FORESIGNERING AND APPLIED SCIENCES

FALL 2014, Volume 40, No. 1



Award-Winning Research • Future Engineers • Back in Space



Students who come to UW learn from some of the best and brightest scientists in the world.

> - Assistant Professor Jeff Clune Department of Computer Science College of Engineering and Applied Science

> > Data Visualization Specialist Nikhil Shetty works with a student in UW's Shell 3-D Visualization Laboratory.

GO FOR GOLD

A Call to Excellence

In May 2012, Gov. Matt Mead, the Wyoming Legislature and the Wyoming Governor's Engineering, STEM Integration Task Force articulated a vision to propel the College of Engineering and Applied Sciences and the University of Wyoming to new realms of excellence in instruction, research and service. UW's leadership, faculty and staff are committed to the vision; and equally important, UW's industry partners have embraced this vision and will help actualize it.

Preparing Students for the 21st Century

The College of Engineering and Applied Science is a nationally recognized institution of academic excellence and world-class research. Student and faculty engagement is a hallmark of the college, helping our students reach their full potential to achieve dynamic and rewarding careers. Through small class sizes, UW engineering students have the opportunity to gain hands-on experience with real-world projects alongside renowned faculty and research scientists.

Unprecedented investments are creating world-class facilities for engineering students and researchers. The College of Engineering and Applied Science combines accessibility and affordability with an experience that prepares our students to be competitive in a global market.







Features

12/ In Pursuit of Excellence

A new era is dawning for the College of Engineering and Applied Science.

18/ Award-Winning Research

UW Assistant Professor Lamia Goual's recent National Science Foundation CAREER Award will aid her research into rock and fluid interactions.

22/ Future Engineers

The College of Engineering and Applied Science's Engineering Summer Program introduces high school students to the field and to UW.

Departments

- 02 / Editor's Letter
- 03 / From the Dean's Office
- 04 / News & Notes
- 08 / Students in Action
- 10/ Faculty in Action
- 26 / Alumni in Action
- 27 / Memoriam
- 31 / Calendar of Events
- 32 / Did you Know?

On the cover: Thomas Botts, co-chair of the Governor's Energy, Engineering, STEM Integration Task Force and retired executive vice president of global manufacturing for Royal Dutch Shell; Greg Hill, task force co-chair and president and chief operating officer of Hess Corp.; and Wyoming Gov. Matt Mead at the University of Wyoming on Thursday, June 5, 2014.

University of Wyoming College of Engineering and Applied Science

Interim Dean Al Rodi

Associate Dean, Academic Programs Steven Barrett

Associate Dean, Graduate Research Jay Puckett

Executive Business Manager Cricket Hoskins

Departments:

Atmospheric Science Thomas Parish, Head (307) 766-4949 atmos.uwyo.edu

Chemical and Petroleum Engineering David Bagley, Head (307) 766-2500 uwyo.edu/chemical

Civil and Architectural Engineering Dick Schmidt, Head (307) 766-5255 uwyo.edu/civil

Computer Science Jim Caldwell, Head (307) 766-5190 cs.uwyo.edu

Electrical and Computer Engineering John McInroy, Head (307) 766-2279 uwyo.edu/electrical

Mechanical Engineering Paul Dellenback, Head (307) 766-2122 uwyo.edu/mechanical

Editors Jonathan Barrett and Micaela Myers

Graphic Designers Jeff McDonald and Patrick Owen

Photography

All photos by Ted Brummond and Trice Megginson unless otherwise noted *Thank you to all contributing writers for creating a dynamic and diverse collection of content.

Foresight is created twice per year as a collaboration between CEAS and UW Institutional Marketing.

For additional copies, contact CEAS at (307) 766-4253 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.

Introducing a New Era for Foresight

This is an exciting time for the University of Wyoming's College of Engineering and Applied Science (CEAS). In May 2012, Gov. Matt Mead, the Wyoming Legislature and the Wyoming Governor's Energy, Engineering, STEM Integration Task Force articulated a vision to propel the college and UW forward to new realms of excellence in instruction, research and service. UW's leadership, faculty and staff are committed to this Tier-1 vision, and the university's industry partners have stepped forward to help actualize it.

During this time, it's only fitting that *Foresight*, CEAS's flagship publication, become even bigger and better. To help accomplish this, CEAS has partnered with UW's Institutional Marketing department. UW Institutional Marketing is composed of an award-winning team of marketing professionals, designers, Web experts and writers charged with the development, implementation and preservation of the UW brand, including university marketing plans, social media, the UW website, and institutional design and publications, such as *UWyo Magazine*.

While most of the content for this issue of *Foresight* was already in place when we came aboard, under the purview of UW Institutional Marketing, future issues will bring you even more original articles, as well as stellar photography and captivating design.

Published twice a year, *Foresight* informs and inspires CEAS alumni and friends—profiling the incredible students, alumni and faculty, as well as sharing news on the latest research, awards and initiatives. Through engaging and informative content, *Foresight* cultivates relationships with the greater UW community and aims to have a direct impact on giving, alumni and trustee relations, student and faculty recruitment, and public and government relations.

We look forward to this new and exciting partnership, and we hope you enjoy this issue of *Foresight* magazine.

Sincerely,

Micaela Myers

Micaela Myers, editor of UWyo and Foresight magazines



Stay tuned for the January issue of *UWyo Magazine* with a special section devoted to engineering!

Subscribe today! uwyo.edu/uwyo

The UW College of Engineering and Applied Science Welcomes Al Rodi as Interim Dean



In July 2014, University of Wyoming Professor Al Rodi took the reins as interim dean of the College of Engineering and Applied Science. Rodi assumed the position of interim dean from Khaled Gasem, who moved to UW's engineering faculty after completing his time in the interim position June 30.

"We appreciate the work Dr. Gasem has done to move the college forward, and we're happy Professor Rodi has stepped up to provide interim leadership while the dean search advances," says UW President Dick McGinity. "There is great excitement about the efforts that are underway to raise the profile of the College of Engineering and Applied Science, and strong leadership is a key to make that happen."

After graduating from the University of Chicago with B.S. (1965) and M.S. (1969) degrees in geophysical science, Rodi came to UW in 1977 to work with the university's newly acquired King Air research aircraft and obtain his Ph.D. in atmospheric science, joining the faculty of the Department of Atmospheric Science in 1981. He was promoted to associate professor in 1988 and full professor in 1993. Previously, Rodi worked at the Research Aviation Facility at the National Center for Atmospheric Research, where he instrumented aircraft to support the atmospheric science community.

Rodi currently teaches graduate courses in physical meteorology, instrumentation and research ethics, and has mentored many master's and doctoral students. He has published primarily in the area of cloud physics and airborne-observing technology based on his work with the Wyoming King Air research aircraft.

He became the chief scientist on the King Air from 1993–98, director of the University's Flight Center in 1998 and has been head of the Department of Atmospheric Science since 1998. Since 1999, Rodi has been the principal investigator on the cooperative agreements between UW and the National Science Foundation that fund the aircraft and its staff as a U.S. national facility that is part of NSF's Lower Atmospheric Observing Facilities.

The most recent five-year UW/NSF cooperative agreement was funded for \$9.5 million to support operations through 2019.

McGinity leads the search for a new dean, assisted by the executive search firm Korn Ferry. He says a search committee has been selected and will move forward to review candidates soon, with a new dean identified by the end of the fall 2014 semester. The committee includes UW faculty and staff members inside and outside CEAS, along with people from outside the university.

Go online! Visit the College of Engineering and Applied Science website—**uwyo.edu/ceas**—for the latest news, stories and updates.





Like UW on Facebook! If you're on Facebook, make sure to "Like" the University of Wyoming's official page: facebook.com/uwpride. Also make sure you "Like" the CEAS page: facebook.com/uwyoengineer.

