# US Power Grid PMU "Smart Grid" FORESIGHTocations Volume 36, No. 2

Spring-Summer 2011

Phasor Measurement Units in North American Power Grid

# Stabilizing the Power Grid (see story, page 3)

Working for Wyoming and the World







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AND APPLIED SCIENCE

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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.

# Message From the Dean



This editorial is a useful opportunity to provide a brief update regarding the college's progress with the early stages of undertaking a major upgrade and expansion of its facilities. This effort is needed so the college and university can achieve essential planning goals and attain the national or international distinction the programs deserve. The college, which provides Wyoming's only university-degree education and research programs in engineering, computer science and atmospheric science, is justly proud of its programs. For example, our students significantly out-perform the average

in national engineering exams, and our graduates are in high demand by employers in Wyoming and across the country.

The building facility effort is comprehensive and challenging, yet must be done in order to stay well abreast of competitive contemporary standards for university– based education and research. Presently, the effort is shaping up to comprise two major components:

- 1. Replacing what is called the "Sawtooth" with a new core facility for the college in order to–
  - a. elevate education quality and capacity
  - b. provide more office space (faculty, grad students, post-docs)
  - c. provide a college focal area that introduces and connects people to the programs and career paths the college offers
- 2. A new laboratory building (or two) to
  - a. considerably increase research capacity
  - b. enable advanced lab-based education
  - c. house existing labs and workshops displaced when the Sawtooth is replaced

The Sawtooth, of 1925 vintage, is the central and oldest portion of the college's existing building. The photo shown on the opposite page depicts an aerial view of the Sawtooth, shown in the center area of the college building, with its white serrated roof.

We will follow the Wyoming's usual, three-level planning process for developing legislative requests for capital outlay appropriations:

- Level 1—a basic feasibility study
- Level 2—a schematic design, cost estimate and preliminary site investigations
- Level 3—final level, the completion of the design, bidding and construction of the facility



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I am glad to say that we are nicely underway with Level 1, which leads to a report outlining the college's facility needs, various metrics such as estimates of enrollment growth, and areas where the college has strategic opportunity for further distinction. An immediate deadline is late August 2011, at which time the Level 1 report will be submitted to the university. Upon report acceptance, we then move to Level 2. I anticipate that each of the two parts described will then move along more-or-less its own critical path of progress as two linked but separate sub-projects.

As some laboratory facilities will be used jointly by university colleagues in other units, the laboratory building may be developed in consort with those units. For instance, one or two laboratories being considered will



Aerial view of the College of Engineering and Applied Science, UW Photo.

likely involve students and faculty from geology and geophysics, as well as several engineering programs.

This is an exciting and certainly busy time for us as we carefully plan the college's development. Please stay tuned as we progress.

We hope you enjoy this issue of *Foresight* and reading about the many accomplishments of students, faculty and staff. As always, thank you for your generous support of the college's programs, students, faculty and staff.

#### Robert Ettema, Dean

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ON THE COVER: Professor John Pierre, Post–Doctoral Research Associate Luke Dosiek and Professor Suresh Muknahallipatna visit about their power grid monitoring project, photo by Trice Megginson. See full story on page 3.

## **Stabilizing the Power Grid**



Above, power grid phasor measurement units provide information about the power system's operational limitation for careful monitoring of potential blackouts, courtesy photo.

#### Courtesy of Professor John Pierre

Monitoring the stability of the power grid is a research and development area being investigated by the Department of Electrical and Computer Engineering under the direction of Professor John Pierre. Power systems are arguably some of the largest and most complicated systems in the world. For example, one vast power grid currently connects 14 western US states, two Canadian Provinces and a portion of Mexico. Such systems are difficult to fully understand and operate due to their scope as well as complexity. Large scale blackouts cause billions of dollars in economic loss; as was the result of blackouts in the United States during 1996 and 2003. UW's effort is currently focusing on the use of GPS synchronized measurements generated from throughout the power grid to provide real-time monitoring of potential blackout conditions. Pierre states that "these measurements contain colored noise and we use signal processing algorithms to extract information about the vulnerability of the grid to a blackout." In addition to providing resources for blackout avoidance, the group also aims to obtain a better understanding of a power system's operational limits.

UW is currently collaborating in a variety of power and energy related projects with Montana Tech of the University of Montana, Bonneville Power Administration (BPA), Pacific Northwest National Laboratory (PNNL), the Power System Research Consortium (PSRC), and the Western Electricity Coordinating Council (WECC). In excess of \$2.1 million in funding has been provided to the university over the past 10 years, by the US Department of Energy (DOE), BPA, PNNL, and PSRC for the many aspects of this project ranging from basic research to commercialization.

Most recently, the university is participating in WECC's "Smart Grid," initiative called the Western Interconnection Synchrophasor Program (WISP). WISP's overall objective is to improve transmission grid reliability by increasing the number of measurement units and deploying new software applications in power grid control centers. UW's role is to combine efforts with Dan Trudnowski and Matt Donnelly of Montana Tech to write a software engine which will ultimately be integrated into a power system control center's situational awareness application. UW Professor Suresh Muknahallipatna, and Postdoctoral Research Associate Luke Dosiek, are the key personnel responsible for translating the applicable algorithms into industrial grade code. "They are doing an exceptional job of creating a software engine that could have a significant impact on the reliability of power grids," says Pierre.

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"They are doing an exceptional job of creating a software engine that could have a significant impact on the reliability of power grids," says Professor John Pierre.

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In the areas of power and energy, additional and notable related projects are currently underway. Continued funding has been provided by the Department of Energy (DOE) for research on the methodologies for monitoring stability; including new work in identifying forced oscillations and separating them from modal oscillations in the system. In addition, UW plays a role in WECC system wide tests conducted by BPA. These tests include the injecting of known excitation signals into the western United States power system by modulating a specially designed probing signal onto the high voltage DC line that connects the Pacific Northwest to Los Angeles. UW and Montana Tech design these probing signals and then analyze the data produced from the tests. Also, the university is a participating member of the PSRC, along with Rensselaer Polytechnic Institute, the University of Tennessee, and Montana Tech. This consortium is funded by a number of utilities providers in the eastern United States to develop dynamic security assessment tools for the eastern US power grid. Lastly, the Electrical and Computer Engineering Department is involved with a DOE education grant funded through the University of Minnesota to revitalize power engineering education by establishing state of the art laboratories.

