FORESIGHT

Spring/Summer 2013, Volume 39, No. 1



UNIVERSITY OF WYOMING College of Engineering and Applied Science

Dean Rob Ettema

Associate Dean, Academic Programs Steven Barrett

Associate Dean, Facility Development Jay Puckett

Executive Business Manager Cricket Hoskins

> Departments Atmospheric Science Al Rodi, Head 307.766.4945 www.atmos.uwyo.edu

Chemical and Petroleum Engineering David Bagley, Head 307.766.2500 www.uwyo.edu/chemical

Civil and Architectural Engineering Dick Schmidt, Head 307.766.5255 www.uwyo.edu/civil

> **Computer Science** Iim Caldwell, Head 307.766.5190 www.cs.uwyo.edu

Electrical and Computer Engineering Mark Balas, Head 307.766.2279 www.uwyo.edu/electrical

> Mechanical Engineering Paul Dellenback, Head 307.766.2122 www.uwyo.edu/mechanical

.......

Manager of Marketing and Communications **Chief Editor** Jonathan Barrett

FORESIGHT is distributed twice per year by the College Communications Office. For additional copies contact:

CEAS Communications and External Relations 307.766.4248 • engevents@uwyo.edu

Persons seeking admission to the University of Wyoming shall be considered without regard to race, color, religion, sex. national origin, disability, age, veteran status, sexual orientation, or political belief.

Content www.UWYO.EDU/CEAS

Spring/Summer 2013, Volume 39, No.1

3 Dr. Charlie Dolan, H.T. Person Chair and Professor: Recipient of the 2013 John P. "Jack" Ellbogen Lifetime Teaching Award

Women in Engineering: Stacia Slowey

Crossing the Atlantic: The UW King Air (UWKA)

9 Wyoming Wind Complements Renewable Energy Sources from Other States

10 Larry Oolman Recipient of the UCAR/Unidata De Souza Award

> 11 Engineers in Action: Cody McKinney

14 Dr. Carl Frick Awarded 2013 Faculty Early Career Development Award from the NSF

15 Air Pollution Research at the University of Wyoming

> 16 New Faculty and Staff

> > 17

Dr. Wright and Dr. Barrett Receive Los Alamos Funding for Passive Muon Imaging Project

> 18 **Department Highlights**

> > 21 In Memoriam

On the cover: Dr. Carl Frick, a University of Wyoming Assistant Professor of Mechanical Engineering, has been awarded a 2013 Faculty Early Career Development (CAREER) Award from the National Science Foundation (NSF). (full article on page 14)

FROM THE DEAN

Our college is entering a period of exciting times.

A directive from Wyoming Governor Matt Mead and the Wyoming Legislature has created an excellent opportunity for substantially advancing our programs and facilities. This directive tasks us to develop a plan aiming UW's College of Engineering and Applied Science toward becoming a "tier one" academic institution in areas of excellence appropriate for Wyoming. To reinforce this directive, Governor Mead appointed a taskforce focused on UW's energy, engineering, and STEM activities to help develop a set of broad goals associated with developing and delivering excellent programs of education and research.

The term "tier one" can be taken to mean several things. My colleagues and I view it as best meaning that our programs shall become even more competitive with leading programs in the nation, especially in UW's designated areas of distinction; indeed, in certain areas, notably our undergraduate programs, we are nationally competitive. Accordingly, we are committed to carefully increasing faculty and staff numbers, expanding and upgrading facilities, and visibly promoting the college's reputation for excellent programs of education and targeted research. Additionally, we have begun working on the following series of developments:

- Niche areas of excellence central to UW's STEM areas of distinction
- Computational methods, and thinking, integrated throughout undergraduate and graduate curricula while also underpinning research programs
- Advanced experimental facilities supporting the niche areas
- Funding to recruit talented undergraduate and graduate students from Wyoming and beyond
- Productive partnerships forged with industry and agencies

These developments align with Wyoming's and the nation's need for STEM expertise, and reflect major trends in engineering and science. Moreover, the developments will fully utilize the high-quality facilities sought for the Engineering Complex Project, described in earlier issues of Foresight.

The concept of niche excellence applies particularly to graduate study and research, where we will concentrate people and facilities. Additionally, the niche areas will capitalize on expertise across UW and beyond. Niche areas include:

- Unconventional oil and gas reservoirs (new technologies to advance recovery rates and processes)
- Advanced coal technologies, along with energy conversion and delivery (creating value-added technologies and expertise for converting Wyoming's energy resources and ensuring reliable delivery to markets)
- Computational fluid and material mechanics (computer methods used to model physical processes, acquire and mine data, and visualize complex processes)
- Water and atmospheric resources (science and technologies addressing water-resource and climate issues facing Wyoming and the West)
- Biomedical and biological engineering (new materials and methods for improved healthcare)

These niches connect and sit on a strong base of core expertise having the capacity to support, broaden, and invigorate. We envision drawing upon lateral expertise (e.g., developments in computational science, mechatronics, and civil infrastructure benefit many activities), and enabling promising new developments to be pursued. A suitably broad base is required so that we can meet our commitment to producing significant portions of the graduate talent and research expertise needed to support Wyoming's needs.

The cover story of this issue of Foresight highlights the work of Dr. Carl Frick, who exemplifies the cutting-edge research conducted by the college's talented faculty members. His research exper-



tise deals with the relationships between the microstructural behavior of materials and the mechanical performance sought for various innovative applications, such as in biomedical engineering. Dr. Frick's research passion flows into the courses he teaches, and helped win him a prestigious 2013 Early Career Development Award from the U.S. National Science Foundation.