NEWS & NOTES

Professors Tap Supercomputer for Research

mechanical engineering research proposal for high-performance computing allocation at the Lawrence Livermore National Laboratory (LLNL) was selected for support during the eighth Institutional Unclassified Computing Grand Challenge. UW professors Jay Sitaraman and Dimitri Mavriplis will use the "Vulcan" supercomputer to study large-scale simulations of wind farm aerodynamics in turbulent atmospheric inflow conditions.

LLNL's Vulcan supercomputer has 393,000 processors and is the sixth fastest high-performance computing facility in the world. The goal of the UW project is to simulate and analyze flow fields in large wind farms. Both faculty members have worked extensively in developing Helios, which is one of the only computational tools capable of performing simulations at such large scales. Helios was co-developed by the U.S. Army and UW for performing rotorcraft simulations. It is expected that results from the large-scale computational flow simulation will become a benchmark and provide guidance for optimizing turbine placement in future wind farms.

Industrial Affiliates Program Welcomes New Partner



In February 2014, the UW Department of Computer Science welcomed Green House Data, headquartered in Cheyenne, Wyo., as the most recent partner in its Industrial Affiliates program.

The program provides a link between partners and potential employees and faculty members. Green House Data is a leading provider of cloud hosting, managed services and collocation. The company continues to play a major role in the rapid expansion of Wyoming's technology economy, creating 40 jobs since 2007, many of these high-tech positions in Cheyenne.

"The direct interaction with students and faculty of the Computer Science Department was one of the primary reasons we have joined the Industrial Affiliates Program," says Shawn Mills, president of Green House Data. "The program fosters the strengthening of the relationship between Green House Data and the university and speaks to the influence UW has on the technology industry in Wyoming."

"We are very proud to be partnered with Green House," says James Caldwell, head of the Department of Computer Science. "Green House Data is a Silicon Valley-style success story right here in Wyoming. They're able to offer exactly the kind of internships and jobs we hope to find for our students."

For more information on the program, visit **uwyo.edu/cosc/ industrial_affiliates**.

New Master's Degree Program in Architectural Engineering

In March 2014, the UW trustees approved a new Master's of Science degree program in architectural engineering. UW becomes the 10th university in the country to offer this degree. The new program will allow the architectural engineering faculty to recruit more graduate students and increase research activities, particularly in the area of building energy systems. This program goes into effect immediately. For more information, visit **uwyo.edu/civil/grad**.



2014 CEAS Award Winners

Elizabeth Butler

Department of Chemical and Petroleum Engineering Joint Engineering Council Outstanding Senior

Jeremy Clay

Department of Electrical and Computer Engineering Tau Beta Pi Outstanding Sophomore

Debbie Craft

Department of Mechanical Engineering TBP Outstanding Staff Award

Thomas Edgar

Department of Civil and Architectural Engineering 2014 University of Wyoming Ellbogen Lifetime Teaching Award Tau Beta Pi Wyoming Eminent Engineer

Erin Essary

Department of Civil and Architectural Engineering CEAS Outstanding Staff Award

Maohong Fan

Department of Chemical and Petroleum Engineering Sam D. Hakes Outstanding Graduate Research and Teaching Award

Tanner Harms

Department of Mechanical Engineering Tau Beta Pi Outstanding Junior

H. Gordon Harris

Department of Chemical and Petroleum Engineering Tau Beta Pi Outstanding Undergraduate Teaching Award

Elizabeth (Libby) Hungerford

Department of Civil and Architectural Engineering Tau Beta Pi Outstanding Member WES Student Engineer of the Year

Harold McCaskey

Tau Beta Pi Alumnus Eminent Engineer

NEWS & NOTES

UW Helps Lure Company's Tech Center to Wyoming

I n April 2014, Gov. Matt Mead announced that Underwriters Laboratories (UL) will open a technology center in Wyoming, initially at the UW's Wyoming Technology Business Center. UL is an independent safety science company with nearly 11,000 employees serving customers in more than 100 countries. It plans to launch new information technology operations in Laramie.

"I am pleased UL chose Wyoming for its technology center. We look forward to seeing UL expand its presence in our state," the governor says. "A multinational company like UL diversifies our economy and creates exciting opportunities for the people of Wyoming."

"UL considered several locations across the United States for our new technology center," UL Information Technology Director Mike Nuteson says. "During our search, we were extremely impressed with the quality of talent available in Laramie along with the support and involvement of the local, university and state teams. We



will initially employ a small team in Laramie that we plan to expand in time."

An additional benefit of developing a technology center in Laramie is the opportunity for the new team to work with UL's Laramie-based Prospector team. This global plastics information management company (formerly known as IDES) has been in Laramie for almost 30 years and became part of UL in 2012. IDES founder Mike Kmetz started his spin-off company from a research project conducted for IBM by UW.

"This is truly a wonderful opportunity for graduates coming out of the University of Wyoming to stay in Wyoming and work for a great company," says Dan Furphy, CEO and president of the Laramie Chamber Business Alliance.

"Our mission at UL is to promote safe living and working environments, and we envision that this new team can play an important role in helping UL achieve our mission," Nuteson says.

Bill Gern, UW's vice president for research and economic development, says, "Having UL locate its technology center at the Wyoming Technology Business Center is significant for both UW and the business center. It says that this center is very flexible, and it provides a basis for which established companies can locate in Laramie."

Nominate Outstanding Engineers for Awards

B ach year Tau Beta Pi recognizes two outstanding engineers with the Wyoming Eminent Engineer Award and the Outstanding Engineering Alumnus Award. The Wyoming Eminent Engineer Award recognizes engineers who have made outstanding contributions to Wyoming and

the engineering profession. The Outstanding Engineering Alumnus Award recognizes college alumni who have distinguished themselves through outstanding contributions to engineering. Request nomination forms from Steve Barrett, steveb@ uwyo.edu; completed packages due Feb. 15, 2015. Outstanding engineers and scientists can also be submitted for the college's awards, which honor graduates who have distinguished themselves with outstanding professional and community leadership achievements.

Contact Baillie Miller, bmille42@ uwyo.edu, or visit **uwyo.edu/ceas/** development/awards.

Gov. James Geringer Appointed to the National Assessment Governing Board



In March 2014, two former governors who made education issues a cornerstone of their service were appointed to the National Assessment Governing Board. Gov. Ronnie Musgrove of Mississippi and Gov. James Geringer of Wyoming—who sits on the UW College of Engineering and Applied Science National Advisory Board—will fill the two open positions on the governing board.

The governing board sets policy for the National Assessment of Educational Progress (NAEP), known as The Nation's Report Card. NAEP makes objective information on student performance in nearly a dozen subjects available to policymakers and the public at the national, state and district levels.

"These two former governors will be a valuable addition to the board," U.S. Secretary of Education Arne Duncan says. "Their past experience and commitment to service will help guide our efforts to measure and evaluate student achievement and ensure that all students graduate from high school prepared for college and careers."

Geringer was the 30th governor of Wyoming, serving from 1995 to 2003. In his two terms as governor, he focused on improving education through standards, accountability and technology; modernizing Wyoming's economic base to extensively include technology; changing how natural resource agencies among state, federal and local governments worked together; establishing communitybased health and family services programs; and implementing strategic planning and information technology systems. Geringer has also been involved in education policy and leadership through service as a member or chair in numerous education organizations. He joined the Environmental Systems Research Institute in 2003 as director of policy and public sector strategies to work with senior elected and corporate officials.

The two newest members take office as the governing board is involved in several important initiatives, including NAEP parent engagement—with a focus on conveying the urgency of closing achievement gaps and improving student performance and innovative computer-based NAEP assessments.

Rocky Mountain Bioengineering Symposium

he 2014 Rocky Mountain Bioengineering Symposium (RMBS), the oldest continuously held biomedical engineering symposium in the United States, took place April 4–6, 2014, in Denver, Colo., attracting participants from around the world. Both participating graduate students from UW placed in the competition. Paige Fisher, representing her team from the Department of Chemical and Petroleum Engineering, placed second in the Presentation Awards category

for her team's paper, "Photodegradable Hydrogels for Selective Capture and Release of Mammalian Cells." Arif Khan, representing his team from the Department of Electrical and Computer Engineering, received the President's Award for his team's paper, "Localization of a Moving Target Using a Fly Eye Sensor."

