers.



The team of organizers that put together this year's Engineering Connections Dinner. (Photo by SWE)

The New Engineering Facility

Construction of the new UAF College of Engineering and Mines Engineering Facility will soon be underway and groundbreaking will occur on March 30, 2013. More laboratory space and a structural engineering strong wall are just some of the many innovative features that the new building space will provide.

This new facility will extend from the existing Duckering Building, adding approximately 119,899 new gross square feet and connecting the School of Engineering and Mines with the School of Management, which will encourage collaborative relationships between the two disciplines. Since 2006, the enrollment in the engineering programs has nearly doubled, going from approximately 500 students to roughly 900 now. With the corresponding increase of faculty and staff, space in Duckering now comes at a premium.

To respond to the state's need, the UA Board of Regents set a priority to move than double the annual number of baccalaureate graduates to 200 to include UAF and UAA engineering program graduates.

According to College of Engineering and Mines Dean Doug Goering, ongoing research projects have been hindered by the lack of suitable workspace. (continues on Page 3)



Overlooking the three-story tall High Bay Laboratory of the New Engineering Building.

A Letter From The Dean

Welcome to the first edition of the CEM Newsletter. I am excited about this new opportunity to communicate with our stakeholders, and I think you will find the contents engaging. It's a great time to be connected to CEM, to witness unprecedented levels of support for new facilities, the great successes of our faculty and students, and wonderful opportunities for our graduates.

It's also a time of unprecedented support for engineering in general. This past February, the President's Council on Jobs and Competitiveness called on the nation to produce 10,000 more engineers a year over the next decade. The UA Board of Regents has also called on us to double the number of engineering graduates in Alaska. High demand for engineers in the U.S. is resulting in high salaries and many opportunities for our graduates. Earlier this year, CNN identified engineers as the top earners of recent college graduates.

At the same time the State of Alaska and the University of Alaska Fairbanks are making

substantial investments in engineering education. These investments are attracting additional faculty and allowing new facilities to come on line. The impact is better service to our students and to the State of Alaska. We are making great progress and contributing to President Obama's call for more engineering graduates. In parallel, we are focusing more intently than ever on research that benefits Alaska. Research in areas such as energy, adaptable infrastructure, natural resources, and the environment contributes to the economies of Alaska and the nation.

I hope you enjoy the articles in this inaugural edition of the newsletter. You'll find more information about recent accomplishments and the exciting developments we're working on now. I'm sure that you will come away with a sense of refreshing excitement and engagement with the college. Thanks for your ongoing support, and please feel free to give us your feedback.

Douglas J. Goering
Dean



Department News

Department of Civil Engineering

Even though marine highways provide a necessary service for coastal communities in a number of regions within the United States, the knowledge base for marine highways is less developed than for other modes of transportation; they are often overlooked in transportation studies even though marine highways are actually part of the U.S. highway system. "Characterizing the Load Environment of Ferry Landings for Washington State Ferries and the Alaska Marine Highway System," a project led by Andrew Metzger, is designed to help fill an existing knowledge gap by studying vessel impact parameters as vessels land against docking structure. When information is lacking, engineers and planners of marine highway facilities must make assumptions about how to finance, design, build, operate, and maintain these significant transportation systems, often with considerable uncertainty. Metzger's study intends to provide probability-based engineering design criteria for vessel impact demands.

Department of Electrical Engineering

Professor Seta Bogosyan is the PI of CyberAlaska, a project supported by NSF Cyber-Physical Systems (CPS), Office of Cyberinfrastructure (OCI), and GK12 programs. The recent grant coordinating activities in the ECE and CS departments are structured as a GK12 project, in that selected graduate fellows performing research in CPS are involved in teaching and mentoring high school teachers and students with

well-planned lectures and level-appropriate projects related to their CPS research. The ultimate goal is to enhance the graduate fellows' communication and multidisciplinary team leadership skills and to provide them with a better understanding of the theory/practice underlying their research through the communication of somewhat complicated CPS concepts to a less technically savvy audience. Motivating and educating teachers and students in engineering and computer science and the preparation of STEM teachers and students in this emerging priority area are the other aims of the project. As the first CPS effort in the nation at the high school level, the project will yield a 9-12 grade level "tested" CPS curriculum, supported with hands-on research projects and competitions involving networked ground, aerial, and underwater robotic platforms and associated dynamic data-driven simulations, all led by the selected graduate fellows of CEM. Bogosyan is assisted by Co-Investigators Orion Lawlor (CS), Greg Newby (ARSC), and graduate fellows Steven Kibler (ECE) and Mike Moss (CS).