Rest assured that our proud tradition of delivering rock-solid undergraduate programs (as good as any in the nation) will be enhanced via curricular adjustments, exposure to cutting-edge research such as pursued by Dr. Frick, and increased opportunities for student internships (summer jobs) while maintaining student-focused services (advising, scholarships, job placement) and optimal student/ faculty ratios.

Our college is handily positioned to move on the opportunity presented by Governor Mead and the Wyoming Legislature. Their commitment to UW and the college will yield long-term results for Wyoming's economic development while providing the college a distinctive signature in the landscape of American universities.

Robert Ettema

/ Jetua

Dean



Dr. Charlie Dolan, H.T. Person Chair and Professor: Recipient of the 2013 John P. "Jack" Ellbogen Lifetime Teaching Award

Dr. Charles "Charlie" Dolan was selected as the recipient of the John P. "Jack" Ellbogen Lifetime Teaching Award for 2013. This award is the highest honor that the university awards for teaching. The award is "to recognize the long distinguished and exemplary career of one senior faculty member who has excelled as a teacher at the University of Wyoming."

In addition to this, Charlie has received a number of awards in recognition of his outstanding contributions to teaching and professional service at UW including: CASE Professor for 2011; the Precast/Prestressed Concrete Institute Martin P. Korn Award for contributions to the design and research advancements of prestressed concrete for 2011; Tau Beta Pi Engineering Honor Society - Wyoming Eminent Engineer of the year for 2010; and the recipient of the Top Prof Awards in 1995, 2003, and 2010.

His authored textbook the, *Design on Concrete Structures*, is currently in its 14th edition, and is now utilized by thousands of structural engineering students from around the globe.

At the close of the 2012 Fall semester, Dr. Dolan retired as the inaugural H.T. Person Engineering excellence chair. In 2002, the College of Engineering and Applied Science conducted a national search to find an outstanding engineering educator to fill the H.T. Person Chair. The Chair was named in honor of H.T. Person who served the University of Wyoming from 1929 to 1968 as a Professor of Civil Engineering, Head of the Department of Civil Engineering, Dean of the College, and 16th President of the University. H.T. Person's primary concern was always the student. The students remembered his ability to make complicated subject matter understandable, and that his door was always open to them. When grades were slipping or students were discouraged, he was the one who talked them into completing their degrees. H.T. used his contacts to find employment for his students. He was a mentor, father figure, and friend.

The 2002 search ended with the selection of Charlie Dolan, then a faculty member in the Department of Civil and Architectural Engineering. The charge for the H.T. Person Chair included providing leadership for design related teaching and learning including increasing and strengthening interdisciplinary experiences and spearheading efforts to improve teaching and learning in the College.

"Dr. Dolan is the educator's educator. He is what we all aspire to be." Dr. Steven F. Barrett, Associate Dean of Academic Programs

As the H.T. Person Chair, Dolan developed a set of motivating freshmen design challenges used in the ES-1000 Orientation to Engineering course. The design challenge provides students the opportunity to practice the design process through a motivational, team-based, hands-on design exercise. Over the last several years, design challenges have included balloon launchers, wind generators, Styrofoam planes, hill climbing robots, and underwater robots. Students have a lot of fun while learning critical engineering skills. Dolan's collection of freshmen design challenges has been published by Morgan and Claypool Publishers, in the book titled *The Engineering Design Challenge, A Creative Process*.

During his years as the H.T. Person Chair, Charlie strengthened the nontechnical skills of our graduates. He achieved this through his involvement in teaching the interdisciplinary honors course, Technology and Society, and through leading a series of multidisciplinary capstone design projects for the College's graduating seniors. Charlie involved students in real world, complex engineering projects. Students were required to design the technical portions of the design but also consider the soft skills including environmental impact, public opinion, and project marketing. Dr. Dolan's contributions will be sorely missed.

Charlie lives the spirit of this award daily. He has dedicated himself to outstanding undergraduate teaching most notably in the areas of freshman orientation, senior design, scholarship and service.

Coming soon from Morgan & Claypool Publishers

The Engineering Design Challenge: A Creative Process Charles W. Dolan, P.E. H.T. Person Chair of Engineering

Synopsis:

The H.T. Person Endowment at the University of Wyoming was established in 1990 to focus on undergraduate education. Introducing and teaching design to undergraduate students has been the focus of the H.T. Person Chair for over a decade. It is my pleasure to share some of the chair's experiences with you in the hope that they may be of assistance to your program. In addition to the description of the projects, the methodology for organizing and executing the projects is presented.



Charles W. Dolan, P.E. H.T. Person Chair of Engineering



Robert Ettema, Dean



*The University of Wyoming Libraries subscribe to the Morgan and Claypool Publishers online subscription service. Copies of Dr. Dolan's book can be downloaded at no cost from the Morgan and Claypool Publishers website (www.morganclaypool.com) when accessed from a UW IP address.

"In the almost 30-years that I have been teaching engineering students on the job and in the 25 years that I have been teaching them in the classroom, I have run across just a few students who are capable of getting the kinds of grades in the difficult engineering curriculum that Stacia has, while simultaneously participating in numerous extracurricular activities," says Design Squad supervisor Jim Kladianos. "She brings a level of enthusiasm and a 'go-getter' attitude to the workplace that is unlike anything I have experienced before."