UW undergraduate presenters included Graham Barrett, Casey Brauchie and Kyle Hurley. Presentations were made on each of their senior design projects developed as consulting contracts via private companies. Papers included: "Wrist/Arm Support to Assist in Fine Motor Control for Essential Tremor Patients" and "Wheelchair-Mounted Robotic Arm to Hold and Move Communication Device." Papers accepted for presentation and publication appear in the yearly issue of *Biomedical Sciences Instrumentation* journal, an internationally distributed publication by the International Society of Automation and are also archived in online databases such as MEDLINE and PubMed.

students in action

First-Generation Engineer



By Micaela Myers

No one in Ann Gibbons' family had been to college, thus making applications, scholarships, financial aid and college test preparation foreign territory. But in 10th grade, Gibbons found Upward Bound, a federally funded program administratively based out of the University of Wyoming that serves eligible low-income and firstgeneration students throughout the state by offering academic support, enrichment, and financial aid and college application assistance.

"If you didn't have a family member who went to college, they're kind of like that substitute," says Gibbons, who is originally from Cheyenne, Wyo. "Most kids who are in Upward Bound are first generation, so it's kind of a scary thing to think of how to pay for college or how to apply or what you want to do. Brandi Roesener, the Upward Bound project coordinator for Laramie County, helped me apply to UW and other colleges, and helped me apply for scholarships."

Gibbons went on college visits with Upward Bound and attended the program's summer camp at UW before deciding to attend the university. "I really liked the campus a lot. UW has a really good engineering program, and I got the Hathaway Scholarship, so it's hard to pass up," she says. She's now a senior in the engineering program, majoring in energy systems. "I'm interested in energy—geothermal, wind, all those," Gibbons says. "We're the first university to have the energy systems ABET accreditation."

In addition to a full class load, Gibbons works at the UW Upward Bound office, plays intramural soccer, acts as a Daniels Fund Scholar Ambassador for the state of Wyoming and serves as the secretary for the Society of Women Engineers (SWE).

"The main goal of SWE is to promote female involvement in engineering," she explains. "Since the number of females in engineering is so small, SWE gives women in all engineering fields a chance to meet and interact. One of our goals is to create a sort of support system where upperclassmen can give class advice and even homework help to underclassmen, and to find opportunities where we can volunteer and get involved with the community (such as at the local schools and Girl Scouts). One of the bigger events we have each year is the SWE student-faculty dinner where students and professors get together to interact and help promote women in engineering. This past year we opened the dinner up to the entire UW community to get more involvement. We also have a yearly fundraiser in order to raise enough money to send some of our members to the national conference. We want members to be able to go so that they can meet other SWE members, employers and women who already work in an engineering field from around the nation."

Gibbons hopes to work in the energy industry after graduation. "I wouldn't mind staying in Wyoming," she says. As an engineer, Gibbons wants to make a difference in the world, perhaps taking part in creating a more efficient wind turbine blade or other energy-related improvements that will help future generations.

"I hope that I help somebody," she says of her future. "I hope I can say I took part in something that will continue for generations."

Student Engineer of the Year



By Heather Gibbs

Originally from Rock Springs, Wyo., Dakota Roberson has been racing and riding motocross since his 11th birthday; a lifestyle that has taken him through an increasing total of 12 states. In the spring of 2013, Roberson graduated from the College of Engineering and Applied Science with a bachelor's degree in electrical engineering with honors and a minor in mathematics. He completed his degree in four years with a 4.0 GPA and was named Wyoming Engineering Society Student Engineer of the Year.

During his time at UW, Roberson was hired as a summer intern for Sandia National Laboratories. There, he performed research related to photovoltaic and electrical energy storage and its usage at the distribution level. He also conducted research on the control of inter-area oscillations on the Western Electricity Coordinating Council and contributed to journal papers related to photovoltaic energy at the distribution level.

Roberson has maintained this heavy course and work load while simultaneously following his passion for motocross. He has had several wins and top-three championship performances in regional series and has attended the national Ponca City Amateur Championships as the only attendee from Wyoming.

Roberson is now pursuing his doctorate in electrical engineering and his passion for signal processing and electric power under Professor John Pierre at UW. Roberson was offered an extended remote position from Sandia National Laboratories. He also serves as president of Tau Beta Pi.

Celebrating Diversity



By UW Institutional Communications

In January 2014, Ahmed Balogun of Nigeria was named the recipient of the UW 2014 Willena Stanford Commitment to Diversity Award. Balogun, who will be a senior in the 2014–15 school year, is majoring in mechanical engineering, enrolled in the Honors Program and seeking a minor in finance. In spring 2014, he became the first international student to be elected president of the Associated Students of UW (ASUW).

According to one of his nominators, "Ahmed represents the best of the University of Wyoming, and he has been a tremendous ambassador for multiculturalism." Balogun was nominated by UW faculty, staff and his peers, several of whom praised his investment in both formal and informal diversity initiatives on and off campus.

Balogun "has been extremely involved in student organizations, many of which promote diversity initiatives on campus," a nominator says.

He has been both a mentee and mentor in the Multicultural Student Leadership Initiative since his first year at UW. He is one of the current co-chairs of the United Multicultural Council, an ASUW program that provides social and educational activities and advocacy for multicultural students. Balogun also is a member of the International Student Association and the Wyoming African Student Association. Additionally, he was the 2012–13 ASUW director of diversity and development.

Balogun accepted the award at the annual Willena Stanford community supper, Jan. 20, following the Martin Luther King Jr. march. More than 230 UW and community guests commemorated the memory of King and honored Stanford, an inspirational former UW instructor in African-American and Diaspora Studies, and past member of the MLK March and Days of Dialogue Steering Committee.

faculty in action

UW Team Earns NASA Grant



By Kenya Johnson

University of Wyoming Associate Professor Cameron Wright and his team of graduate students have been awarded the Phase II follow-on to the NASA grant for the fly eye sensor. Wright is a professor in the Department of Electrical and Computer Engineering. The project aims to create a specialized vision sensor that can measure wing deflection for aircraft, and they're adapting a version of the fly eye vision sensor for this purpose. The \$275,000 award is shared with the NASA Ames Research Center. The UW portion is \$137,000 from May 1, 2014, through Oct. 31, 2015.

Every proposal was reviewed by at least three reviewers. This was a very competitive solicitation, and the review panel recommended many proposals as worthy of funding to the NARI Oversight Committee. The oversight committee, consisting of senior Aeronautics Research Mission Directorate (ARMD) officials, reviewed the list taking into consideration the potential value of the recommended proposals to ARMD and ARMD's portfolio, and selected eight proposals to be awarded for Phase II research. As part of this new award, a flight test is being planned where the sensor will be used to measure wind deflection of an unmanned aerial vehicle undergoing various maneuvers.

Electrical and computer engineering graduate students who have worked on this project include Rob Streeter (now at the U.S. Air Force Academy's unmanned aerial vehicle development laboratory), Arif Khan (about to start his doctorate studies in the fall), and just joining the team is Garrett Zans, who is beginning his master's degree fall 2015 (Zans is also one of UW's star track and field athletes).

Professor Edgar Honored



By UW Institutional Communications

Thomas Edgar, an associate professor of civil engineering in UW's College of Engineering and Applied Science, received the 2014 John P. Ellbogen Lifetime Teaching Award. The award recognizes the long, distinguished and exemplary career of one senior faculty member who has excelled as a teacher at UW. "I thought, in 2002, when I won the Ellbogen Meritorious Teaching Award, that was one of the greatest honors I could receive as a teacher," says Edgar, who started at UW in 1981 as a lecturer and received tenure in 1989. "Twelve years later, the Ellbogen Lifetime Achievement Award is a step up. It's gone higher than that. It's humbling more than anything."