Department of Mechanical Engineering

With the assistance of four Ph.D. students, Professor Debendra Das and the nanofluids group have been successful in developing new correlations for thermophysical properties of different nanofluids and their performance in different models of heat exchangers from analytical, experimental and numerical studies. (continues on Page 3)

The New Engineering Building (continued from Page 1)

Additionally, students are challenged by increased traffic in the computer labs and crowded study rooms. The new building will have many innovative features, including the addition of approximately 40 laboratories, a state-of-the-art cold room facility, and several flex labs with detachable walls that will allow the lab size to fluctuate with projects.

The building extension will also allow room for potential new programs, such as a chemical engineering program, something that has been desired by students and faculty alike for several years.

Plans also include a structural engineering strong wall measuring over 15 feet high and housed in a three-story tall high bay laboratory. Each of these components will serve the dual purpose of teaching and research. Faculty offices will be assigned throughout the building at various locations to promote cross-departmental collaboration and research, from interdisciplinary fields, ranging from economics to anthropology to fire science.

The building extension will also allow room for potential new programs, such as a chemical engineering program, something that has been desired by students, faculty and industry alike for several years.

After winning a competitive bid process, the architecture firm of ECI Hyer/NBBJ is in the process of designing the new facility. It will be built to LEED silver standards (a ranking system for the design, construction, and operation of green buildings). Additionally, by having it attached to an existing building, heating costs are expected to be greatly reduced, resulting in a lower carbon footprint.

The project will cost \$108.5 million, and it is part of a total funding effort with the UAA School of Engineering's new facility in Anchorage. Funding has been provided for half the construction costs to date for both facilities, thanks to a collaborative effort with the UAA School of Engineering and external advocates who convinced the legislature and governor of the pressing needs in the engineering fields. The UA Board of Regents have submitted a request to the governor for the other half of the funding for both facilities, and the legislature will consider this request in the upcoming 2013 legislative session. The official groundbreaking is scheduled for March 30, 2013. Under current estimates, the building should be finished and open to students for the spring semester of 2016.

Image top left: An aerial view of the new engineering facility. The extension will be nestled between the current Duckering and Bunnell Buildings using the space that is currently a parking lot.

Image bottom left: West view facade of the new engineering facility.

Department News (continued from Page 2)

This research will benefit Alaska, where improving the performance of building heating systems is of paramount importance. This past year, students interested in aerodynamics and astrodynamics formed a new student organization: The UAF Student Aero Group. During their first year, they competed in the American Institute of Aerodynamics and Astrodynamics' (AIAA) Design/Build/Fly (DBF) competition by designing, constructing, and flying a radio controlled aircraft in the national competition held in Wichita, Kansas. The DBF experience was considered a success and the group is presently awaiting AIAA's release of this year's competition list and rules to see what projects they might choose to enhance their educational experience.

Department of Mining and Geological Engineering

Taylor Duggar (MIN) and Marina Critchett (GE) were named by faculty as the Outstanding Students from the two undergraduate programs for the last academic year. The academic year also saw faculty receive prestigious awards. Sukumar Bandopadhyay was awarded the AIME Mineral Industry Education award for advancing mining education in Alaska and mentoring students worldwide, and the SME Coal Division's Percy-Nicholls award for notable scientific or industrial achievement in solid fuels. Margaret Darrow was awarded the CAREER grant from NSF. The department also had much to rejoice from once again placing 100% of the graduates, with many heading

to employers such as the State of Alaska, British Petroleum and Freeport McMoran, with the rest opting for graduate school. Will Collingwood has a new role in the department. Besides finishing his MS (Mining Engineering) degree and joining the PhD program, he will assist the department by independently teaching two classes. For being current on the department, visit/"like" us at <http://www.facebook.com/UAF.MinGeoEngg>

Department of Petroleum Engineering

Professor Shirish Patil was the recipient of the Society of Petroleum Engineers (SPE) Distinguished Member award. He is one of the 14 distinguished memberships that were awarded this year. UAF's SPE student chapter faculty advisor, Abhijit Dandekar, nominated three PETE seniors to participate in the Education Week that will be held in conjunction with the 2012 Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC) from 11 – 14 November. Wade Boman (PETE senior), who was selected by the committee to participate in the Education Week, will be one of the 60-80 students from all across the globe that were selected for this event. The American Association of Drilling Engineers (AADE) student chapter at UAF now has a new faculty advisor, Shirish Patil. Finally, UAF's SPE student chapter officers, Chaitanya Borade, Sally Starn, J. Kyle Raese and Justin Cannon attended the student chapter officers' workshop held during the 2012 SPE ATCE in San Antonio.