Wyoming

Women in Engineering: Stacia Slowey

11

Stacia Slowey was recently named one of the 2013 New Faces of Civil Engineering – College Edition by the American Society of Civil Engineers (ASCE). She will graduate this May as a double major in Civil Engineering and Environment and Natural Resources. She is the second UW Civil Engineering woman in a row to be recognized by ASCE as one of the "New Faces." Gretchen Heberling landed this distinction in 2012.

Each year ASCE seeks out 10 individuals, 30 years of age or younger that exemplify qualities of leadership, technical prowess, confidence, integrity, sound judgment, and a positive attitude, to receive this honor. These students are chosen based on their demonstration and promise of becoming future leaders in the engineering profession.

"In the almost 30-years that I have been teaching engineering students on the job and in the 25 years that I have been teaching them in the classroom, I have run across just a few students who are capable of getting the kinds of grades in the difficult engineering curriculum that Stacia has, while simultaneously participating in numerous extracurricular activities," says Design Squad supervisor Jim Kladianos. "She brings a level of enthusiasm and a 'go-getter' attitude to the workplace that is unlike anything I have experienced before."

Stacia has additionally been selected as the civil engineering Outstanding Senior by the Joint Engineering Council. She has also been nominated for the Rosemarie Martha Spitaleri Award, UW's prestigious recognition of the outstanding female graduating senior. This recognition is based on scholarship, leadership, contributions to the university and character. The recipient of this award epitomizes the ideal role model of student scholarship and achievement.

www.uwyo.edu/ceas/news/womeninengineering

Women in Engineering is an article series developed to highlight a select group of women that continue to set the standard of academic and extracurricular excellence. While declining female enrollment in undergraduate engineering programs has been a continuing issue at universities nationwide, the women of the College of Engineering and Applied Science continue to emerge as some of our College's top leaders. These scholars continue to hold significant leadership roles and are being recognized for their unprecedented work ethic and academic achievement.



Amy DiRienzo MS in Mechanical Engineering

Alicia Martin MS in Mechanical Engineering

Emily Huth MS in Environmental Engineering

Outside of engineering, Stacia pursues an interest in the fine arts. Throughout high school, Stacia spent much of her free time in the pottery studio. She graduated high school as an International Baccalaureate with the Art Option and has also had her work published in a textbook.

Stacia grew up in Thornton, CO and chose the University of Wyoming because of its close, but not too close, proximity to home.

During her time at the University of Wyoming, Stacia has served in a plethora of positions including President of the Society of Women Engineers; Treasurer of the Institute of Transportation Engineers (ITE); webmaster for Tau Beta Pi; and was also a member of both the Tau Beta Pi and the Mortar Board honor societies.

Stacia currently works for the Wyoming Department of

Transportation's (WYDOT) Laramie Design Squad under the supervision of Jim Kladianos. The design squad is a cooperative education unit operated by WYDOT in conjunction with the Department of Civil and Architectural Engineering. Members of the squad are full-time engineering students who work a minimum of 20 hours per week for WYDOT, producing contract plans for highway construction projects.

Stacia encourages women who are thinking of entering the engineering field to do so, and to do so diligently.

Following graduation in May, Stacia will be working for HDR Engineering in Rapid City, SD as a Civil Engineer in Training (EIT). She also plans to obtain her master's degree in Civil Engineering at the South Dakota School of Mines and Technology.

Crossing the Atlantic: The UW King Air (UWKA)

Photo: The UWKA in Iceland in 2010, one of the five intermediate stops it will make on itstrip between Laramie and Exeter in Southwestern-England this summer.

For the second time in four years, the University of Wyoming King Air (UWKA) research aircraft will cross the Atlantic to participate in an international research project in Europe. In 2010, the UWKA spent six weeks in Finland investigating clouds and precipitation to develop algorithms that can be applied to satellite measurements to determine distribution and amounts of precipitation in high latitudes. This summer, the UWKA will be collecting detailed measurements in convective clouds in order to better understand the role of cloud dynamics and differing microphysical pathways in determining the amount, intensity, and spatial distribution of precipitation produced by convective systems.

Drs. David Leon and Jeff French, both Senior Research Scientists in the Department of Atmospheric Science, together with Co-Investigator Dr. Sonia Lasher-Trapp from Purdue University, are funded by the National Science Foundation to participate in the UK-led Convective Precipitation Experiment (COPE) that will be conducted in the southwestern peninsula of the UK during July and August, 2013. Measurements from the UWKA will focus on the interaction between ice formation, warm rain production, and cloud/clear air mixing to gain insight into how the interaction between these processes effects the intensity, overall amount, and spatial distribution of precipitation at the surface.

00000 uw

The UWKA will be one of two aircraft sampling convective clouds during COPE. The UK Met Office (www. metoffice.gov.uk) operates a BAe-146 (a 4-engine jet aircraft) that will also be instrumented to make detailed measurements inside clouds. While the BAe-146 is sampling mid-levels in cloud, the UWKA will be flying at or near cloud-top to document processes occurring near and at cloudtop while using the Wyoming Cloud Radar and Wyoming Cloud Lidar to profile the cloud system. The ability to "see through the cloud" with the radar and lidar while having detailed in situ measurements at two different levels will provide a unique and powerful data set for understanding cloud processes.