A registered professional engineer in both Wyoming and Colorado, Edgar specializes in soil and water relationships such as flow in porous media, groundwater hydrology and the design of dams. He has researched electro-kinetic remediation of soils, deformable and expansive soils, septic system leachate remediation and wellhead protection of public water supplies.

"For more than three decades, Thomas Edgar has placed student learning at the front of his consideration when he teaches," says Richard Schmidt, professor and head of the Department of Civil and Architectural Engineering, who nominated Edgar. "I continue to marvel at his dedication to student learning; his attempts to effectively reach every student in his class; and to emphasize the critical importance of what they should be learning to their later academic or career objectives."

"Dr. Edgar has a wonderful rapport with people of all ages," says David Ward, project manager in the construction division of the Wyoming Water Development Office who, as a UW master's student, took one of Edgar's classes. "His ability to connect with students and his talent at teaching simple/advanced concepts, are both truly superior."

Edgar is no stranger to accolades. His awards include: UW Excellence in Advising Award, 1997 and 2001; Mortar Board Top Professor, 1985, 1990 and 2000; UW Freshman Outstanding Professor, 1998; American Society of Civil Engineers Outstanding Faculty Member, 1983, 1986 and 1993; and the American Society for Engineering Education New Engineering Educator Award, 1987.

Doctorate Pathway to Licensure

By CEAS Staff

Department of Civil and Architectural Engineering Assistant Professor Mohamed Ahmed is the most recent UW faculty member to become a licensed professional engineer in Wyoming via the new Ph.D. pathway to licensure.

The Wyoming Board of Registration for Professional Engineers and Professional Land Surveyors was successful in getting its law changed. The new law went in effect on July 1, 2013, and we now have a set of rules that are effective as of Dec. 23, 2013.

One of the major changes in the law was to allow a licensure pathway

for those with an earned doctorate in engineering. Specifically, this pathway waives both the FE and PE exams in recognition for all of the examinations that one must complete in order to receive the doctorate degree.

The Wyoming board recognizes that this is the first engineering licensure law in the United States that will effectively waive both the FE and PE exams for those with qualified earned doctoral degrees. Because of that, the board realizes that those who are licensed via this pathway will, at least in the near future, have difficulty getting comity licensure from other jurisdictions. However, the board has been encouraging other jurisdictions to include this new pathway in future modifications of their licensure laws.

This license will have all of the rights and responsibilities that accompany any license in the state of Wyoming. Please note that since the teaching of design-oriented courses and research investigations are in the state's definition of the practice of engineering, industrial experience is not required.

For additional information, please contact David L. Whitman, H.T. Person Professor, Department of Electrical and Computer Engineering, whitman@uwyo.edu, (307) 766-6466.





A new era is dawning for the UW College of Engineering and Applied Science.

By CEAS and UW Foundation Staff

ver the last two years, the University of Wyoming College of Engineering and Applied Science (CEAS) has embarked upon an exciting journey in pursuit of excellence in instruction, research and service.

At the start of this adventure—in 2012—Gov. Matt Mead created the Governor's Energy, Engineering, STEM Integration Task Force to address the challenge set forth by the Wyoming Legislature in House Bill 121, which called for an "approach to lead the University towards a Tier-1 academic and research institution in areas of excellence appropriate for Wyoming." He charged the task force to develop a "well-articulated, understandable strategy that will enable us to fulfill the challenge of becoming Tier-1."

Mead was very interested in integration and synergy, citing the significant investments already made at the university in the areas of energy, engineering, computational capacity, science, technology and mathematics as the platform for moving forward. Underpinned by four strategic pillars—K-14 STEM education, excellence in undergraduate education, world-class research and graduate education, and productive economic development through partnerships—the Tier-1 Engineering Initiative was born. Over these last two years, great strides have been made to lay the foundations to realize the Tier-1 Engineering Initiative dream. Most recently, in March 2014, following the development of a comprehensive implementation plan, Mead and the Legislature appropriated biennium funding for Phase 1 of the engineering initiative-focusing first on establishing and developing distinguished education and research programs-with further funding for facilities development. Adding to



this state support, industry partners and alumni have stepped forward in partnership and collaboration.

The Tier-1 implementation plan is strongly growth oriented. During the initial phase—by the end of 2016 it is expected that CEAS will have added six new faculty members, four research scientists, 10 post-doctorate researchers and 45 doctoral candidates, and awarded 90 engineering undergraduate scholarships to attract the brightest students.

"Newly formed research clusters will lead the research agenda growth, initially targeting niche areas that have relevance and impact to the Wyoming economy—these target exploiting unconventional oil and gas resources, developing energy conversion solutions, and applying computational science and engineering to industry and business challenges," says Engineering Tier-1 Program Coordinator Richard Horner. "Longer term, intent is to develop new research pursuits within CEAS in areas such as water resource management, biotechnology and bioengineering," he continues. "Over time, the envisaged research cluster program will touch on other areas where CEAS might achieve excellence and scholarly impact."

Impressive Leadership

The Wyoming Governor's Energy, Engineering, STEM Integration Task Force is made up of an impressive group of UW graduates, including industry leaders Thomas Botts, former executive vice president of global manufacturing for Royal Dutch Shell and board director for EnPro Industries Inc. and Wood Group; Greg Hill, president and chief operating officer of Hess Corp.; Dick Agee, founder and chairman of Wapiti Energy LLC; Dave Bostrom, president and owner of Bostrom Enterprises LLC; Chad Deaton, former

executive chairman of Baker Hughes Inc. and board member of Marathon Oil Corp.; and Eric Marsh, former executive vice president of Natural Gas Economy at Encana Corp. and senior vice president for the USA Division, currently president and CEO of Vine Oil & Gas LP. Other distinguished members include Dave Freudenthal, former governor of Wyoming, attorney and board member of Arch Coal Inc.; Tom Lockhart, state representative and retired vice president of power systems for Pacific Power; Phil Nicholas, attorney and state senator; and Brigadier General Pat Burns, chairman of the National Advisory Board for CEAS and retired director of Installations and Mission Support, Air Combat Command Headquarters, Langley Air Force Base.

"Given the opportunity to give back and help move this forward to again make us a top engineering school resonated with my passion for the

Clockwise: Mohammad Piri, Wyoming Excellence Chair in Petroleum Engineering, and Thomas Botts, task force co-chair; UW President Dick McGinity and Professor Lamia Goual; Greg Hill, task force co-chair and president and chief operating officer of Hess Corp.; UW Foundation President Ben Blalock with Gov. Matt Mead; Mead and Hill.

state and the University of Wyoming," says task force co-Chairman Hill (B.S., mechanical engineering, '83).

"This is about changing the way we're educating engineers and preparing them for the real world," says co-Chairman Botts (B.S., civil engineering. '77). "We must connect them to the business world, as well as integrating engineering with other disciplines to solve tough problems that not only benefit external companies but benefit the state of Wyoming."

"The ultimate outcome is world-class students, world-class research in several niche areas, and jobs and economic development for Wyoming," Hill adds.

"It is unprecedented for a university to bring together this caliber of alumni leadership who are at the pinnacle of the energy and engineering industries," says UW Foundation President and CEO Ben Blalock.

The Grand Plan

Long term, the task force, working

closely with CEAS, has identified a number of crucial ambitions, namely by 2020—investments to ensure students leave with an outstanding educational experience, with undergraduate enrollment increased from 1,400 to 1,800; a doubling of the number Ph.D. graduates to 30 per year; and a doubling of awards and scholarships to attract the brightest and best talent from Wyoming and beyond.

"Within the research arena, extensive outreach activities will be in place to attract leading industry and external funding agencies to collaborate and fund cutting-edge engineering and applied science that focuses upon high-impact problem solving and economic development," Horner says. "Success will be driven by integrated multidisciplinary teams consisting of faculty and researchers drawn from CEAS and other UW colleges, each establishing themselves as recognized authorities in their field."