Current research team members include Dr. Pierre, Dr. Muknahallipatna and Dr. Dosiek as well as graduate students: **Gurudatha Pai, Russell Martin, Zheng Cao, and James Follum**. Many graduate students formerly involved in the above mentioned research have successfully gone on to a variety of careers. Ph.D. graduates Nin Zhou and Frank Tuffner continue to collaborate with the university while working at PNNL. Ph.D. graduate Rich Wies is a faculty member at the University of Alaska—Fairbanks, and Ph.D. graduate Mike Anderson is employed with Boeing. M.S. graduates Ashish Subramanian and Irene Legowski are employed by Mathworks and the Institute for Telecommunication Sciences, respectively.



Above, Professor Pierre visits with Luke Dosiek, Suresh Muknahallipatna and graduate students Gurudatha Pai, Russell Martin, Zheng Cao and James Follum about signal processing algorithms, photo by Trice Megginson.

## **UPCOMING EVENTS**

September 9–10 National Advisory Board Meeting Laramie, Wyo.

October 14 3 p.m. Ag Auditorium H.T. Person Lecture

October 15 UW Homecoming

December 1 Senior Design Symposium

December 2 6:30 p.m. Commencement Fine Arts Concert Hall

January 31, 2012 Deadline for Hall of Fame & Distinguished Engineer Nominations

February 2-4, 2012 Wyoming Engineering Society Convention Sheridan Holiday Inn Sheridan, Wyo.

April 20, 2012 Tau Beta Pi Engineering Honors Banquet Hilton Garden Inn/ UW Convention Center

Please contact the College Communications Office at (307) 766-4248 or by e-mail to engevents@uwyo.edu about other exciting events.

## **Faculty Tenure & Promotion**

The following faculty members were offered tenure and promotion advances for Spring 2011. CONGRATULATIONS to these outstanding faculty members.

Associate Professor to Full Professor Steven Barrett Electrical and Computer Engineering

> **Bart Geerts** Atmospheric Science

#### Assistant Professor to Associate Professor & Tenure

Hertanto Adidharma Chemical and Petroleum Engineering

**Tony Denzer** Civil and Architectural Engineering

Mohammad Piri Chemical and Petroleum Engineering

Margareta Stefanovic Electrical and Computer Engineering

Associate Lecturer to Senior Lecturer James Ward Computer Science

## Engineers Without Borders Raffle Results

Thank you for supporting Engineers Without Borders–Wyoming (EWB-WYO). The Wyoming Chapter held a drawing for a side of beef, Vizio 42-inch LCD HDTV, one-day guided pheasant hunt donated by Jeff Fuller and Fuller Farms, and a one-day guided fly fishing trip donated by Mike Urynowicz. Drawing winners were: **David Bagley** (beef); **Kevin Frank** (HDTV); **Lance Marrs** (pheasant hunt); and **George Fletcher** (fly fishing). EWB-WYO raised \$4,600 thanks to your generous support and will travel back to Kenya to continue their project to deliver clean water to the village of Mbita.

Your generous support provides hands-on learning student opportunities and contributes to the enhancement of life-sustaining development activities in underdeveloped countries. **THANK YOU!** 

## UW Scientists Launch Major Carbon Storage Research Project



Above, left, one of Dr. Piri's Ph.D. students, Morteza Akbarabadi, works with a three-phase separator. Right, a high-pressure and high-temperature vessel containing a rock core sample is located in the CT scanner for flow experiments with supercritical CO2, photos by Thyra Page.

#### Courtesy of UW News Service

UW researchers will develop technologies to safely and economically store carbon dioxide (CO2) with funding announced by the U.S. Department of Energy.

Supported by the \$1.5 million DOE grant, UW researchers will study the storage of supercritical CO2 and other minor constituents in southwest Wyoming's Rock Springs Uplift, geologic formations identified as among the most promising targets for storing CO2 in Wyoming. It is also the site of a planned stratigraphic test well to be drilled by a partnership led by UW that includes Baker Hughes, also supported by a major DOE grant.

UW was one of 15 institutions receiving funding to continue DOE initiatives to help develop the technology and infrastructure to implement large-scale CO2 storage in different geologic formations across the nation. The projects will pave the way to help reduce U.S. greenhouse gas emissions, and make the United States a leader in mitigating climate change, according to the DOE.

Project leader **Mohammad Piri**, Professor in the Department of Chemical and Petroleum Engineering, says a multidisciplinary research team will assess how much carbon can be injected into the formations and if it can be permanently trapped with negligible leakage. Experimental and modeling work will be conducted on reservoir rock samples that will be recovered from the stratigraphic test well.

When CO2 is stored deep in the earth, temperature and pressure conditions will hold it under a "supercritical" state — a stable, relatively dense phase with physical properties that are different from those of gas and liquid. This is a desirable state for storing carbon in geologic formations, Piri says.

The investigation will combine state–of–the–art experimental studies, numerical pore and reservoir–scale modeling, and high–performance computing to investigate various large–scale storage schemes to maximize the permanent trapping of supercritical CO2. Researchers will also investigate the effect that minor constituents such as air, nitrogen and sulphur oxides - common products of combustion — have on the storage and permanent trapping in the receiving reservoirs.

Piri says the NCAR–Wyoming Supercomputing Center being built near Cheyenne will enable advanced computational analysis and modeling of the experiments and the motion of the injected CO2 in the subsurface. Researchers will also use the Encana Research Laboratory that focuses on multi–phase flow in porous media and computed tomography (x-ray imaging) research.

Recognizing the importance of carbon storage in ensuring the future of Wyoming's fossil fuels industry, UW is contributing an additional \$1.37 million to the project, funded by DOE for three years. Other UW scientists contributing to the project are Professors Felipe Pereira, Frederico Furtado and Victor Ginting from the Department of Mathematics, and Professors **Lamia Goual** and **Shunde Yin** in the Department of Chemical and Petroleum Engineering.

This project is the first externally funded major research initiative developed in UW's School of Energy Resources newly–established Center for Fundamentals of Subsurface Flow. Mark Northam, SER director, and Ron Surdam director of SER's Carbon Management Institute, have contributed to this effort.



