

## MECHANICAL ENGINEERING | NEWS

**University of Idaho**  
College of Engineering

## BOISE SATURDAY MARKET



An eager driver

Justin Pettingill, Zach Lipple, Mark Woodland, Jason Maas and Dillon Savage traveled to Boise in August with the Formula Hybrid SAE Car and the Clean Snowmobile to show off these projects at the Boise Saturday Market. The day was beautiful and the onlookers were oohing and aahing and asking good questions. Denise Engebrecht, Program Coordinator and Advisor for Engineering Management & Technology Management on our Boise campus,



The flume was a captivating attraction for on-lookers.

is shown in the driver's seat, no doubt dreaming of driving such a vehicle. Her comments: "Had a great time with our awesome students at the Capital City Market in downtown Boise on Saturday, August 22, 2015. It was fun to see so many families stop by with their kids, mouths wide open in awe of the UI hybrid race car and the clean snowmobile. Hopefully they'll be our future engineers!"



Denise Engebrecht with the team

During the Boise Saturday Market the University of Idaho booth was used by the Center for Ecohydraulics Stream Laboratory (a component of U of I Boise) as a public outreach opportunity. A small, working flume (5 foot long river simulator) was set up at the booth. The eye-catching magic of flowing water was a great pull to engage with the public about our presence in Boise and educate them about our program. Various water features and properties were illustrated through the plexiglas model. The display drew a steady flow of onlookers throughout the event.

On the first floor of the Idaho Water Center building in Boise is a 75-foot long, tilting flume where research is conducted. This giant flume, capable of supplying sediment and pumping 15 thousand gallons a minute, was installed in 2009 as a result of work by Professor Ralph Budwig. We are happy to show it off to students of all ages, or any other interested parties. Contact Denise Engebrecht, [denisee@uidaho.edu](mailto:denisee@uidaho.edu), to schedule a visit to this impressive piece of equipment.

## STUDENTS



### James White

Commencement College of Engineering Standard-bearer

James White, BSME Fall 2015, was our College of Engineering standard-bearer for Fall Commencement. He carried the College of Engineering banner and led this Fall's graduates in procession. James grew up in Lewiston, Idaho, and attended Lewis-Clark State College in pre-engineering coursework before transferring to the University of Idaho to major in Mechanical Engineering. At both schools he has been on the Dean's List a number of times, and on the President's List at LCSC.

He maintains an active interest in solid modeling, design for manufacturing, and mechatronics. As such he has been an effective technical lead on the local American Society of Mechanical Engineers Microbaja project and an active contributor to the University of Idaho Hybrid Electric Vehicle team where he has been an integral part of suspension system upgrades and formulation of new vehicle performance testing procedures.

**Future plans:** *I have been offered a position at a Fortune 500 company in Houston, TX. I plan to accept the position and learn as much as I can with hopes to become a project manager. Utilizing the skills and connections obtained as a project manager I plan to start my own company building educational robotic devices and training systems to jumpstart younger generations' interest in STEM programs.*

## ALUMNI AWARDS for EXCELLENCE to AKPEDZE DAVID AFANTCHAO and NATHAN GREENWOOD

### David Afantchao Junior in Mechanical Engineering and Biology



Nomination letter from  
Dr. Alton Campbell

**To the Alumni Awards  
for Excellence Selection  
Committee:**

Over the last 3 years, I have had the privilege to serve as an adviser/mentor to David Afantchao through the Honors Program and the Pre-med Program; and I highly recommend him for an Alumni Award for Excellence. To provide a preliminary overarching perspective, David was born in Togo and came to the UI three years ago as a 17-year

old, first-year student. As you would expect, he initially struggled with transitioning to a new country, culture, language, and university academic expectations; but he overcame all of those challenges and has achieved to extraordinary levels.

First, David is a serious and dedicated student who enjoys intellectual challenges. He is majoring in Mechanical Engineering; and he has earned a 3.70 GPA. In addition, he is a member of the selective Engineering Scholars Program as well as the University Honors Program, and has completed six honors courses to date.