A Platform for Industry Collaboration

Productive economic development through partnerships is a key component of the Tier-1 Engineering Initiative. Building world-class laboratories that are equipped with the latest facilities through public-private collaboration is a further feature of the commitment being made to deliver the Tier-1 dream.

As of June 2014, UW has raised \$15 million through corporate partnerships with Marathon Oil, Baker Hughes, Arch Coal, Ultra Petroleum Corp., Shell, ExxonMobil, Hess and Halliburton Co. The Legislature has matched these gifts and donations with a \$15 million appropriation to complete funding to build the High Bay Research Facility—with construction starting in December 2014. The High Bay Research Facility will be used to conduct fundamental research on critical This is about changing the way we're educating engineers and preparing them for the real world. We must connect them to the business world, as well as integrating engineering with other disciplines to solve tough problems that not only benefit external companies but benefit the state of Wyoming.

-Thomas Botts, former executive vice president of global manufacturing for Shell

aspects of unconventional reservoir characterization and development; longer term, accommodating other large-scale experimental configurations in a semi-industrial setting. In the 2014 Wyoming legislative session, the governor and the Legislature set aside \$10.5 million to match industry investments for technology and equipment for the High Bay Research Facility. Already, through the generosity of Hess (\$2.3 million) and Arch Coal (\$.2 million), UW is on target to reach its funding goal for equipping the High Bay Research Facility.

The ready availability of state matching funds equal to industry financial contributions demonstrates the commitment of the state of Wyoming to the Tier-1 Engineering Initiative. It also provides attractive financial leverage to industry partners and allows the university's energy programs to achieve marked distinction and prominence in areas of strategic importance to Wyoming's—and the nation's—energy economy.

Mohammad Piri, UW's Wyoming Excellence Chair in Petroleum Engineering, has developed an extensive network with leading researchers across the oil and gas industry, and seeks to deepen the extent of high-impact collaborations with scientists and engineers from the energy industry. Piri's pursuit of excellence is to better understand characteristics of oil and gas reservoirs and how to effectively improve recovery using existing processes, equipment and facilities through advancing technology. Piri's research is pioneering within the field of the physics of flow and transport in porous media.

"It is faculty like Mohammad Piri who thinks big in original ways and constantly strives for excellence in ground-breaking areas of research that will take CEAS to Tier-1 and realize the dream," says Mark Northam, director of the School of Energy Resources.

The UW High Bay Research Facility will contain approximately 60,000 square feet of large-scale, flexibly configured research laboratories, offices and meeting areas. Built in partnership with the School of Energy Resources, CEAS and the Department of Geology and Geophysics, the High Bay Research Facility will be located on north 19th Street near the UW Centennial Complex, with completion anticipated in 2016.

Once complete, the High Bay Research Facility will enhance UW's capacity in strategic areas of energy research. The facility will house labs where large-scale experiments that go beyond the size of a traditional engineering laboratory can be conducted. The facility will contain a digital rock physics lab, geomechanics lab, a core-flood testing apparatus and a structural engineering lab, along with the supporting facilities and personnel to manage the facility.

As an example of industry collaboration, in March 2014, Halliburton announced a gift of \$2 million to support the construction of the High Bay Research Facility and provided a further \$1 million in programmatic funding for researching unconventional reservoirs. These investments were immediately doubled to \$6 million with state of Wyoming matching dollars through the School of Energy Resources.

"Halliburton is proud to work with the University of Wyoming to provide a state-of-the-art teaching environment for the next generation of engineers, including the UW students who may join us in the future," says Dave Lesar, chairman, president and chief executive officer of Halliburton. "We believe that the UW High Bay Research Facility will enable academic excellence and provide students with the necessary education to help find solutions for global energy demands."

"The University of Wyoming and all of the private partners who have come forward to date are creating a brighter future," Mead said in March. "We want to develop leading technologies to make energy production more efficient, safer and better for the environment. Halliburton and the other companies already contributing to the High Bay Research Facility are choosing to invest here. This is significant, because these multinational businesses can invest their research dollars anywhere. We thank Halliburton for being the latest company to choose UW."

"The University of Wyoming is very pleased that Halliburton is joining other industry leaders in supporting the construction of the High Bay Research

The ultimate outcome is world-class students, world-class research in several niche areas, and jobs and economic development for Wyoming.

-Greg Hill, president and chief operating officer of Hess Corp.

Facility and UW's world-class research into unconventional reservoirs," says UW President Dick McGinity. "The High Bay will allow us to accelerate research that promises to make energy more abundant everywhere in the world. UW is grateful to industry partners such as Halliburton, and to Wyoming's governor and legislators, for enabling UW to achieve a leading role in energy research worldwide."

"UW is privileged to significantly expand an important energy collaboration with one of the key companies that is advancing our state's economy," Blalock says. "Halliburton CEO Dave Lesar immediately embraced the opportunity to work more closely with Gov. Mead and the University of Wyoming. It is clear that UW's collaboration with Halliburton is long term."

Following the Halliburton gift, in June 2014, Hess announced its second commitment to UW in the past two years, gifting a \$2 million contribution to build the High Bay Research Facility, \$1.5 million for instrumenting the UW digital rock physics laboratory and a \$.8 million donation for purchasing computation capacity to undertake reservoir imaging—\$4.3 million total. Hess' first commitment to UW was in March 2012, providing a \$4.4 million gift to establish the digital rock physics laboratory in the Energy Innovation Center and a further \$.6 million to undertake sponsored research at UW. Because of the Hess funding commitments, state matching funds equal to \$8.8 have been made available to support UW's pursuit of partnerships with industry leaders.

"Hess Corp. has been generous in its commitment of time, expertise and money," Mead says. "We appreciate its investment in Wyoming's future. The University of Wyoming has a specific plan with Hess and the other corporate partners to support the energy industry through innovation and research. Hess builds on great work already underway at UW."

With Hess' support of the High Bay Research Facility, Hess and UW will expand the existing partnership to perform fundamental research on critical aspects of unconventional reservoir characterization and development.

"New technology is key to our continued growth," Hill says. "Our work with UW and the Hess Digital Rocks Lab will fundamentally change our understanding of oil and gas production from unconventional resources and lead to the development of more efficient and effective recovery techniques."

"The Hess Corp.'s support of UW's energy-related research and education

is exceptional and historic," McGinity says. "Hess' generous contribution will provide our faculty and students with a state-of-the-art facility in which to study critical issues ranging from geomechanics and reservoir studies to gas-to-liquids and coal-toliquids. The events leading up to this announcement are a case study of how industry, the university and the state create game-changing public-private partnerships that will benefit the people of Wyoming and the nation for decades to come."

"Hess has set a new standard for UW corporate partnership," Blalock says. "Greg Hill has played a key role in creating a greatly expanded opportunity for the energy industry to become aligned with UW's energy agenda. I cannot overstate my appreciation to Greg and his Hess team."

Partnerships such as these provide a strong framework for the future. "Advanced discussions are underway with other energy companies to enrich education and research partnerships between them and UW, in addition to sustaining valuable partnerships with existing companies, such as Arch Coal, Baker Hughes, ExxonMobil, Marathon Oil, Shell and Ultra Petroleum," Horner says. "Industry dialogue continues with the energy industry companies at all levels to create opportunities valuable to both themselves and UW, focusing upon distinguished areas for collaboration that mesh with UW Engineering Initiative Tier-1 objectives."

The New Engineering Building Project

Construction of a new engineering building and renovation of the current building will enable the delivery of strategic imperatives defined by the UW Tier-1 EI Implementation Plan.

The project will begin the first quarter of 2016, with construction completion by the third quarter of 2018. Estimated to cost \$110 million the largest single capital project in UW history—the project includes the construction of a new purpose-built building equipped with the very latest education and research laboratory capabilities that will include dedicated collaboration activity spaces and forums. The opportunity will also be taken to renovate, rejuvenate and refresh the current Engineering Building, which fronts onto Prexy's Pasture.