HH

Obtaining the measurements and conducting the analysis is only part of the challenge. Just getting the UWKA to Europe requires a major effort. Test flights will begin in April and need to be completed by mid-May. Upon completion, the UWKA staff will begin stripping down the airplane, replacing the instrumentation on the inside of the cabin with two 100-gallon fuel tanks that will allow the aircraft to make



the long hops across the Atlantic via Newfoundland, Greenland, Iceland, and Scotland. The trip can take up to a week or longer depending on the weather. While the UWKA is making its crossing, the scientific instruments and support equipment will be shipped commercially. Once everything arrives in the UK, the aircraft and instrumentation will be re-assembled and made ready to fly. It's a long trip for a small airplane, but the enthusiastic support for the UWKA in COPE from NSF, the UK Met Office, and other organizations underscores the unique capabilities of the UWKA as a tool for atmospheric science research.

The deployment to the UK is funded

by the National Science Foundation under a cooperative agreement between the NSF and UW's Department of Atmospheric Science.



Wyoming Wind Complements Renewable Energy Sources from Other States



The research team of Dr. Jonathan Naughton (Mechanical Engineering), Dr. Thomas Parish (Atmospheric Science), and Jared Baker (Mechanical Engineering) recently completed the first of a series of reports on how Wyoming wind complements renewable energy resources in other states.

The studies, funded by the Wyoming Infrastructure Authority and the U.S. Department of Energy, consider the importance of resource diversity. Resource diversity is a measure of how well resources complement each other. Two locations where the winds tend to be high at different times would exhibit good diversity, whereas locations where the winds are high at the same time would yield poor diversity. In the case of wind resources, good diversity arises from different factors controlling the winds. In the study, wind data from weather forecasting models have been used to assess the diversity between winds at different locations.

Although using geographically different locations to diversify renewable energy resources has been discussed in the past, the team's current series of studies has been the first to quantify this diversity and provide concrete examples of the benefits. For example, combining wind assets from California and Wyoming to serve customers in California would reduce the variability of the power supplied compared to using wind entirely located in California. Reducing the variability makes wind easier to integrate into the electrical grid and reduces the amount of firming resources needed to supply power when the winds drop. This latter aspect can save 10's - 100's of millions of dollars a year when the amount of wind energy installed in the two states reaches 6,000 MW.* The benefits of diversity can thus be added to the high quality of Wyoming wind to make Wyoming's wind resources attractive for development.

A follow up study using wind data from Wyoming, and data from wind and solar installations elsewhere is underway to further demonstrate the beneficial effects of diversity.

* As a comparison, a typical large coal-fired power plant will have one or more units that produce up to 500 MW.



Larry Oolman Recipient of the UCAR/Unidata De Souza Award

http://weather.uwyo.edu

The award "honors individuals whose energy, expertise and active involvement enable the Unidata Program to better serve geoscience. Honorees personify Unidata's ideal of a community that shares data, software and ideas through computing and networking technologies."



Larry Oolman, Department of Atmospheric Science Senior Research Scientist who developed a website that has become a popular weather information source for meteorologists worldwide, has received the University Corporation for Atmospheric Research (UCAR) Unidata community's Russell L. DeSouza Award. The award "honors individuals whose energy, expertise and active involvement enable the Unidata Program to better serve geoscience. Honorees personify Unidata's ideal of a community that shares data, software and ideas through computing and networking technologies."

In the early 1990s, Oolman developed a website (*http://weather.uwyo.edu*) to support teaching and research within the Department of Atmospheric Science in the UW College of Engineering and Applied Science. At first his weather site used a dial-up modem to serve data acquired with a satellite receiver. As the Internet expanded and the archives grew, the website became increasingly popular. Each day, the site provides data in response to more than 130,000 requests from more than 2,500 unique computers. In a typical month, requests originate from nearly 100 countries.

"Larry has posted his email address on the site, and responds personally to numerous questions about the data and weather in general. He frequently generates custom data sets for students and researchers," says Professor Al Rodi, head of the UW Department of Atmospheric Science. "When the site goes down, Larry hears about it immediately. He is tireless and unselfish in supporting emergency and special data requests. He is definitely an unsung hero in this regard."

One highly visited section of the site is its archive of balloon soundings and surface observations from around the world. An additional highly visited page generates forecasts for the trajectory of balloon launches. These pages are frequently used by students interested in launching inexpensive balloons equipped with GPS tracking and cameras to heights over 100,000 feet to obtain near-space photographs.

"Many students who record their experiences with reports posted on the Web mention the University of Wyoming forecasts," Rodi says.

A member of the Unidata Users Committee from 2008-11, Oolman is active with the standardization of aircraft data, and has worked closely with NCAR on research projects.

Funded primarily by the National Science Foundation, Unidata is one of eight programs in the University Corporation for Atmospheric Research (UCAR) Office of Programs. More than 250 institutions share data, tools, and support to enhance earth-system education and research. In an era of increasing data complexity, accessibility, and multidisciplinary integration, Unidata provides a unique and rich set of services.

Engineers in Action: Cody McKinney

In memory of Mr. Rick Ward – Mentor, Racing Partner, Polaris Race Coordinator, and Friend. Always willing to help and always treating racers the way that he would want to be treated. - Racing bib #7X, Retired by RMSHA*

Originally from Pinedale, WY, Cody McKinney began racing snowmobiles semi-professionally at age 14; by age 17, he was racing professionally. He would go on to receive sponsorships from companies such as KLiM, Bucky's Outdoors, McKinney Construction, Starting Line Products, EZ Ryde, Great Lakes Sound and Vibration, and Polaris.

In the fall of 2004, Cody entered a career program offered at Bridgerland Applied Technology College located in Logan, UT. During this time he earned a certificate in Computer Aided Drafting and Design. Upon completion of the program, Cody returned to Pinedale, building custom homes during the summer with McKinney Construction, the family business, while racing professionally during the winter.