# Anadarko Awards

#### Courtesy of Professors Alvarado and Brant

**Vladimir Alvarado**, assistant professor in the Department of Chemical and Petroleum Engineering, was selected, along with **Jonathan Brant**, assistant professor in the Department of Civil and Architectural Engineering, for an Anadarko Faculty Fellowship.

Vladimir Alvarado is an expert in Enhanced Oil Recovery (EOR) and flow through porous media. He received his undergraduate degree from the Universidad Central de Venezuela (UCV) in Caracas Venezuela. He holds a Ph.D. from the Department of Chemical Engineering and Materials Science at the University of Minnesota, under the supervision of the late H. Ted David and the late L.E. "Skip" Scriven in 1996. He also was awarded a masters degree from IFP, France in Exploration and Production. He has published more than 35 peer-reviewed journal articles and proceedings, as well as more than 30 conference proceedings. He authored a book titled Enhanced Oil Recovery: Field Planning and Development Strategies in cooperation with Dr. Eduardo Manrique. He has more than 20 years of experience in industry with 15 of them spent at PDVSA-Intevep, the R&D division of PDVSA, Venezuela. He joined the Department of Chemical and Petroleum Engineering at UW in 2006, where he has developed a research program on multiphase flow in porous media and interfacial science with applications in EOR, CO2 storage and emulsion stability and flow through porous media. He currently advises or co-advises more than 10 MS and Ph.D. students at UW and PUC-Rio, Brazil.

Alvarado proposes to develop a proof of concept using the resources from the Anadarko Fellowship to demonstrate that by adjusting produced water chemistry it would be possible to re–inject water with some content of dispersed oil to increase oil recovery and water disposal capability. If the concept is demonstrated, it will bring two benefits:

1. Environmental/cost mitigation of water disposal in mature oilfield production operations by proper reutilization of produced water.

2. Improved recovery and reduced operating costs from minimized treatment of large volumes of water and processing of fresh water sources.

His research team is currently formulating emulsions using WY oils to initiate the proof of concept and funding is being sought to further develop this idea.

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# Faculty Fellowships

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**Jonathan Brant**, is an assistant professor in the Department of Civil and Architectural Engineering at the UW. His expertise and research are in the general area of environmental engineering, with a specific emphasis on physicochemical water treatment processes. He joined UW in August 2008 after working as a consultant for HDR Engineering, Inc., in Seattle, WA for two years. He obtained his B.S. in Civil Engineering from the Virginia Military Institute and his M.S. and Ph.D. degrees in civil engineering from the University of Nevada, Reno. Prior to working at HDR he was a post–doctoral researcher at Rice University and later Duke University.

Brant's research focuses on the development and implementation of advanced technologies and approaches for treating and reusing water for beneficial purposes. To date, he has authored or co–authored over 20 peer–reviewed articles on membrane processes and the behavior of manufactured nanomaterials in environmental systems. In addition he has authored six book chapters related to water treatment and the environmental implications/applications of nanotechnology. He most recently published a book chapter on the selection and design of membrane processes for treating oil and gas produced waters in the book titled Coalbed Natural Gas: Energy and Environment.

Brant's research project, which is part of the Anadarko Fellowship for Excellence in Energy Scholarship, is titled Monetization of Produced Water Through the Selective Recovery of Dissolved Metals using Magnetic Nano–



Adsorbents. The motivation for this research stems from the belief that while oil and gas produced water is commonly viewed as a waste stream it is instead a valuable commodity that can serve as a resource to areas like Wyoming, which are "water poor". This research will also serve another purpose, which is to provide an economic incentive for the energy sector to treat and reuse produced waters. To this end this research will focus on recovering dissolved metals of value from produced water treatment streams in order to offset the costs associated with treatment and to maximize the extent to which we use our natural resources.

At the conclusion of this research project we hope to have developed a feasible and efficient approach for both treating oil and gas produced waters and for maximizing the economic benefits that are associated with energy development activities in Wyoming.



Mehrnoosh Moradi Mahdi and Kazempour, (pictured opposite page) two Ph.D. students in Vladimir Alvarado's group, work on chemical formulations for enhanced oil recovery based on emulsion technologies in the Chemical EOR laboratory in the College. Top, Xiyiu Wang (former Ph.D. student) completes research on emulsion work in the laboratory, UW photos. Left, Coleman Henry, an environmental engineering master's student, is inspecting his hollow fiber microfiltration (MF) during a membrane fouling test run. The bench-scale system fully simulates the full-scale operation of an MF system that is commonly used to remove particulates and other suspended solids from a variety of wastewater sources, including produced water, photo by Thyra Page.

# Union Wireless Supports Engineering and Applied Science Students

#### Courtesy of Union Wireless, Mountain View, Wyoming

**Roberto Garcia** and **Steven Toedter** are the 2011 recipients of the Union Wireless UW College of Engineering and Applied Science Scholarship. Both students were honored at the Tau Beta Pi Honors Banquet held on April 15 in Laramie.

Roberto, is the son of Antonio and Maria Garcia. He is a Junior in mechanical engineering and plans to graduate in the fall of 2012. He is a member of the National Society of Collegiate Scholars. The second oldest of 4 children, Roberto grew up in Pine Bluffs, Wyoming. His older brother also graduated from the UW in mechanical engineering. Roberto enjoys music, playing the guitar, bike riding and camping. "I appreciate very much the scholarship from Union Wireless. It will certainly help me further my education."

Steven, is the son of Tim and Michele Toedter. He is a junior in Energy Systems Engineering from Hawk Springs, Wyoming (20 miles south of Torrington) and plans to graduate the spring of 2013. He is the younger of two children. His older sister also graduated from UW in finance/banking in 2009. Steven enjoys the outdoors, particularly hunting, fishing and hiking. "I greatly appreciate the scholarship money from Union Wireless. I respect Wyoming companies who have an interest in helping Wyoming students further their educations." According to Frank Draney, Director of Human Resources for Union Wireless, "the scholarship was set up to support the students in local communities interested in pursuing an education in a technical field and who desired to work in the Rocky Mountain region after graduation. The scholarship reflects the technical educational pursuits of the Management of UTC including John G. Woody, CEO and Eric J. Woody, Chief Technology and Operations Officer. Both John and Eric graduated from UW with electrical engineering degrees.

Rob Ettema, Dean of the College of Engineering and Applied Science, stated "The College has enjoyed a strong relationship with Union Wireless for many years and appreciates the support from the company for our students and our scholarships, as well as the engineering and computer science jobs the company provides. In fact, Union Wireless has hired some of our most outstanding graduates in recent years."