"The Engineering Building project will reflect integration with the Michael B. Enzi STEM Facility—currently under construction—linking with the High Bay Research Facility, and the Energy Innovation Center in a way that captures space and facility synergies, optimizing the use of the complex of buildings," Horner says.

Realizing the Tier-1 Dream

With the support of the state, alumni and corporative partnerships, UW is well on its way to achieving the goals set forth in the Tier-1 initiative. The future ahead is bright. Underpinning the leadership shown by Mead and his task force, the university's leadership, faculty and staff are committed to this vision and most grateful for this support. To learn more about the Tier-1 initiative and follow its progress, visit **uwy0.edu**/ **ceas/engineering-initiative.**

AWARD-WINNING RESEARCH

UW Assistant Professor Lamia Goual's recent National Science Foundation CAREER Award will aid her research into rock and fluid interactions.

By UW Institutional Communications

B y studying oil and its effects on heterogeneous rocks in the subsurface, Lamia Goual plans to create an advanced computer model that will benefit both the environmental and energy industries.

To assist her research efforts, Goual, an assistant professor in the University of Wyoming's Department of Chemical and Petroleum Engineering, will use a \$400,000 Faculty Early Career Development (CAREER) Program Award she recently received from the National Science Foundation (NSF).

Goual receives the funding Sept. 1, 2014, for her project, titled "CAREER: Impact of Mineralogy and Wettability on Pore-Scale Displacement Mechanisms of Nonaqueous-Phase Liquids (NAPLs) in Heterogeneous Rocks." NAPLs are chlorinated compounds or petroleum hydrocarbon products.

"I will be using oil (as an NAPL)," Goual explains. "I want to use these findings not only for remediation of NAPLs in aquifers, but also to understand improved oil recovery by surfactant flooding.

"This research focuses on water and energy, both of which are important to the university, the state of Wyoming and the nation," Goual says.

Outcomes of this research will help advance knowledge and understanding of immiscible fluid displacement in heterogeneous rocks, or rocks composed of multiple materials. The research will have important applications in managing and optimizing use of water resources; remediation of contaminated aquifers; underground storage of CO_2 ; improved oil recovery from conventional and unconventional sources; and fuel cell technologies.

Using High-Tech Tools

To design an appropriate remediation system that uses surfactants to clean oil in aquifers, it is important to understand the characteristics and behavior of NAPLs in the subsurface.

Using the Hess Digital Rock Physics Laboratory in UW's Energy Innovation Center, as well as the NCAR-Wyoming Supercomputing Center (NWSC) and UW's Advanced Research Computing Center (ARCC), her goal is to generate high-resolution maps of pore space topology and mineralogy (shape and composition of rocks) in rock samples from which network models are created. Goual also plans to perform in-situ flow experiments to measure fluid occupancy and the effect of surfactants on NAPL remediation in the same rocks, to validate the model.

"This research wouldn't be possible without these facilities," Goual says. "We will be able to create more realistic representations of rock topology and mineralogy in our models."

Current computer models can accurately analyze only homogenous rocks. Her research will be able to analyze heterogeneous rocks, which are composed of multiple minerals, including carbonate and clay.

Although they originate at the ground surface, NAPLs can find their way into moving groundwater aquifers. They eventually can reach water wells, streams and lakes through accidental spills, inadequate disposal practices

Lamia Goual (left) and graduate student Vahideh Mirchi in the Energy Innovation Center lab.

This research focuses on water and energy, both of which are important to the university, the state of Wyoming and the nation.

or storage facility leaks. If such compounds enter the subsurface, they tend to stay in concentrated zones and can pose an environmental risk to groundwater.

Goual will examine and measure the impact of NAPLs on wettability alteration. Wettability is defined as the tendency of one fluid to spread over and adhesively coat a solid surface in the presence of another fluid. The degree to which NAPLs alter rock wettability depends upon rock mineralogy and pore geometry; surface roughness and charge; aging of contaminants; chemical composition of NAPLs; water chemistry; initial water saturation and temperature.

The majority of existing microtomography studies use glass beads to study the effect of wettability on NAPL flow. Goual will be the first to perform such a study on rock sample cores. To use such samples requires higher resolutions. "For this research, we need to image samples at a few micron resolution," she says.

The Hess Digital Rock Physics Laboratory includes the most advanced high-resolution 3-D X-ray microscope available, one that produces ultra-highresolution images of reservoir rock on the nano-scale. However, Goual will use another 3-D X-ray machine in the lab—one that can produce reservoir rock images at the micro-scale.

Spreading Knowledge

NSF CAREER Award stipulations require award recipients to include an educational outreach component.

Goual plans a new "Journey into Underground Rocks" program, which will provide students in grades 6–12 an immersive opportunity to move with the flow inside multi-scale rocks, and better understand fluid/fluid and fluid/rock interactions. The program

I am able to use industry research to leverage my work and increase my collaborations.

will use the Cave Automatic Virtual Environment (CAVE) in the Shell 3-D Visualization Laboratory located in UW's Energy Innovation Center.

In the CAVE, students will be shown images of rock samples Goual has captured as well as the model's predictions of flow inside the samples.

"They will see the rock from outside and we will gradually zoom in. They will feel like they're moving inside the rock," she says. "The CAVE will allow me to create an environment for kids that combines fun with learning, and that's what NSF likes to fund."

Additionally, a "Surface Science Days" program—a two-day summer workshop that will take place at UW in partnership with the new Comprehensive STEM Initiative in Wyoming (CSI-WY)—is designed to bring underrepresented students together and allow them to apply the science they learn to real life.

"The first day, we'll go to the lab and they will learn how the measurements are performed," Goual says. "On the second day, we'll take a field trip to a company that specializes in remediation."

In Select Company

The CAREER Program is a Foundation-wide activity that offers the NSF's most prestigious awards to support junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the organizations' missions. Only assistant professors without tenure are eligible. The CAREER Program is intended for faculty

members who are at or near the beginning of their careers.

The NSF's Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET) recommended Goual for the award. Budgeted over five years, the grant funding will pay for materials and supplies, foreign and domestics travel, and salaries for two graduate students.

"This (NSF CAREER Award) validates my work," Goual says. "I am able to use industry research to leverage my work and increase my collaborations."

Goual's primary area of research involves interfacial science (science of fluid/fluid and rock/fluid interactions) and thermodynamics as applied to production and flow in porous media, with applications to oil and gas recovery, geological storage of greenhouse gases and remediation of contaminated aquifers.

Goual received her doctoral and master's degrees in petroleum

engineering, both at Imperial College in London, England. She received her bachelor's degree in chemical engineering from Ecole Nationale Polytechnique in Algeria.

Previously, she was a research scientist at UW's Enhanced Oil Recovery Institute during 2006–07; a post-doctoral fellow in chemical and materials engineering at the University of Alberta, Canada; and a research engineer for Sonatrech oil company in Algeria from 1994–97. Left: Lamia Goual works with graduate student Mohammad Sedghi. Right: Goual in the lab with Vahideh Mirchi.

The College ofEngineering andApplied Science'sEngineering SummerProgram introduceshigh school students tothe field and to UW.

By Micaela Myers

Students participate in hands-on learning. Seen far left: Jessica Saffold; second photo: Duncan Gans and Meghan McCarron. Approximately 36 students enjoy the program each summer. hen it comes to the future of engineering, high school students play a big role. As the University of Wyoming College of Engineering and Applied Science (CEAS) moves toward its Tier-1 vision, attracting the best and brightest high school students is key.

"For the past two years a number of dedicated faculty, staff, advisory board members and UW administrators have worked diligently to translate Gov. Mead's vision of a 21st century, world-class College of Engineering and Applied Science into an action plan," says Steve Barrett, CEAS associate dean for academic programs. "One of the plan's key ingredients is continued excellence in undergraduate education. CEAS has always been known for outstanding, ABETaccredited programs in a wide variety of engineering disciplines and computer science at an affordable cost. Initiatives within the Tier-1 plan will allow students to explore engineering and applied science at an earlier age, provide expanded avenues to attend UW programs and provide assistance to enrolled students."