As a sponsor, Polaris provided Cody with the latest snowmobiles. This allowed him to actively participate in Polaris's research and development efforts.

Cody raced both in the Stock and Modified Classes for the 600, 700, and 800. In the Open Modified Class many of the components for the sleds he raced were constructed from scratch. He has always approached the manufacturing of the machine from the rider's perspective, directly resulting in an advantage against the competition.

While on the Rocky Mountain Snowmobile Hillclimb Association racing circuit, Cody met Rick Ward. Rick was immediately impressed with Cody's natural ability to design user-friendly sled components. He emphasized to Cody that he would have the rest of his life to race, inspiring Cody to further his education by enrolling at Boise State University in pursuit of a B.S. in Mechanical Engineering, requiring him to put racing aside.

After a semester at Boise State, Cody transferred to the University of Wyoming. The College of Engineering and Applied Science provided him with the smaller class sizes that he sought after, coupled with personable faculty members. Now a senior, Cody graduated this spring with a B.S. in Mechanical Engineering.

Currently, Cody works in the College's Workshop as a technician. This has provided him the opportunity to work on various machining projects, including the use of the 3-D printer recently acquired by the college.

This past November, Cody was a member of the UW team placing 3rd in the ASME Student Design Challenge in Houston, TX. The team previously placed 1st in the district competition that took place in Baton Rouge, LA.

Teams to take 1st and 2nd came from France's, Institut Superieur de L'Aeronautique et de l'Espace, and Cal Poly. Other schools participating included: The Indian Institute of Technology, Bombay; Khalifa University of Science (UAE); and Hong Kong Polytechnic University.

Each team was challenged with the task of designing four self-propelled devices that could collectively complete a relay race in the shortest period of time. Each device was required to contain an on-board energy source while also triggering the motion of the subsequent device. The devices competed on a pre-designed course. Bonuses were awarded for devices having different energy sources and for initiating subsequent devices.

In May, Cody will head to Washington State to compete in the SAE Baja Competition with his senior design teammates. The team of ten Mechanical Engineering students will compete against approximately 100 teams, tasked with the challenge of engineering the fastest and best performing off-road race car. The team consists of three student leaders and one overall leader; Cody serves as the team leader for suspension.

Cody will continue racing professionally this upcoming winter. With the constant need to keep his hands dirty while innovating products, his long-term goal is to engineer high-performance, lightweight parts for the racing community.

"If you have a goal and it means something to you, you're not going to fail. Don't be afraid of the work... If there's a will, there's a way. Set your parameters and get there." - Cody McKinney

POLARIS

www.uwyo.edu/ceas/news/engineersinaction



Engineers in Action is an article series developed to highlight a select group of individuals who have combined their engineering expertise with a passion to push themselves and respective sports to the limits. The most advantageous aspect of being an athlete as well as an engineer is that after graduation is complete, the opportunity exists to design, test, and in some cases invent, the products used by generations of existing and upcoming athletes following in their footsteps. This can often lead one to the far stretches of the world, pushing both the physical and mental aspects of human capabilities.

The award is just over \$463,000 and is spread across a five-year period. This award, one of NSF's most prestigious, is given to faculty who exemplify the role of teacher-scholars through outstanding research, and the integration of education and research.

> Photo: Dr. Carl Frick, Assistant Professor of Mechanical Engineering, holding calibration specimens for the Agilent Nano Indenter G200 he uses for characterizing mechanical behavior at sub-micron scales. The Nano Indenter will be a key piece of equipment used for investigating the shape-memory nickel-titanium alloys described in his CAREER proposal.

Dr. Carl Frick, a University of Wyoming Assistant Professor of mechanical engineering, has been awarded a 2013 Faculty Early Career Development (CAREER) Award from the National Science Foundation (NSF). The award is just over \$463,000 and is spread across a five-year period. This award, one of NSF's most prestigious, is given to faculty who exemplify the role of teacher-scholars through outstanding research and the integration of education and research. The CAREER Program is intended for faculty members who are at or near the beginning of their careers and is meant to build a firm foundation for a lifetime of leadership.

Biography

Dr. Frick had his first experience with conducting experiments as a summer research assistant in Dr. Rishi Raj's lab at the University of Colorado at Boulder. He continued working there as an independent study student until he graduated with his B.S. degree. This laboratory experience piqued Dr. Frick's interest in graduate school. He went on to receive his M.S. and Ph.D. - all in mechanical engineering - from the University of Colorado at Boulder. His graduate research focused on shape-memory alloys under the direction of his advisor, Dr. Ken Gall. He then served as a post-doctoral visiting scientist at the Max Planck Institute for Metals Research in Stuttgart, Germany, where he examined small-scale mechanical deformation of materials. He then joined Abbott Vascular, a division of Abbott, as a Senior Research Engineer. There, he developed proof-of-concept biomedical devices that utilize the unique behaviors of novel alloys. In August of 2008, he joined the Department of Mechanical Engineering at the University of Wyoming.

As a result of his own experiences, Dr. Frick ardently believes in integrating laboratory research into undergraduate education. In the past four and a half years, over 30 undergraduates have worked in his lab. His hope is to inspire them to pursue careers in science and engineering as he did.

CAREER Award Research

Dr. Frick's current research focuses on linking microstructural mechanisms to mechanical behavior. His CAREER proposal aims to unlock the mysteries of nickel-titanium shape memory alloys. These alloys are "smart metals" that can be trained to change their shape as a function of temperature.