Beyond academics, David has divided his time between working his way through school and being exceptionally involved in numerous leadership and service activities. He is a member of the National Society of Black Engineers; and he has served as Vice-President of

the African Students Association playing a major role in helping plan and carry out Africa Night in 2014. His volunteer efforts have included participating in Vandal Volunteers (taking food to a local town to feed the elderly), Saturday of Service, Make a Difference Day, Palouse Bicycle Collective (volunteer mechanic), international student orientation week (IPO volunteer), and assisting patients at the Snake River Clinic (free health clinic in Lewiston). David has also volunteered as a peer mentor for new international students, as an academic tutor for the Engineering Scholars Program, and as a tutor for the Academic Support and Access Program. In addition, he has served on two Alternative Service Break (ASB) trips, one of which traveled to Nicaragua over the holiday break with a team of 12 students who worked on a coffee plantation and built a porch for a women's cooperative. The other ASB trip was to Hammond, Louisiana, doing construction work on a house.

Over the last three years, I have watched David grow rapidly into a mature young man. He has a quiet determination to set and achieve goals as demonstrated by his academic achievements. As vice-president of the African Student Association, David stepped far out of his comfort zone to become a leader. During Africa Night 2014, he was in charge of coordinating the food and its preparation; and I saw him move from line to line that evening making sure that everything was in place. And finally, he cares deeply about helping others as demonstrated by his long list of service activities and experiences. For example, early last spring David spent a half-hour with me excitedly sharing photos from his ASB trip to Nicaragua. His self-confidence and his latent abilities have grown by leaps and bounds over the past year.

In summary, David has excelled in his academics, in his professional career preparation, and particularly in leadership and service. For all of these reasons, I highly recommend David for an Alumni Award for Excellence.

Sincerely,

*Alton G. Campbell*  
Director, Honors Program

## How I got here...

from Akpedze David Afantchao

I was born and grew up in Togo, a small country located in West Africa. My parents have always had high standards not just for themselves but also for my siblings and me. My father is a customs officer and got his master's degree in French. My mother got her master's degree in English—more specifically in linguistics—and now works as an inspector of education in Togo. They have always taught me the value of hard work and dedication. In high school, I was part of a very demanding program that focused on mathematics and physics. During my last year in high school, there were less than 250 of us in the program nationwide. I was able to graduate and made it to the top 20 of the country.

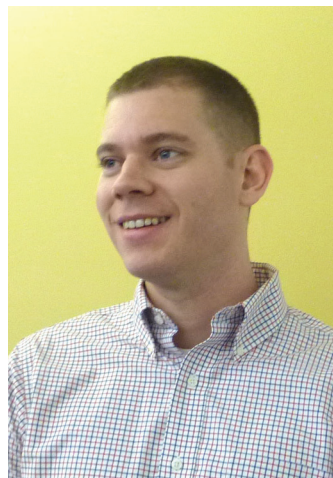
I had a very deep interest in helping people around me, as healthcare is a very important issue where I lived. I then decided right after high school to go to medical school, which is actually possible in Togo but with a lot of hard work. At the same time, I also wanted to study in the US and decided to apply to some American universities. At that time, I realized that one of the states that could work for me is Idaho as I knew an uncle of mine who lives there and I thought it would be great to be in a place where I have some relatives. I then decided to apply to the University of Idaho. I was not sure if I would be admitted or not, therefore I started going to medical school at the University of Lome, the capital of Togo, about a month before I received my admission confirmation from the U of I. I then knew that it would be a better option for me to study abroad and have access to more opportunities. I started taking steps to get ready to go to the US.

French is the official language of Togo. In addition, I speak Ewe which is my native language; one of the 37 local languages of Togo. I was among the best in English in my high school as my mother was always there to teach me new material ahead of what we learned in class. In order to get ready to come to the US, my parents signed me up to take more English courses at an American Culture Center back home. I also used to lock myself in my room for a couple of hours every other day to practice listening to conversations in American English. The time had come for me to go to the US and I stopped going to medical school in Lome.

My first experiences in the US were quite frustrating as I was just 17 years old, by myself, and I had not reached my final destination yet. Despite all the hard work practicing English, I still was not able to understand most of the things people were saying. I eventually made it to Spokane after struggling quite a bit. I met my uncle there and we headed to Moscow together.