Union Telephone Company, founded in 1914 by John D. Woody, expanded into wireless communication and data services in 1990. On average, the company erects or updates a new cell tower weekly. The company operates 12 retail locations and has over 30 agents serving Wyoming, Northwestern Colorado and Northeastern Utah.

Presenting the scholarship award, below, left include (left to right) Steven Barrett, College of Engineering and Applied Science Associate Dean of Academic Programs; Roberto Garcia, scholarship recipient; Linda Montoya, Union Wireless Human Resources Manager; Frank Draney, Union Wireless – Human Resources Director; and Dean Robert Ettema of the College of Engineering and Applied Science.

Pictured below, right, presented the scholarship award to Steven Toedter include (left to right) Frank Draney; Steven Barrett; Steven Toedter student scholarship recipient; Linda Montoya; and Dean Robert Ettema; courtesy photos.



# **Tau Beta Pi Honors Eminent Engineer Recipients**

### Wyoming Eminent Engineer

James R. (Jim) Kladianos has been employed by the Wyoming Department of Transportation (WYDOT) for a period of almost 35 years, starting in 1976. Jim began his career with WYDOT as a designer in the Bridge



Division, and transferred to Project Development in 1982 to take a position as the assistant design team leader in the Laramie Design Squad. He became the design team leader in 1988, a position which he continues to hold.

The Laramie Design Squad is a cooperative edu-

cation unit operated by WYDOT in conjunction with the Department of Civil and Architectural Engineering at the University of Wyoming (UW). The members of the Design Squad are full time engineering students who also work a minimum of 20 hours per week for WYDOT, producing contract plans for highway construction projects under the supervision of three, full-time design engineers. During the course of their tenure in the Design Squad, the students are taught the fundamental principles of highway design, associated federal and state design policies and procedures, the operation of computer software for drafting and roadway design, etc. by Jim and the two Assistant Design Team Leaders.

Jim received a B.S. degree in civil engineering from UW in 1976, an M.S. (specializing in structures) in 1989, and a Ph.D. (specializing in transportation) in 2002. He has been a part-time instructor for the Department of Civil and Architectural Engineering since 1987, and taught classes mainly in the structural area until 2002. After obtaining a Ph.D., Jim switched to teaching transportation classes, and currently teaches one course per semester—Transportation Engineering, Geometric Design of Highways or Capstone Design Experience (CDE) in Transportation.

Jim has been a Registered Professional Engineer in the state of Wyoming since 1981, a member of the American Society of Professional Engineers since 1976, and a member of the National Society of Professional Engineers since 1982. He has served as a panel member for three National Cooperative Highway Research Program research projects in the area of geometric design.

### **Alumnus Eminent Engineer**

**David L. McPherson** earned a B.S. in Mechanical Engineering in 1962, and M.S. in Electrical Engineering in 1963, both from UW. He also received an M.S. in the Engineering Executive Program from the University

of California at Los Angeles in 1971. Prior to his retirement in 1998, he served as Senior Vice President of Raytheon Company and Executive Vice President of Raytheon Systems Company and General Manager of the Defense Systems Segment. The Defense Systems Segment operations had \$5.2 billion in revenues and 27,000



employees located primarily in Arizona, Texas, Massachusetts, California, and Washington. Prior to joining Raytheon, Dave was Senior Vice President of Hughes Aircraft Company and President of the Weapons Systems Segment – one of four major Hughes operating units. He led the consolidation activities of the General Dynamics missile businesses and the Hughes Missile Systems Group. As President of the new entity, the Hughes Missile Systems Company, he established a vision and change process resulting in leadership in market share and winning the Arizona Governor's Quality Award, which is awarded competitively to the Malcolm Baldridge Criteria.

Dave began his career with General Dynamics in 1963, as a Research Engineer. Following various assignments in engineering and management, he was named Director of Advanced Projects in 1976 and Director of the Division Air Defense program in 1977. In 1981, he was appointed Vice President and Program Director for the Stinger Weapon Systems program, and in October 1985, became the Vice President of Research and Engineering for the Valley Systems Division. Prior to joining Hughes, he was Corporate Vice President and General Manager of General Dynamics' Air Defense Systems Division.

Dave is active on the National Advisory Board for the University of Wyoming College of Engineering and Applied Science, with Arizona Quest for Kids, the Tucson Airport Authority and is on the Northern Trust Bank Advisory Board for Arizona and Colorado. Dave and his wife Susan reside in Tucson and have two sons, Dr. John McPherson of Nashville, Tennessee and David McPherson of Monarch Beach, California, and four grandchildren.

# TAU BETA PI HONORS BANQUET

The Dean of the College of Engineering and Applied Science and the members of Tau Beta Pi are pleased to announce the following award recipients:

#### **Outstanding Member**

Jennifer Catchpole, Computer Engineering Cheyenne, WY

#### **Outstanding Sophomore**

Mikel Walbridge, Chemical Engineering & Chemistry Evanston, WY

#### **Outstanding** Junior

Yifan Zhang, Petroleum Engineering Dongying, China The members of the Joint Engineering Council are pleased to announce the following award recipients:

#### **Outstanding Senior**

James Follum, Electrical Engineering, Sundance, WY

#### Departmental Nominees for Outstanding Senior

Jeffrey Burroughs, Computer Science, Laramie, WY Chris Cronick, Energy Systems Engineering, Anchorage, AK Elizabeth Hollowed, Civil Engineering, Meeker, CO Everett Koelling, Petroleum Engineering, Powell, WY Chris Laursen, At-Large Nominee, Powell, WY Torry Mullen, Chemical Engineering, Green River, WY Charles Schmidt, Mechanical Engineering, Laramie, WY Rob Streeter, Computer Engineering, Saratoga, WY Caryn Wykert, Architectural Engineering, Laramie, WY



#### Tau Beta Pi Outstanding Freshmen

Front row: Elizabeth Butler, chemical engineering, Douglas, Wyo.; Taran Triplett, mechanical engineering, Cheyenne, Wyo.; Erik Schmidt, chemical engineering, Loveland, Colo.; Gabriel Maestas, computer engineering, Green River, Wyo.; Libby Hungerford, architectural engineering, Gillette, Wyo.; Ben Steer, architectural engineering, Porters Corners, New York; Leal Klingensmith, architectural engineering, Garatoga, Wyo.; Penn.; Ben Collamer, civil engineering, Saratoga, Wyo.; Samuel Gates, civil engineering, Saratoga, Wyo.; Paul Drake, architectural engineering, Cheyenne, WY; Levi Anderson, mechanical engineering, Powell, Wyo.; back row: Tau Beta Pi past–President Rob Streeter and Banquet Vice–President Greg Ranft. Additional outstanding freshmen that were unable to attend the banquet: Garret Cowley, civil engineering, Cheyenne, Wyo., Ryan Felde-Vassallo, chemical engineering, Cheyenne, Wyo., and Trenna Terrill, architectural engineering, Laramie, Wyo.