One such program for early engagement already in existence is the Engineering Summer Program. For the past 26 years, high school juniors from around the country have come to UW to learn all about engineering from UW's professors and graduate students.

The students live on campus, eat at Washakie Dining Center and choose from a variety of classes. "It's very lab based and hands-on," says Jeffrey Anderson, the program's director and a lecturer in the UW Department of Electrical and Computer Engineering. "The class sizes are about eight to 10 students, so it's a really good

NGINEERS

opportunity to make some great connections. We try to cover many areas of engineering."

Classes include subjects such as atmospheric science, where the students collect weather data from a unit attached to a balloon they send up and follow; electrical engineering, where the students learn to transmit audio signals over a laser beam and to program robots to complete tasks; composite materials, where students build and test their own materials; and computer-aided design, where they design things and print them on a 3-D printer.

The students also take an engineering field trip to an actual site. In the summer of 2014, the trip was to a Halliburton Co. hydraulic fracturing location. They also participate in group activities such as picnics and barbecues, skit nights and a trip to the UW planetarium. "They form a lot of friendships that are very lasting," Anderson says. "I often see groups of former Engineering Summer Program students who seem to connect when they come in as UW students, and they're study buddies all the way through college."

The high school students also learn what opportunities are available in engineering and make connections with UW faculty members.

"The goal is to introduce students to the fields of engineering and to UW," says Laurie Bonini, recruiting coordinator for the UW College of Engineering and Applied Science. "They're on campus, and they're living like a student when they're here. We want them to kind of feel that connection and get excited about being here. The other thing is just to introduce them to engineering as a potential field. They tend to be the strong math and science students who come to this, but they're not really sure what engineering is. Or, if they are thinking engineering, they don't know the difference between electrical engineering and mechanical engineering. This helps them learn a little bit about that.

"We're getting some very top-level students to come here," she continues, adding that an equal number of male and female students attend.

Student Perspective

"It's so awesome just being in an environment where everyone is excited about learning and genuinely engaged and participating," says Jessica Saffold of Aurora, Colo., who participated in the 2014 program, taking composite materials and computer science courses. "I think it's really valuable that I get to have this experience and see

more about what engineers do. Going in, I really had no idea. I think this was the perfect place to do it and on the side learn more about the school. After coming here, I'm definitely going to apply."

One of her favorite experiences was the field trip. "It was a highlight for me to see first-hand what goes on," Saffold says. "It was really cool to go there and see the machines they use. They do some amazing things. I think I'm a lot more grateful now, especially for energy and things like that after seeing the process it goes through to get it to us."

Saffold is sure she wants to pursue engineering now, possibly chemical engineering. "I think it would be really cool to manufacture or create new pharmaceuticals," she says.

Jeffrey Wen of Casper, Wyo., was considering either law or engineering before attending the summer program, but is now leaning toward engineering. "I like the idea of what goes on and the different possibilities engineering can provide," he says.

Wen participated in electrical engineering and ATV classes during the program. "We looked at the math behind ATV design, so how to produce torque and power and speed," he said of the ATV class during the program. "Yesterday we drove the ATV around and did different tests. We switched out the tires and the drivers and will graph that today."

Duncan Gans of Lander, Wyo., also came to the Engineering Summer Program to learn more about engineering. "I'm really interested in math and science, and since engineering is a combination of those two, I wanted to come to the camp and see the different branches of engineering and whether or not I enjoyed it," he says.

Gans took part in atmospheric science and curves and concrete, but one of his highlights was meeting the other students. "One of my favorite things is meeting all of the other kids who are equally passionate and invested in learning more about engineering as a whole," he says.

Meghan McCarron of Firestone, Colo., took computer electronics and concrete classes during the summer program. "Curves and concrete is absolutely my favorite. I want to major in civil engineering when I go to college, and it's been so much fun,"

she says. The class included a trip to a job site where they met with the transportation design team.

McCarron enjoyed getting to know the UW professors. She wants to earn an engineering degree to make a difference in the world. "I really want to be involved in a program called Bridges to Prosperity," she says. "Every year they choose a different third-world country, and they go and build foot bridges in rural, isolated communities.

People go to third-world countries, and they think they need clean water, health care and education, but a lot of people don't realize that just connecting a rural community to a major city with something as simple as a bridge can provide them with all of those things at once. So I really want to go be a chief engineer for that program and help the world in my own personal way."

Alumni Outcomes

"I highly recommend this program to anyone, even if you're not interested in engineering," Saffold says. "I think this camp has really helped me to learn and grow as an individual."

Beth Butler of Douglas, Wyo., winner of the Joint Engineering Council's Outstanding Senior award, graduated from UW with her degree in chemical engineering May 2014. She originally attended the Engineering Summer Program in 2009. "This camp provided a great environment for me to figure out what type of engineering I liked and to meet friends that I would have for the rest of college," she says. "I participated in the civil and chemical engineering classes where I got a taste of those disciplines.

"The Engineering Summer Program definitely influenced my decision to become an engineer," Butler continues. "It showed me that UW cares about its students and that it has a good program. UW has been the perfect school for me."

High school juniors can apply to next year's program with a deadline in late March 2015. Thanks to sponsorships from the Wyoming Engineering Society, the J. Kenneth and Pat Kennedy Endowment, Mr. Paul N. Scherbel, Halliburton, the UW Office of Summer Session and Winter Courses, and the UW College of Engineering and Applied Science, tuition, room and board is just \$200 for the entire week.

"Any student considering the program should jump at the chance," Butler says. "Even if a student isn't sure about doing engineering, it is a great opportunity to find out more about UW and meet some neat people that think like you do."

She adds, "The Engineering Summer Program is one of my highlights from high school, and I know it helped me get where I am today."

To learn more, visit **uwyo.edu**/ **ceas/high-school/esp**.

alumnin action

BACK IN SPACE

By Leah Roesler

NASA's Space Launch System, which is scheduled to have its first launch in 2017, will be able to hold a crew of four astronauts. These astronauts will go farther and stay in space longer than astronauts on any previous space mission. Before this can happen, the rocket and spacecraft must be built. That is where Tal Wammen comes in.

Wammen is a 2013 graduate of the University of Wyoming who earned his bachelor's degree in civil engineering. He now works as an engineer for NASA at the Marshall Space Flight Center in Huntsville, Ala. Before landing his job, Wammen worked with NASA as an intern. He began his internship in January 2010 and worked at Marshall Space Flight Center for a semester before he was selected for the co-op program, where he alternated a semester of school and a semester of work with NASA between the summers of 2010 and 2012. He even got to see a space shuttle launch in Florida before NASA quit launching astronauts into space in 2011.

Since it discontinued the Space Shuttle Program, Wammen says, "It's kind of funny; people always ask me if NASA even exists anymore." It does indeed and is getting ready to start sending people into space once again. This time the agency will send people not just to the International Space Station, but to the moon, Mars and beyond.

Wammen's role in getting people back into space has to do with fuel tanks for the rocket engines. He works in a team of around 15 engineers who are all project managers, meaning that they oversee projects from start to finish. He says, "There are a lot of people involved, so a lot of that is problem solving and getting the team to come to a solution."

His team is finishing the design of

two test stands to prove the structural integrity of the fuel tanks. Next it will oversee the building of the test stands. "Next year NASA is going to be testing the fuel tanks that will be used to supply fuel to the rocket engines. So we are building test stands that will be used to twist them and pull them and test the material strength.

"I've always been interested in what NASA does, but I never thought I would end up working for them," Wammen says. "I can't say that I was one of those kids who grew up always wanting to be an astronaut or something. I grew up in South Dakota on a cattle ranch. I never thought I would be working for NASA."