At the University of Idaho, I started with a major in Biology as it seemed to be the preferred one for pre-med students. I had been thinking a lot about what I really wanted to do and started to think more and more about engineering. My second semester, I was a pre-med student double-majoring in biology and mechanical engineering. I eventually dropped my biology major and decided to be a full time mechanical engineering student at the beginning of my third semester. It was a big change for me and I was still struggling a little with the language barrier. In spite of all those difficulties, I stayed very motivated, partly because my professors and advisors who knew me always encouraged me to keep doing my best.

I am still interested in healthcare and I still want to come back home and apply my knowledge to the healthcare field. I had the chance to meet Professor Joel Perry, one of my favorite professors. His research involves working with and building rehabilitation devices. I automatically joined his team and never regretted it. I am very confident I will be able to one day use the knowledge I am receiving to improve the healthcare situation in Togo. I am thankful for this opportunity that has been given to me. I am even more thankful for my parents who are my greatest support and my sponsors. I am determined to do the best I can, even though I am sure it will not be simple.



## Nathan Greenwood

MEME Fall 2015

Nomination letter from  
Capt. M. J. McClintock

### **To the Alumni Awards for Excellence Selection Committee:**

I am proud to nominate LT Nathan Greenwood for the Alumni Award for Excellence. Nathan is a remarkable Naval Officer who daily demonstrates

exceptional academic prowess, innate desire to serve, and proactive leadership skills within my Battalion and across the University of Idaho campus. He is a True Vandal!

LT Greenwood has maintained a flawless 4.0 record in the challenging graduate degree program of Mechanical Engineering. This is most noteworthy given his full-time job responsibilities in my Department. Nathan is an Assistant Professor of Naval Science and my lead instructor for Naval History and Ships Systems. He is also my staff Nuclear Power and Special Operations Officer who coaches and mentors all our students who are seeking acceptance to these selective and specialized career fields. Furthermore, he is my command physical fitness leader responsible for developing innovative exercise routines and tracking student performance for over 70 participants. His results-driven attitude led to a significant reduction in physical fitness test failures and injuries, while greatly improving the overall performance of students in this area.

LT Greenwood's unmatched personal leadership example extended off-campus through his community service and outreach. For the past two years, he volunteered at the campus-sponsored State Special Olympics and was a key contributor to five community veterans' remembrance ceremonies. As our Recruiting Officer, he has met with dozens of potential University of Idaho students and their families, including serving as the table representative at all Vandal Friday and similar campus outreach events.

I can imagine no other graduate student more deserving of this special recognition than LT Nathan Greenwood. He personifies the best of both the Navy and this university's highest ideals.

*M. J. MCCLINTOCK*  
CAPT USN  
NROTC Commanding Officer

## How I got here...

from Nathan Greenwood

I grew up in Madisonville, TN, a small town in the foothills of East Tennessee. I went to the US Naval Academy in Annapolis, MD after high school, graduated in May 2009 with a B.S. in Mechanical Engineering, and was selected for service in the submarine force. I spent most of the first two years on active duty training to operate the submarine's nuclear plant. In February 2011 I reported to USS Tennessee, which was finishing up a three year overhaul period in the Norfolk Naval Shipyard before returning to her homeport in Kings Bay, GA. Once in Kings Bay I completed four strategic deterrent

patrols while serving as the ship's Reactor Control Assistant, Communications Officer, and Assistant Operations Officer.

Once my sea tour was complete, I knew I wanted to be a Navy ROTC instructor. The options that lined up with my report date pretty much came down to the unit here or at the University of Kansas. After three years in southern Georgia, I missed the hills of home. I didn't think Kansas would be much better in terms of topography, so I asked to be assigned here and was lucky enough to get it. I joined the staff of the UI/WSU Navy ROTC unit in February 2014.

The university extends some incredible benefits to the ROTC instructors, so I was able to take graduate classes at a great discount. Because my Navy nuclear training was accredited through the Naval Postgraduate School, I was also able to transfer in a large number of credits. Only needing 6 more classes to complete my masters, I decided to pursue the non-thesis MEME so that I could explore academic interests from other departments in place of what would have otherwise been thesis research credits. Overall I am very pleased with the well-rounded academic experience I was able to have here at UI.

I spend most of my time working at the Navy ROTC unit, advising and mentoring our midshipmen to help them figure out their best fit in the Navy after graduation and what it will take to get them there. In my free time I enjoy volunteering with the Special Olympics and watching whichever sports are in season!