Dr. Frick believes a poor understanding of how the interwoven atomic mechanisms behave during the reversible shape transformation process has prevented nickel-titanium from being used in a wider range of applications. He intends for his research to open the door for nickel-titanium being used extensively in a variety of industries, such as biomedical, aerospace, civil engineering, and electronics.

"The reason it (nickel-titanium) is able to change shape and go back is because its capability of a coordinated shift in its crystal structure," Dr. Frick says. "I want to investigate and get a deeper understanding of how that occurs at the nanometer level."

Educational Outreach

Consistent with the educational outreach mission of the CAREER Award, Dr. Frick will organize a new laboratory session for the Engineering Summer Program at UW. This program gives promising high school juniors an opportunity to participate in a hands-on experience in various engineering fields, working one-onone with faculty members and advanced students. Dr. Frick's new lab will introduce students to advanced research techniques, such as electron microscopy and nano-scale mechanical testing based on the tools used in his research.

The CAREER Award will also provide Dr. Frick the opportunity to strengthen an international collaboration between the University of Wyoming and a leading materials research institute. The grant will be used to pay the stipend and tuition for a Ph.D. student, and once a year, the student will be sent to conduct research at the Leibniz Institute for New Materials (INM) in Saarbrucken, Germany. That arrangement is possible due to a previous relationship Dr. Frick forged with Dr. Eduard Arzt, Scientific Director and Chairman of INM.

Air Pollution Research at the University of Wyoming



Photo: Field site in the Uintah Basin near Vernal, Utah, where the University of Wyoming is participating in a large-scale effort to understand the mechanism of wintertime ozone formation. Inset: Dr. Shane Murphy, Ass. Professor

Production of natural gas in the United States has dramatically increased in recent years. This rapid increase has been made possible by advancements in directional drilling and hydraulic fracturing techniques. To the surprise of many, increased development and production of natural gas in Wyoming's Upper Green River Basin (UGRB) has also brought with it an increase in ambient ozone concentrations. While ozone in the stratosphere blocks potentially harmful ultraviolet radiation coming from the sun, ozone at ground level is a key component of smog and leads to human health problems.

Dr. Robert Field, Dr. Derek Montague, and researcher Jeff Soltis of the Department of Atmospheric Science have been monitoring ozone and its precursors in the UGRB since 2008. Their research, along with others, has shown that ozone formation in the UGRB results from complex reactions involving emissions from oil and gas extraction. The emissions are concentrated in shallow surface inversion layers that form during the winter. Snow cover is essential for ozone formation in the UGRB primarily because it increases, by reflection, the amount of sunlight available to drive ozone-forming reactions. It may also play other chemistry related roles that currently remain unclear.

Recently, Dr. Shane Murphy joined the Department of Atmospheric Science faculty after completing a postdoctoral fellowship at the National Oceanic and Atmospheric Administration (NOAA). In his past work, Dr. Murphy used advanced mass spectrometry techniques to measure atmospheric pollutants. Upon his arrival in the Department, Dr. Murphy joined forces with the Air Quality Group and expanded the research from focusing solely on the Upper Green River Basin to also include studies, in collaboration with NOAA and others, of air pollution in the Uintah Basin near Vernal, Utah. The Uintah Basin is currently experiencing high-ozone events that are even more severe than those observed in Wyoming.

Last summer the Air Quality Group was awarded a grant from the School of Energy Resources to purchase a state of the art mobile mass spectrometer. This mass spectrometer allows the group to measure gaseous volatile organic compounds that are precursors to ozone and airborne particles, the two principle components of smog. The mass spectrometer was recently deployed to Utah to measure emissions during an event where ozone levels approached 150 parts per billion, twice the 8-hour average national air quality standard.

The Department of Atmospheric Science is building a mobile laboratory that will house this new mass spectrometer along with numerous other instruments to facilitate cutting edge air pollution measurements. Over the next few years, the Air Quality Group will conduct field studies in Wyoming, Utah, and further afield, such as a planned study of an oil and natural gas field near Los Angeles, CA. These studies will help elucidate the mechanisms of ozone and particle formation in these very different locations that all experience emissions from oil and gas extraction. Preliminary evidence suggests that

the mechanism of ozone formation varies significantly from one location to another. Understanding these mechanisms will allow industry to more efficiently control emissions to prevent high-ozone events.

Jeff Clune • Assistant Professor Department of Computer Science Ph.D. in Computer Science, Michigan State University

Research Emphasis

Dr. Clune studies evolutionary computation, a technology that harnesses natural selection to evolve, instead of engineer, artificial intelligence, robots, and physical designs. He is also interested in learning how evolution produced the complex, diverse life on this planet. Keywords describing fields that he performs research in include: evolutionary algorithms (also known as genetic algorithms or evolutionary computation), neural networks (including evolving neural networks, having them learn, deep learning, and computational neuroscience), robotics, artificial intelligence, and research into the evolution of intelligence, complexity, evolvability, and altruism.



New Faculty

During the summer of 2010, he served as Postdoctoral Scientist with the BEACON Center for the Study of Evolution in Action at Michigan State University.

Prior to arriving at UW, Clune served as a Postdoctoral Fellow for the Departments of Computer Science and Mechanical and Aerospace Engineering at Cornell University from 2010-2012.

> Wendy Perkins • Staff Assistant Wyoming Technology Transfer Center Department of Civil and Architectural Engineering BA in Photo Journalism

Wendy has worked for UW for the past 12 years in the Department of Accounting (COB), Gender and Women's Studies Program (A&S), and now the Technology Transfer Center. She describes herself as a community activist and currently serves as a board member for the Social Justice Research Center, the UW Women's Leadership Program, the Naughty Pines Derby Dames, and the Women's Advancement and Research Center.