Marvin Perry and son Seth



Linda Hakes-Hickerson and Jonathan Naughton

## **Outstanding Staff Member**

Marvin C. Perry III was raised in Indianapolis, Indiana and fell in love with Wyoming during a backpacking trip in the Wind River Range. After attending Purdue University, he earned a master's degree in mechanical engineering at UW under the direction of Dr. David Walrath. Before returning to Laramie in 2007, he held several positions with Toray Industries, primary supplier of composite material to the Boeing 787 "Dreamliner" airplane. He worked in Alabama and Washington as composite materials research engineer and process engineer, and was appointed R&D liaison to Boeing and other 787 partner companies.

Marvin now stays occupied designing and maintaining specialized equipment in support of broad experimental research in the Civil & Architectural Engineering Department. He spends much of his time assisting graduate students in setting up their experimental apparatus, usually involving custom software and instrumentation. He is a member of the College's Staff Council and currently serves as Vice Chair for the Council.

"Marvin provides exceptional design and programming for a diverse range of applications, but more importantly, he instructs our students on "real world" engineering topics," said Jonathan Brant, Assistant Professor in the Department of Civil and Architectural Engineering.

### Samuel D. Hakes Outstanding Graduate Research & Teaching Award

Jonathan W. Naughton has been a faculty member in the Mechanical Engineering Department at the University of Wyoming since 1997 and is currently an Associate Professor and Director of the Wind Energy Research Center. Jonathan obtained his B.S. from Cornell University and his Ph.D. from the Pennsylvania State University in the area of compressible fluid dynamics. Prior to joining the UW faculty, he worked at NASA-Ames Research Center for four years.

Jonathan's research interests include aerodynamic instrumentation development, experimental characterization of turbulent flows, control of turbulent flows, the unsteady aerodynamics of wind energy, and atmospheric inflow modeling. He teaches both undergraduate and graduate courses in fluid dynamics and has mentored and graduated 11 M.S. and four Ph.D. students. He currently advises eight graduate students, five M.S. candidates and three Ph.D. candidates.

As director of the WERC, he continuously works to expand and support the activities, facilities, and visibility of WERC by pursuing strategic partnerships with state government, other universities, federal laboratories, and industry.



Cameron H.G. Wright

### Outstanding Undergraduate Teaching Award

Cameron H. G. Wright has been a faculty member in the Electrical and Computer Engineering Department at UW since January 2003 and is currently an associate professor and the associate department head. Cam earned the B.S.E.E. (summa cum laude) from Louisiana Tech University, the M.S.E.E. from Purdue University, and a Ph.D. from the University of Texas at Austin (in the areas of signal/image processing, computer vision, and biomedical instrumentation). He is a licensed Professional Engineer, and holds Federal Communications Commission licenses for commercial radio and television broadcasting stations; for terrestrial, airborne, and maritime radar; and for amateur radio. His current research projects include the development of an artificial vision sensor based on the eye of the common housefly, and biomedical research into quantitative assessment of concussion and other traumatic brain injury in athletes. He is an associated faculty member with three multi-disciplinary Ph.D. programs at UW: Biomedical Sciences, Neuroscience, and Molecular and Cellular Life Sciences. He has graduated 15 M.S. students, has four M.S. and two Ph.D. students in progress, and has served as mentor to four undergraduate research students.

#### Honoring Sam D. Hakes

In Spring 2003, the College of Engineering and Applied Science renamed the Outstanding Graduate Research/Teaching Award to the Sam D. Hakes Outstanding Graduate Research and Teaching Award in honor of Sam Hakes, Dean of the College, 1972–1996. This award, originated by Sam, is given to a College faculty member each year to recognize meritorious accomplishments in graduate research and teaching. The Sam D. Hakes Outstanding Graduate Research and Teaching Award recognizes the outstanding efforts of College faculty and celebrates Sam's many achievements and dedication to graduate education in the College. Sam's daughter Linda Hakes-Hickerson was present at the Tau Beta Pi Banquet to present this year's award.



Commencement exercises were held May 7, 2011. Retired Air Force Brigadier General Patrick Burns, Joint Engineering Council Outstanding Senior James Follum and Wyoming Engineering Society Outstanding Senior Rob Streeter delivered the commencement speeches.

Congratulations to the following degree candidates from the College of Engineering and Applied Science:

#### **DOCTOR OF PHILOSOPHY**

Qichang Chen, Computer Science Brian Kyle Dean, Electrical Hee Joon Park, Chemical Zachary Tyrrell, Chemical Anthony Wallace, Computer Science Yonggang Wang, Atmospheric Science Hao Zhang, Chemical

#### **MASTER OF SCIENCE**

Anthony Albert Allias, Electrical Sharath Aramanekoppa, Electrical Jeffrey Baumann, Mechanical Shashidhar Belbase, Civil Travis Bolinger, Computer Science Brandon Chiu, Electrical Zebulon Coulter, Civil George Dzotepe, Civil Ahmed Elghriany, Civil Michael Follum, Civil Daniel Foster, Mechanical Kendra Heimbuck, Civil Aaron Hudlemeyer, Mechanical Rory Jarrard, Computer Science Qiuhong Jia, Environmental Rebecca Johnson, Civil Usha Koirala, Electrical Bradley Leppert, Electrical Alex Jay Mackay, Mechanical Christopher Mertes, Mechanical Justin Mullings, Mechanical Edward Offei, Civil