Research News

A Note from INE Director Dan White

The Institute of Northern Engineering (INE) is home to many of the world's leading researchers in cold weather and cold climate engineering. Our research spans disciplines, offering expertise in energy production, modeling and testing of mechanical systems, environmental engineering and hydrology as well as infrastructure, mining, and petroleum development. Federal and State agencies along with private industry come to INE to meet their basic and applied engineering research needs for cold or isolated environments. INE's researchers have an unequalled reputation for conducting fieldwork in the remote and extreme regions of the earth.

Although well-known in the arctic regions of the world, INE's researchers are increasingly being drawn into global scale projects as mining, oil development, shipping, and other global industries look north to the future. Technologies that will allow expansion into the Arctic were developed by INE. The history, expertise, and facilities in INE make our researchers well-positioned to lead the world's industries and agencies into the North; protecting the environment, developing its resources, and providing sound engineering applications.

I invite you to visit INE, our facilities, faculty, staff, and students. Participate as a funder of research, donor to our research foundation, partner in enterprise, or curious individual. If you are an aspiring faculty, staff or student, check us out. INE offers full research services including grant writing, budget management, purchasing, travel, editing, and human resources support. Be a part of something bigger, a well-established but still growing research enterprise that allows you to grow as an individual and achieve your goals.

Contact Aly Englert at 474-5457 or aenglert@alaska.edu to schedule your visit today.

Research Center Updates

ACEP: When it comes to drilling for Alaska's energy resources, oil and gas exploration come to mind. But there is another type of energy resource that can be exploited from deep within the earth – geothermal energy. This summer, the **Alaska Center for Energy and Power** partnered with researchers at the Geophysical Institute to characterize the Pilgrim Hot Springs geothermal site located approximately 35 miles north of Nome, and simultaneously test an innovative remote sensing technique that could significantly reduce the cost of geothermal resource assessments. The team is drilling a series of 1000+ foot holes to identify the source of the geothermal fluid and verify expected reservoir temperatures to estimate if this resource has the potential to power Nome. The project is funded by the Department of Energy (\$3.6M) and the Alaska Energy Authority Renewable Energy Grant Fund (\$1.9M). Project partners include the United States

Geological Survey, Unaatuq LLC, Bering Straits Native Corporation, and Mary's Igloo Native Corporation.

AUTC: The Institute of Northern Engineering and **Alaska University Transportation Center** started a new Marine North research program, which will be led by Andrew Metzger, Assistant Professor of Civil and Environmental Engineering. The program will focus on marine transportation in northern latitudes, and all engineering aspects surrounding it. It will provide technical support for policy development and address emerging research needs of numerous government and private industry stakeholders at a time when Arctic maritime transportation is becoming an imperative topic for Alaska. Increased international activity and interest in the Chukchi and Beaufort Seas in specific raises needs for onshore support through infrastructure and technology that are currently unmet.

(continues on Page 5)

Welcome & Farewell

New Faculty

- Matt Bray
Research Faculty, PDL
- Jeremy Kasper,
Research Faculty, INE
- Anton Kulchitsky
Research Faculty, INE
- Nicole Misarti
Research Faculty, WERC

New Staff

- Alyssa Englert
Assistant to the INE Director
- Jennifer Hedrick
Office Manager, Petroleum Engineering
- Katie Ridenour
Purchasing Coordinator, INE

Farewell

- Gang Sheng Chen
*Assistant Professor,
Mechanical Engineering*
- Erica Franich
Proposal Coordinator, INE
- Geoff Jacobs
Purchasing Coordinator, INE
- Stephanie Knaebel
Office Manger, Petroleum Engineering
- Amy Rath
Education Outreach Coordinator, ACEP
- Hollie Seiler
Purchasing Coordinator, INE
- Dan Walsh
*Professor, Mineral Preparation
Engineering*



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Research Center Updates (continued from Page 4)

MIRL: “Alaska-centric” and “cooperative” best describe the research in this *Mineral Research Industry Laboratory* update.

Margaret Darrow and her graduate student, Jason Zottola (MS, Arctic Engineering), are currently exploring the effect of groundwater flow on permafrost degradation under Alaskan roadways, in a project funded through AUTC. Ronnie Daanen (INE) is also part of the project.