His realization that he could work for NASA came in 2010, when he was a sophomore at UW. Wammen says, "I started the internship in 2010, and then I got the co-op program set up as well. So the way that worked was I would go to school for a semester, and then I would go work for NASA on location." This prolonged his time in school, but Wammen says, "It was worth it in the end.

"I had a couple different job offers at private companies right out of college that probably would have paid me more, but I don't think they could have I've always been interested in what NASA does, but I never thought I would end up working for them.

Image courtesy of NASA

given me the opportunities that I've had working for NASA," Wammen says. "It's such a relaxed place to work, and they give you the freedom to innovate." But innovation can also be the difficult part of his job. He says, "We are trying to push the boundaries of technology. Sometimes you don't know if the answer you came to is the right answer because it's never been done before."

Wammen says that his education at UW plays a big role in his job success. He was able to build relationships with professors here, and he still trusts their knowledge. "On a couple occasions I have called some of my teachers from my classes there and asked them to help me out on certain problems. I have a great relationship with the faculty there at UW," he says. "The experience I got there at college is something that has helped me every day at work."

alumniin memoriam

Since our 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. Hyatt E. Moore	BSEE '42	Palos Verdes Peninsula, CA
Mr. Eugene S. Jones	BSEE '47	La Habra, CA
Mr. T. Donald Overy	BSEE '50	Mesquite, NV
Mr. Kenneth W. Rogers	BSME '50	Napa, CA
Mr. Albert M. Rittenour	BSME '51; BSEE '50	Casper, WY
Mr. Bill L. Broseghini	BSEE '51	Rock Springs, WY
Mr. John T. Doyle	BSCE '55	Pinedale, WY
Mr. Edwin C. Sunnergren	BS GenEng'51	Sparks, NV
Mr. Bruce L. Porter	BSME '55	Huntsville, AL
Mr. Paul M. Castleberry	BSME '56	Morgan Hill, CA
Rev. M. B. "Mo" Campbell	BSCE '59	Sheridan, WY
Mr. Arthur G. Hallett	BSCE '59	Lander, WY
Mr. Joseph Kalasinsky	BSME '59	Sheridan, WY
Mr. Gerald R. Daniels	BSPE '60	Fairfax, VA
Mr. Henry A. Wilson	BSEE '60	Surprise, AZ
Mr. Richard L. Leonard	BSEE '61	Gering, NE
Mr. Anthony J. Perrella	BSEE '64	Las Vegas, NV
Mr. Martin R. Tadlock, Jr.	BSME '64	Roscommon, MI
Mr. Milton H. Stokes	BSCE '67	Layton, UT
Mr. John W. Hall	MSEE '68	Not Available
Mr. Lyle R. Lake	BSCH '70	Newcastle, WY
Mr. Glenn Sugano	BSCE '70	Rock Springs, WY
Mr. Michael J. Rohde	BSCE '72	Ypsilanti, MI
Mr. Thomas J. Roe	BSEE '73	Panama City Beach, FL
Mr. Randy B. Bath	BSPE '74	Cody, WY
Mr. Steven E. Rea	BSCE '75	Cheyenne, WY
Mr. Scott C. Woolsey	BSCE '86	Wheatland, WY
Mr. Dennis A. Baker	UW Alum, Friends of the College	Afton, WY

Mr. Dennis A. Baker Mr. Michael B. McQuisten Mr. Donald G. Wagner Mr. Phillip C. Watts

Mrs. Mary Quealy

UW Alum, Friends of the College UW Alum, Friends of the College UW Alum, Friends of the College UW Alum, Friends of the College

Friends of the College

Laramie, WY Gillette, WY Longmont, CO

Rock River, WY

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

Wyoming

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

UNIVERSITY

N15EN

- ONLINE: Make a payment online using our secure server: www.uwyo.edu/giveonline.
- PHONE: Call the University of Wyoming Foundation during normal business hours at (307) 766-6300 or (888) 831-7795.
- 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!

The mission of WyoAlumni is to be the online home for everyone associated with the University of Wyoming - including friends, alumni, and supporters. WyoAlumni strives to be the primary online destination for people to connect with the UW and its people.

The Possibilities of WyoAlumni are Endless:

DISCOVER

- Find your friends and classmates
- Check out the latest UW news
- Register for university events
- Support your favorite college or department
- Get involved with the Alumni Association
- Find your dream job with multiple career resources
- Access the UW Libraries databases

CONNECT

- Create and customize your own profile page
- Connect seamlessly with Facebook
- Share photos
- Post class notes

COMMUNICATE

- Contact friends
- View photos
- Read alumni notes
- Chat online

NETWORK

- Make business connections
- Post and search resumes and jobs
- Check out mentoring opportunities

Get connected to WyoAlumni today: wyoalumni.uwyo.edu.

Please call (307) 766-7000 or e-mail wyoalumn@uwyo.edu if you have questions.

205 S. 3rd Street Lander, WY 82520 Phone: (307) 335-8466

P0 Box 536 Gillette, WY 82717 Phone: (307) 685-3137

Engineering and Design • Water Resource Management • Regulatory Compliance • Surveying Environmental Health and Safety • Construction Management • Reclamation • Air Quality Ecological Assessment • GIS/Remote Sensing

Thank you for believing in the University of Wyoming's vision to provide opportunities for its students to seek and achieve a better life through our mission of teaching, research, and service.

Energy to Power the Country[®]

UW CALENDAR OF EVENTS

SEPTEMBER

Classes begin: Sept. 3

Cowboy football vs. Air Force: Sept. 6

Campus Pass: Sept. 6

CEAS National Advisory Board meetings: Sept. 11–13

Wyoming Union 75th Anniversary Exhibit in Gallery 234: Sept. 15–Oct. 23

Family Weekend: Sept. 19–21

Cowboy football vs. Florida Atlantic: Sept. 20

OCTOBER

Engineering, science and technology job fair: Oct. 7

Saturday University (Jackson): Oct. 11

Homecoming week (H.T. Person Distinguished Lecture featuring Kentucky nanoNET Director Kevin Walsh, Oct. 17; Breakfast on the Lawn, date TBD; CEAS Dean's Office reception, Oct. 17): Oct. 11–18

CEAS Awards Luncheon: Oct. 17

Wyoming Union 75th Anniversary Celebration (following Homecoming parade): Oct. 18

Cowboy football vs. San Jose State: Oct. 18

Marian H. Rochelle Gateway Center grand opening: Oct. 24

NOVEMBER

Cowboy football vs. Utah State: Nov. 7

Discovery Days: Nov. 17

Cowboy football vs. Boise State: Nov. 22

Thanksgiving break: Nov. 26–28

DECEMBER

Senior Design Competition: early December Last day of classes: Dec. 12 CEAS fall commencement ceremony: Dec. 13 Finals week: Dec. 15–19

For the latest events and information, visit **uwyo.edu/calendar**. UW Cowboys and Cowgirls: **wyomingathletics.com** Fine arts: **uwyo.edu/finearts**

University of Wyoming Graduates Engineering the Mountain West

CHEYENNE, WYOMING 307-637-8422 www.mmwyo.com

UW College of Engineering and Applied Science graduates report a high level of satisfaction, as shown by these impressive numbers.

The College of Engineering and Applied Science (CEAS) is a nationally recognized institution of academic excellence and world-class research. CEAS combines accessibility and affordability with an experience that prepares students to be competitive in a global market.

A survey of recent graduates revealed:		
31%	completed an undergraduate research experience	
11%	participated in an international experience	
64%	reported a starting salary greater than \$50,000	
43%	reported a starting salary greater than \$60,000	
In addition, Fundament	, UW CEAS students consistently pass the tals of Engineering Exam at a rate of	

5-12 percent higher than the national average.

We are Proud

The College of Engineering and Applied Science at the University of Wyoming

and the la

J.

2020 Grand Avenue, Suite 305
Laramie, Wyoming 82070

UNIVERSITY OF WYOMING

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