Evan O'Toole, Civil Hao Qian, Computer Science Paul Ringenberg, Civil Erika Schoen, Civil Shreyas Seshadri, Electrical Brandon Skari, Computer Science Jared Stiver, Civil Eric Sundstrom, Petroleum Brian Symons, Chemical Patrick Tcheunou, Chemical Joshua Tomayer, Electrical Jeff Wenke, Civil James Winters, Civil Scott Wolfer, Civil Andrew Wrucke, Civil Baichhabi Raj Yakami, Electrical

#### **BACHELOR OF SCIENCE**

Architectural Engineering Jennifer M. Beffert Jeffrey S. Christensen Travis Penfield Doherty Sarah Elizabeth Dunlap Douglas Fankell Brent Allen Franko Trent Daniel McAteer Michael Joseph Porcelli Christopher John Stearns

#### **Chemical Engineering**

Abdullah Abdulaziz Al Aqeel David Granum Brandon Griffin Cami Jackson Quinn Langbauer Andrew Marushack Torrey Mullen Mark Pond Mingchen Tang Irena Vankova Nathaniel Vogel Andrew West Malithi Wickramathilaka



# BACHELOR OF SCIENCE (continued)

#### **Civil Engineering**

Buton M. Andreen Cole B. Axthelm Leah Victoria Birgen Raymond Joseph Catellier Jesse Nicholas Creel Tyson Dutton Edwin Ferguson, IV Collin D. Fossen Jerry L. Hamel Jr. Daniel John Haves Brian L. Hedrick Craig Tyler Jepson David Arthur Johnson David Beckham Kemper Nicholas Korsick Michael LaBrake Amber Nicole Lebsock Ji Liu Christopher L. Melson Eric Daniel Milliken Dana M. Morrison Stephen Isaac Pence Justin D. Petersen Rhianna Jean Poss Colin S. Reinert Tad R. Rosenlund Daniel Martin Seth Joseph Caleb Slawiak Justin Michael Starck Justin Allen Terfehr Aaron J. Triebenbach Ryan Dillon Wells

#### **Computer Engineering**

Mark Alan Oxley Robert W. Streeter Emery J. Witt

#### **Computer Science**

James D. Bohling Jeffery Burroughs Kenneth H. Carpenter III Ryan William Herod Carl Samuel Jaeger Andrew William Lindberg Cameron Shea Lund Chad McRann Lisa Marie Owen Brandon Forrest Payne Eric Andrew Richardson Jay P. Wuensch Frank John Zebre

#### **Electrical Engineering**

Caleb Nathanael Cresswell Dax Michael Crum James Dale Follum Mujtaba Haider Benjamin M. Hoerst Ryan Kane Chepchumba Soti Limo Tyler Richard Morton James Robeson Robert W. Streeter Alex Clayton Tippetts

#### **Energy Systems Engineering**

Tommy Joe Baumgardner III Cember Jordan Crawley Christopher H. Cronick Thomas J. Gebes II Christopher M. Laursen Timothy H. Neill, Jr.

#### Mechanical Engineering

Jubal Allison Joshua Chance Barry Christopher Makky Battisti Luke Justin Biggs

Congratulations to the UW Outstanding Graduating Senior Award Finalists: Rob Streeter of Saratoga, Wyo., and Jennifer Catchpole of Cheyenne, Wyo. Kristianna Jave Bilan Dorin David Blodgett Nicholas Ryan Borrego Bryan Warren Bortner Steven Lee Boyd Nolan Brasington Amy Lynn DiRienzo Dakotah Daniel Gali Robert Spencer Garland Jeffrey Helgerson Austin T. John Dustin Kanada Christopher M. Laursen Andrew Magstadt Alicia Claire Martin Eric Alan Robinson Nicholas Andrew Roder Nicholas E. Rozack Charles Gregory Schmidt Luke Gardiner Walker Iason Blair Warner Patrick Thomas Weber David Jon Wilcox

#### **Petroleum Engineering**

Adam Badura Dylan F. Esquivel Matthew E. Fare David A. Haakinson Tai Le Huu Everett Norfleet Koelling Mark James Ringler Derek Timothy Smith

COLLEGE OF

**ENGINEERING** and

APPLIED SCIENCE

UNIVERSITY OF WYOMING



#### **Jason Delaney,** B.S. civil engineering 2004, of Golden, Colo., competed in the Boston Marathon, finishing 20th overall for the men in 2:19:17 and averaging a 5:19 pace. Delaney was seventh for U.S. men in the marathon.

Gretchen Heberling of Greensboro, Maryland was selected to receive the 2011 Y.C. Yang Civil Engineering Scholarship from the American Society of Civil Engineers for the award amount of \$3,000. Gretchen is an Architectural Engineering major interested in large-scale building construction, modern structural integrity, design, new materials testing, LEED ("green") certification, and business processes associated with complex projects. She intends to pursue an M.S. in High Performance Buildings (Building Technology).

James Winters of Pinedale, Wyo., received the Precast/ Prestressed Conrete Institute (PCI) Daniel P. Jenny Research Fellowship for "Pull-Out Capacity of Cast-in-Place Anchors in Early Age Concrete" under the direction of Civil and Architectural Engineering Professor and H.T. Person Chair, Charles Dolan. The son of Brad and Geri Winters, he graduated in May with an M.S. in civil engineering and has accepted a job as an Engineer I with the Wyoming Department Transportation of Bridge Department in Cheyenne.



Gretchen Heberling

# **Student Highlights**

Jesse Creel of Casper, Wyo., is congratulated by Paul Rechard (pictured right) at the recent Tau Beta Pi Honors Banquet for being selected as the recipient of the 2011–12 Mary Lou and Paul A. Rechard Endowed Fellowship in Civil Engineering for Water Resources. Other recipients of the award were **Ryan Rasmussen** of Wright, Wyo., and **Nancy Thoman** of Riverton, Wyo.

Brian Dean and Rob Streeter received awards for their "top papers" at the recent Rocky Mountain Bioengineering Symposium in Denver, Colorado. The research examined the



Musca domestica (common housefly) sensor project, an ongoing endeavor at UW. The project seeks to develop a sensor based on the rudimentary function of a fly's eye, including the inherent hyperacuity (high sensitivity to motion) present in the insect's vision. During the summer period of 2010, several characterization tests were conducted on the latest sensor design at UW. It was found that the light-adaptation circuitry being utilized caused inverted Gaussian-shaped artifacts in the output signals. These artifacts, while initially bothersome, have a distinct use as a means to detect motion direction across the sensor's field-of-view. Their paper provided background information on the sensor design being considered, discussed some of the tests conducted, and offered results that illustrate the signal artifacts. The potential uses of these artifacts, as well as what causes them, was discussed in detail.