New Staff



Dr. Wright & Dr. Barrett Receive Los Alamos Funding for Passive Muon Imaging Project

Dr. Cameron Wright and Dr. Steve Barrett from the Department of Electrical and Computer Engineering have received funding from the U.S. Department of Energy's Defense Nuclear Nonproliferation Research and Development Office (NA-22) for a three year project that will employ passive muon imaging to detect sensitive nuclear material (SNM).

Cosmic muons occur naturally in the environment. Since they are charged, massive (for a subatomic particle), and lose relatively little energy going through matter, they are a suitable choice to image SNM, even if the SNM is hidden or otherwise shielded. Wright, Barrett, and ECE graduate students Kimberly Perry and Andrew Davis will be working with researchers from Los Alamos National Laboratory (LANL), National Securities Technologies (NSTec), and Decision Sciences Corporation (DSC) on the project.

The goal of the project is to investigate different imaging modes (tomographic, telescopic, and transmission) to rapidly determine if SNM is present and to provide images of the desired resolution. The research has far reaching implications in border security and nuclear weapons treaty verification applications, with significant interest from both civilian and military organizations. Collectively, Wright and Barrett have 50 years of military service in the Air Force and Navy prior to joining the faculty at UW.

Dr. John Pierre Elevated to IEEE Fellow

ECE Professor John Pierre has been elevated to Fellow standing by the Institute of Electrical and Electronics Engineers (IEEE) with the following citation: "for development of signal processing methods for estimation of power-system stability." The total number of selected in any one year cannot exceed one-tenth of one-percent of the total IEEE voting membership. IEEE is the professional society for electrical and computer engineers. Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement.



Pierre's research attracted the attention of the US De-

partment of Energy, power utilities, and the power industry. The methods he and his colleagues invented are the foundation of new software being integrated into power grid control centers for monitoring the reliability of the power grid. Pierre stated, "I've been very fortunate to have collaborated with excellent colleagues and graduate students over the years."

Pierre joined the faculty at UW in 1992, after earning his M.S. and Ph.D. degrees from the University of Minnesota in EE with a minor is statistics. He received his B.S. degree in EE with a minor in Economics from Montana State University. While at UW, he has received Mortar Board Top Prof recognition on three occassions for undergraduate teaching and also received the College of Engineering and Applied Science award for Research and Graduate Teaching in 2005. He is active in the IEEE Power and Energy, Signal Processing, and Education Societies, having published in the journals of all three societies.

Dr. Amy Banic and Students Attend the Rocky Mountain Celebration of Women in Computing (RMCWiC)

This past fall, Dr. Amy Banic and a group of students from the Department of Computer Science attended the Rocky Mountain Celebration of Women in Computing (RMCWiC) in Fort Collins, CO. The goal of the RMCWiC is to encourage the career interests of local women in computing. The conference provides social support, facilitates



networking with computer professionals, and provides attendees with exposure to a variety of social and technological advances in the field. This annual conference provides a unique opportunity for women from the region in technical fields to share expereiences and strategies for success.

Dr. Banic ran a panel at the 2012 meeting titled *Engaging Teens in Computing Through Current Passions*. Panelists included Suzanne Gallagher and Debra S. Goldberg from the University of Colorado at Boulder; and Ruben Gamboa from the University of Wyoming. The 2014 conference will be hosted by UW in Laramie.

For additional information on the RMCWiC, please visit their website at: http://rmcwic.ucar.edu

Cherie Kelley Awarded UW Employee of the 1st Quarter, 2013



Cherie has been employed as the Accounting Associate Sr. for the Department of Civil and Architectural Engineering since November 2008. She is a trusted employee that has made a positive impact on her Department, the College, and the University. She currently serves on Staff Senate and the CEAS Staff Council. Quoting nominations, "Her drive for quality service and her dedication to the department is admirable" and "She goes out of her way to improve the customer service that comes from her department". While presenting Cherie with this honor, President of Staff Senate, Ben Marks said, "Cherie Kelley has proven to be a strong advocate for staff. She works tirelessly as she serves her many roles on Staff Senate".

Henry and Suzanne Foster Renovate EN6085 in Honor of Former Engineering Professor Donald L. Veal



Before and after pictures of the Atmospheric Science classroom on the 6th floor of the Engineering and Applied Science building.

The Department of Atmospheric Science is proud to announce that the renovation of classroom EN6085 was completed on the first day of classes this semester. Funding for this project included a very generous gift from college alumnus Henry Foster (BS 1963, General Engineering) and his wife Suzanne in honor of former engineering professor Donald L. Veal and in memory of Bill Bearley, former UW tennis coach. The renovation completely restored the 25-year old classroom with new lighting, audio-visual equipment, and furnishings. The wall separating the old weather room section of the classroom was removed, enlarging the space to now accommodate 40 students. Veal was the founding head of the Department of Atmospheric Resources on its creation in 1971 (the department was renamed Atmospheric Science in 1975). He earned a M.S. in 1960 and Ph.D in 1964, both in Civil Engineering, at UW under Prof. John Bellamy. Beginning in 1966, Veal was involved in development of airborne platforms for atmospheric research at UW. This work evolved into the world-class atmospheric research aircraft operated by the department over the past 40 years. Dr. Veal retired after a 29-year career at UW in 1987 after serving five years as the 20th president of the university.