Sukumar Bandopadhyay and his graduate students, Vaibhav Raj and Will Collingwood, on the other hand, have been tackling the role of temperature in the air inversions often seen in Alaska’s surface mines. Bandopadhyay’s team (including recent doctoral graduate Abhishek Chowdhury) is the first ever to numerically model open pit mine ventilation in 3D.

Professors Rajive Ganguli and Dan Walsh are looking into benefits of ultra-cleaning Alaska coal before gasification in a project funded through ACEP. In the same project, Ganguli and his graduate students, Mandar Kulkarni and Zeeshan Shaikh (both MS, Petroleum Engineering) are also exploring gasification using process modeling. Professor Walsh continues advising local placer miners on gravity separation of gold. The past year also saw the establishment of two programs to support graduate student research. The Mining Engineering Research Foundation, supported by Kinross Corporation and Sumitomo, will support mining engineering research, while an agreement with the Alaska Division of Geological and Geophysical Surveys will support geophysical research.

WERC: The *Water and Environmental Research Center* welcomes a new addition, Nicole Misarti, to its research team. Misarti received her Ph.D. from UAF’s School of Fisheries and Ocean Science in 2007 and, until recently, worked first as an NSF Postdoctoral Fellow at Idaho State University and then as a Postdoctoral Researcher at Oregon State University. Misarti’s research interests are broad in scope.

She focuses on long-term marine ecosystem change, climate change, and archaeology. One of her goals is to use long-term proxy data to augment current research on coastal ecosystems in order to assist management and conservation decisions. Misarti is currently involved in a sea otter food web study on Kodiak Island that includes data from field collections in the intertidal as well as data from archaeological sites in the same locations. She is about to begin a project on the Bering Sea coast that involves archaeological excavations and recovery of faunal material to track ecosystem change during known periods of climatic fluctuations. She is also involved in an ongoing bio-complexity project with university researchers and local communities on the Pacific coast of the Alaska Peninsula as well as research along the coastlines of southern Chile and Argentina.

PDL: “Development of an Improved Cement for Geothermal Wells,” a study funded by the US Department of Energy, is one of the recent projects in the *Petroleum Development Laboratory*. PDL research assistant professor Matthew Bray and undergraduate research assistant Justin Cannon are conducting tests to measure free water and compressive strength screening tests of various blends of different zeolites and API class H cement. Justin will soon be heading to Baker Hughes facilities in Bakersfield, CA to acquire training on use of specialized cement testing equipment. The project in collaboration with Trabits Group LLC, Wasilla, Alaska, and Baker Hughes expects to develop light weight cement for geothermal wells. Additional applications to arctic permafrost regions are also being explored.

Research At A Glance

INE researchers submitted 150 new proposals in FY12. So far, 59 of these (39%) have been funded. Requested funding for these awarded projects totals roughly \$8 million.

Some of our recently funded projects include:

- Matthew Wooller, Director of the Alaska Stable Isotope Facility, has been awarded \$343,000 by the National Science Foundation for “Collaborative Research: Paleoclimate, Paleoenvironment and Other Potential Drivers of Extinction of Mammuthus primigenius, St. Paul Island, Pribilof Islands, Alaska.”
- Petroleum engineer Abhijit Dandekar won funding from ConocoPhillips for “Mechanistic Studies for Improved Understanding of Low-salinity Waterflooding based on EOR and Potential Application in the Greater Kuparuk Area” (\$180,000).
- Geological engineer Margaret Darrow received funding from the Alaska University Transportation Center and the Alaska Department of Transportation & Public Facilities to study “Monitoring and Analysis of Frozen Debris Lobes, Phase 1” (\$100,000).
- Douglas Kane, INE WERC researcher, won funding for a new National Science Foundation project, “Dominant Heat Fluxes in Streams & Rivers in Alaska,” a joint effort with Utah State University (UAF funding = \$300K).
- INE/ACEP researcher Jerry Johnson has kicked off a project on developing “Debris Detection and Mitigation for an In-river Hydrokinetic Device” (\$200,000).
- New research faculty member Nicole Misarti begins her career at INE with a newly funded NSF grant: “Collaborative Research: Establishing Baselines for Nearshore Marine Ecosystems by Examining Sea Otter Trophic Variation over 5,000 years of Climatic and Anthropogenic Change” (\$268,716). This project aims to determine an isotopic baseline for sea otter communities in two areas of Alaska that span several thousand years and compare that baseline to historic and modern communities.