A team of eight representatives from UW competed in the North Central Collegiate Cyber Defense Competition (CCDC) on February 26. After eight grueling hours of competition, the UW team captured first place.

The competition challenges teams on their understanding and execution of computer system and networking administration as well as their ability to secure these systems from network based attackers.

The regional win qualified the UW CCDC team for the national competition in April. At nationals, the UW team took fifth place honors against top regional winners from around the country. Team members are pictured below with advisor Jim Ward.



Left to right: Jim Ward, Jeff Burroughs, Jay Wuensch, Frank Zebre, Dietrich Wambach, Brandon Skari, Nick Anderson, Tom Marnell and Eric Richardson, courtesy photo.

## Saratoga Students Receive Scholarship Awards



Rob Streeter, Samuel Gates and Ben Collamer

Rob Streeter is the Wyoming Engineering Society Student Engineer of the Year and recipient of the Jerry Cupal Scholarship in the amount of \$2,500 to continue his master's program in electrical engineering. Rob also received the Susan McCormack Scholarship in the amount of \$1,000. He was one of the finalists for the UW Tobin Memorial Award for Outstanding Graduating Seniors and graduated in May with dual majors in electrical and computer engineering.

Tau Beta Pi Outstanding Freshmen Samuel Gates and Ben Collamer are both civil engineering majors who will continue their studies with the College next year. Both Sam and Ben are recipients of the Polly Garner Leik Chase Scholarship in Civil Engineering in the amount of \$1,250 each for AY 2011-12. Rob, Sam and Ben are natives of Saratoga, Wyo.

# In Memoríam

Sadly since our last issue, we have lost the following alumni. Our sympathy goes out to the families of our valued alumni and friends.

Robert J. Belecky Fay L. Eaton, Jr. Arthur D. Fleming Richard D. Johnston Richard W. Keller Paul A. Pivik Robert E. Snyder Joseph Lyle "Buster" Strohl B.S. Electrical Engineering 1964 B.S. General Engineering 1954 B.S. Mechanical Engineering 1949 B.S. Mechanical Engineering 1957 B.S. Electrical Engineering 1967 B.S. Civil Engineering 1980 B.S. Mechanical Engineering 1957 B.S. Electrical Engineering 1947

Taylor Mac Belt, 87, of Cheyenne died April 1. He was born June 17, 1923, in LaJunta, Colo., to Dresden Taylor and Margaret E. Belt. He married LaDean Taylor on June 24, 1945, in Cheyenne. He was a member of First Christian Church, Rocky Mountain Masonic Lodge No. 40, A.F. & A.M., Wyoming Consistory No. 1 (32nd degree Mason), American Legion and a life member of VFW. Mr. Belt is survived by a sister, Irene Benskin. He was preceded in death by his wife, LaDean Belt; and his parents, Dresden Taylor and Margaret E. Belt.

A.J. "Max" Castagne, 93, of Red Lodge, Montana, died February 20. Max was born on November 13, 1917 in Red Lodge, the fourth son of Joseph and Josephine Castagne. He attended Red Lodge Schools, graduating from Carbon County High School in 1937. Whiel growing up, Max worked with his brothers in their local meat business and on ranches owned by the family. Max graduated from the University of Wyoming in 1942,

Denver, CO Wenatchee, WA Bakersfield, CA Blackfoot, ID Longmont, CO Reno, NV Ocnomowoc, WI Casper, WY

with a B.S. in mechanical engineering. Max worked for a brief time at Boeing Aircraft Co. in Seattle, Washington before entering the U.S. Army Air Corps. He served as an aircraft maintenance officer and was assigned to AT-6 and B-25 squadrons in California. He also served with the air command in the South Pacific and was honorably discharged as a 1st Lieutenant. He resumed his career in engineering, working first in plastics manufacturing with Bakelite Corp. He then began his employment with Westinghouse Electric Corp., initially working in the development and design of aircraft engines and later moving to power plant engineering in Pittsburgh, Penn. and Kennewick, Wash. Upon retirement, Max returned to help his sister Ann and his brothers in Montana. He was preceded in death by his sisters Ann and Lucy; and by his brothers James, Victor, Joseph and Frank. Survivors include several nieces and nephews in Montana. Courtesy of the Carbon County News, red Lodge, Montana.

## New Book Now Available



A new book is available by **Vladimir Alvarado**, assistant professor in the Department of Chemical and Petroleum Engineering. Vladimir has authored a book titled Enhanced Oil Recovery: Field Planning and Development Strategies (http://www. amazon.com/Enhanced-Oil-Recovery-Development-Strategies/dp/1856178552/ ref=sr\_1\_1?ie=UTF8&s=books&qid=1304 427613&sr=8-1) in cooperation with Dr. Eduardo Manrique.

## Welcome to New Faculty

This fall, the Mechanical Engineering Department will add Wyoming native and alumnus **Ray Fertig** as its newest faculty member. Ray received a B.S. and M.S. degree at UW in mechanical engineering in 2001 and 2003, respectively. He then went on to complete a Ph.D. in materials science at Cornell University, during which time he also worked as a visiting researcher at Lawrence Livermore National Laboratory in Livermore, Calif. and at the Max Planck Institut für Metallforshung in Stuttgart, Germany.

After receiving his doctorate, Ray moved back to Cheyenne, where he currently resides with his wife Jessica and son Daniel. For the past three years Ray has been working for Firehole Composites where is currently a senior applied research engineer. His work has recently been applied to nanomechanics of thin films, fatigue life prediction of composite materials and the mechanical behavior of high-temperature ceramics and ceramic matrix composites.

# Faculty and Staff Highlights Professor Adidharma Wins Prestigious International Award



Hertanto Adidharma

Few United States-based professors garner attention from the International Association for the Properties of Water and Steam (IAPWS). The short list now includes UW's **Hertanto Adidharma**, an assistant professor in the Department of Chemical and Petroleum Engineering.

Adidharma recently won the IAPWS' Helmholtz Award, presented annually to a promising early-tomid career scientist or engineer making significant contributions to, or defining new directions, in areas of the association's research.