Stay current on all news of the CEAS on the web at: http://www.uwyo.edu/ceas

I/we would like to make my/our gift to the College of Engineering and Applied Science:

- College of Engineering and Applied Science
- Department of Atmospheric Science
- Department of Chemical and Petroleum Engineering
- Department of Civil and Architectural Engineering
- Department of Computer Science
- Department of Electrical and Computer Engineering
- Department of Mechanical Engineering
- Other_____

FOUNDATION 1200 East Ivinson Street Laramie, WY 82070 (307) 766-6300 • (888) 831-7795

Wyoming

MUNIVERSITY

N13EN

ONLINE: Make a payment online using our secure server: www.uwyo.edu/giveonline.

MAIL: Make checks payable to the UW Foundation, indicate your allocation preference and mail to the address above. Your gift is tax-deductible by law.

Please indicate any changes to your name and/or address:

Please send future issues of *Foresight* electronically to my preferred e-mail address:

Thank you for your continued support!

Email your request to receive FORESIGHT electronically to engevents@uwyo.edu...



and be entered into a drawing for a CEAS Gift Set... (drawing takes place the 1st week of August, 2013)

Thank you for helping the college integrate electronic communications in order to cut down on paper waste, reduce costs and provide an enriched, interactive experience for our readers.

PHONE: Call the University of Wyoming Foundation during normal business hours at (307) 766-6300 or (888) 831-7795.

In Memoriam

Since the last issue, we regret to announce the passing of the following, alumni. Our greatest sympathy is extended to the families of these valued friends.

Mr. Willard T. Young	BSCE '40, MSCE '49	Elk Mountain, WY
Mr. Nick J. Chakakis	BSEE '48	Livermore, CA
Mr. James F. Balden	BSCE '50	Buffalo, WY
Mr. Leno H. Menghini	BSCE '50	Cheyenne, WY
Mr. Thomas D. Overy	BSEE '50	Mesquite, NV
Mr. Clifford D. Marshall, Jr.	BSME '51	Littleton, CO
Mr. Kenneth L. Taylor	BSCE '51	San Luis Obispo, CA
Mr. F.E. "Tut" Ellis	BSGE '55	College Station, TX
Mr. James L. Wiggins	BSME '60	Sun City, AZ
Mr. Donald J. Materi	BSPE '61	Casper, WY
Dr. John C. Gries	BSGE '62, MS '65 (Geology)	Wichita, KS
Mr. Donald A. Gries	BSME '66	Drummond Island, M
Mr. Carlon S. Land	MSPETE '66, PhDCE '74	Waynesboro, VA
Mr. William C. Heatley	BSME '67	Riverton, WY
Mr. Victor D. Hillgren	BSEE '70	Derby, KS
Mr. James M. Schrib	BSEE '80	St. Augustine, FL
Mr. Scott G. Chipperfield	BSPE '85	Casper, WY
Mr. Richard L. Fraher	BS '88 (Mining Eng.)	Rock Springs, WY
Mr. James T. Palmer	BSCE '93, MSCE '95	Chapin, SC
Mr. Shane D. Birch Mr. John J. Dilts Mr. Jason A. Duncan Mr. Darryl A. Eads Mr. Richard Hand Mr. Raymond E. Smith Mr. Victor J. Zueck	UW Alum, Friends of the College UW Alum, Friends of the College	Cheyenne, WY Newcastle, WY Cheyenne, WY Laramie, WY Cheyenne, WY Cheyenne, WY Mesquite, NV

In Memoriam

F.E. "Tut" Ellis, age 79 passed away February 9, 2013 at his home in College Station, TX

Tut was born in Cheyenne, WY March 9, 1933 and though he travelled the world and was extremely successful in the oil and gas business, in his heart he remained a Wyoming Cowboy. He attended school in Thermopolis, WY, graduating from Thermopolis High School where he played basketball and football. Ellis attended the University of Wyoming and graduated in 1955 with a general engineering degree, petroleum option.

He spent his entire 34 year long professional career with Conoco Inc., retiring at the age of 55 after serving as Executive Vice President for Exploration and Production International, Group Vice President of E.I. Dupont de Nemours and Company and sitting on the Conoco Board of Directors. In addition to attending UW, in 1969 he earned a masters degree in management from the Sloan School, MIT in Cambridge, MA. In 2001, Ellis was inducted into the UW College of Engineering and Applied Science Hall of Fame and is also honored as a UW Distiguished Alum.



Leno H. Menghini, 87, of Cheyenne, WY passed away January 5th

Leno was born in Superior, WY, the son of Italian immigrants, Egidio and Constantina (Prevedel) Menghini. His father died when Leno was three years old, and he and his brother and sister went to work delivering milk around Superior to support their family. In high school, Leno then went to work for the UP Coal Company in and around the mines. He graduated from Superior High School and attended the University of Wyoming, where his studies were interrupted by World War II. He was drafted by the United States Army in 1943 and served in an engineering company in Greenland from 1943-46. After an honorable discharge, Leno returned to the University of Wyoming and graduated with honors with a degree in civil engineering in 1950.

Following college, Leno began his career with the Wyoming Highway Department in Rawlins where over the next 40 years he traveled the state, accepting assignments in Rock Springs, Evanston, Basin, Sheridan and Cheyenne. Leno served as Superintendent and Chief Engineer of the Department for fourteen years before retiring in 1990.





College of Engineering and Applied Science Dept. 3295 1000 E. University Avenue Laramie, WY 82071-2000