"It was a big surprise. I didn't expect to win because there were only two past recipients from U.S. universities since 2000," says Adidharma, who joined the UW faculty in 2005. "I feel honored to receive the award, but it is an award that would not have been possible without the advice and encouragement from my mentors and colleagues in the Chemical and Petroleum Engineering Department."

Adidharma joins Eric Luijten of the University of Illinois (2003) and Valeria Molinero of the California Institute of Technology (2005) as the only U.S. winners of the Helmholtz Award in the past 11 years. And, since 1999, only one U.S.based scientist has won the IAPWS' other major accolade, the Gibbs Award.

The IAPWS is a non-profit group of national organizations with members or associate members in 18 countries who study the properties of water and steam, water and aqueous mixtures relevant to thermal power cycles and other industrial applications. "Hertanto's award is a significant honor for himself, of course, but also for UW," says David M. Bagley, head of the Department of Chemical and Petroleum Engineering. "I am delighted to serve a department with colleagues like Hertanto who clearly demonstrate the world-class capabilities of our UW faculty members."

Adidharma will receive his award at the IAPWS' annual meeting, Sept. 4-9 in the Czech Republic. As part of the conference, Adidharma will present to an international group of colleagues from faraway countries including Denmark, Germany, Japan and Russia. The UW professor's research focuses is in the area of molecular and macromolecular thermodynamics applied to energy science and engineering.

Adidharma is a graduate of the Surabaya Institute of Technology in Indonesia (B.S., '87) and Louisiana State University (Ph.D., '99).

## Nick Mahon Receives UW Staff Award

**Nick Mahon,** an engineer in the Atmospheric Science Department received a UW Staff Incentive Award for his dedication and service to the University. Originally from Laramie, Nick and his family have lived here the last 16 years. He graduated from UW with a B.S. in mechanical engineering in 2006 and MBA in 2008. His work focuses on providing engineering design and analysis for equipment installed on the UW weather research aircraft. Nick and his wife Suzie are parents of a five month old daughter named Isla.



Nick Mahon

# **Alumni Highlights**

Andrew Gerhart, M.S. mechanical engineering 1998, was named Michigan Professor of the Year by the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education. He also holds degrees from the University of Evansville in Indiana and the University of New Mexico and has taught at Lawrence Technological University in Southfield, Mich., since 2002, where he coordinates 12 courses in the College of Engineering.

**Stacy Knull**, B.S. petroleum engineering 1995 was recently appointed vice president and chief operating officer of Daylight Energy Ltd. Effective April 11, she assumed leadership of Daylight's oil and gas operations, including engineering, exploitation and production activities. She has over 20 years of experience in the energy industry focused primarily on unconventional resource play growth from a grassroots conceptual stage through to full scale asset development. Prior to joining Daylight, Stacy served as vice president of Clearwater Business Unit and Canadian Conventional Exploration and Joint Ventures for Encana Corporation. Stacy is a professional engineer with membership in the Association of Professional Engineers, Geologists, and Geophysicists of Alberta Canada.

**Boots Nelson**, B.S. civil engineering 1959, was named the March 2011 Artist of the Month by the Mesquite, Nevada Virgin Valley Artists Association. Boots enjoys the opportunity to show his paintings that "express a mood, tells a story, and creates emotion." His art work was displayed at the Mesquite Fine Arts Center and more information about his paintings can be found at www.mesquitefineartscenter.com. Boots was selected as the Tau Beta Pi Wyoming Eminent Engineer in 1986 and inducted into the College Hall of Fame in 2010.

Northern Wyoming native, **Brian Pearce** B.S. computer science 2010, has recently joined Teton Data Systems in Jackson, Wyoming, as a software engineer. His brother **Paul Pearce** B.S. computer science



2002, has been employed by Teton Data Systems since 2003. Their brother **Tom Pearce**, is currently a student at UW majoring in computer science, with plans to graduate in 2012. Keeping with the UW tradition, the Pearce siblings followed their father **Leonard Pearce**, who received a B.S. in petroleum engineering in 1972 from UW. Their mother, Susan Oltion Pearce, received a B.A. in elementary education in 1971 from UW. Pictured are Tom, Paul and Brian Pearce, taken at their older brother Ray's wedding last year.

Col. Richard Scott Stapp B.S. electrical engineering 1985, M.S. electrical 1989, engineering from the University New of Mexico, currently serving as the director of the Aerospace Sustainment Directorate at Hill Air Force Base in Utah, had his nomination for brigadier general confirmed by the U.S.



Senate. He received his commission in 1986 as a distinguished graduate of Officer Training School, Lackland AFB, TX. He served as the lead flight test engineer for the Joint Service V-22 Osprey and conducted over 250 hours of flight test on two prototype V-22s. He also served as an instructor at the U.S. Naval Test Pilot School. His command tours include the 36th Electronic Warfare Squadron, Air Combat Command and the Special Technology Group, National Reconnaissance Office. Among his many accomplishments, he was the recipient of the 2009 CIA's Agency Seal Medal and the Director of National Intelligence's Award for Collaboration Leadership.

Nick Stuckert, B.S. engineering chemical 2010, was selected as a **ScholarPOWER** 2011 award recipient at the University of Michigan's Graduate School of Chemical Engineering Ph.D. program. The award celebrates the excellent academic performance of engineering students.





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#### Nonprofit Organization U.S. POSTAGE PAID PRINTCO GRAPHICS





**James Follum** of Sundance, Wyo., is the recipient of a National Tau Beta Pi Fellowship award. He will receive a \$10,000 grant to support his graduate level study. The Tau Beta Pi Board selects candidates based on qualities that fulfill two "great requirements," outstanding scholarship and exemplary character. Jim graduated in May with a B.S. in electrical engineering with an emphasis on power systems and signal processing.

"Jim is an excellent student. He has been working with me on undergraduate research and is continuing on straight to a Ph.D. program," says John Pierre, Professor in the Department of Electrical and Computer Engineering.

Last summer, Jim had the opportunity to assist with research developing methods to analyze the stability of power systems at the Department of Energy's Pacific Northwest National Laboratory in Richland, Washington. This experience helped solidify his decision to remain at UW after graduating in May and pursue a Ph.D. in electrical engineering. He intends to build a career research the power system following graduation. He is a participant in Tau Beta Pi and Golden Key honor societies.