Although I graduated Saturday [December 12], my assignment to the Navy ROTC unit staff will last through the end of the spring 2016 semester. After that I have decided to leave active duty. I am working closely with a headhunting firm that specializes in placing junior military officers into the civilian sector, as well as my network of colleagues that have already transitioned to find my next job. I am exploring a wide range of career fields, from energy production and manufacturing to finance and technical sales. I also have my eye on the fact that NASA started accepting applications for the astronaut program yesterday. I have heard submariners are pretty competitive for that, so I'm planning to throw my hat into the ring there and see what happens. Regardless of where I end up and what I end up doing, I am certain that my experience at UI will have played a significant role in making that possible.

## STUDENT PROJECTS AND ACTIVITIES

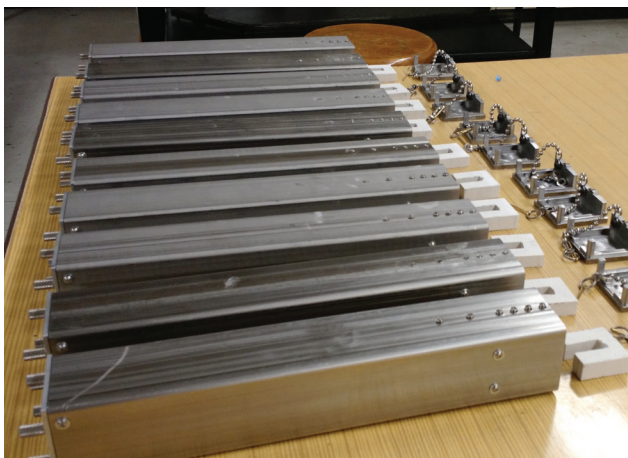
### Under Fire: Engineering Students Design Tools to Monitor Wildfire Soil Temperature Profiles

Linking higher educational programming to industry experts not only enhances inter-institutional communication, but also provides students with direct experience in designing solutions to real-world problems. Such experience is invaluable, which is why the University of Idaho's (UI) College of Engineering continually challenges its students with high-level design projects in their senior capstone course.

Since the early 1990s, Research Engineer Pete Robichaud at the Moscow-based USDA Forest Service Rocky Mountain Research Station has been a participating client in the capstone course. A leading expert in the field of post-fire erosion, Robichaud is consistently incorporating new technologies to better understand and mitigate the effects of wildfire on soil erosion. Recently, his needs for the UI design teams focuses on creating soil temperature probes that can accurately record and withstand the temperature of an active

wildfire, which can reach 650° C. Each probe senses soil temperature at six depths (1, 2, 3, 4, 6, & 8 cm), which provides a more detailed picture of wildfire impacts on below-ground soil resources. Such information will improve our understanding of the relationship between soil temperature during wildfire and changes in soil water repellency—a common occurrence after wildfire wherein soil particles repel water, changing the rate of infiltration and thus influencing erosion. These temperature measurements can also help assess seed source survival and root damage.

Thus far, there have been three iterations of the soil temperature probes created by UI engineering students. During the 2015 Teepee Fire, Robichaud and his team deployed ten of the latest probes. Additionally, there are future opportunities slated for these devices in 2016, and other researchers have expressed interest in borrowing the devices for their own studies.



*The final 10 units ready for use by the Forest Service.*



*The CNC mill cutting aluminum stock for probe*

More on the probes from Jacob Gilles, graduate student mentor of the capstone team: "From the student perspective, this project was a great opportunity for the lean manufacturing class of 2015 to apply everything they had learned so far in the mechanical engineering curriculum. Three separate undergraduate teams were given a set of design goals set by the Forest Service and they had two weeks to accomplish them through creating prototype probes. This limited time frame and complexity of the project had the teams working at

a pace similar to one seen in industry. The end of the summer lean manufacturing course brought three solid prototypes which were passed over to three graduate students who continued to improve upon them based on feedback from Pete Robichaud. About a month of changes and new ideas brought a final design which was selected by the Forest Service. The M.E. department was tasked with creating 10 units by the end of the semester which would allow the probes to be used in the 2015 fire season."



Shawn Trimble, Justin Pettingill and Jake Gilles, the graduate student team

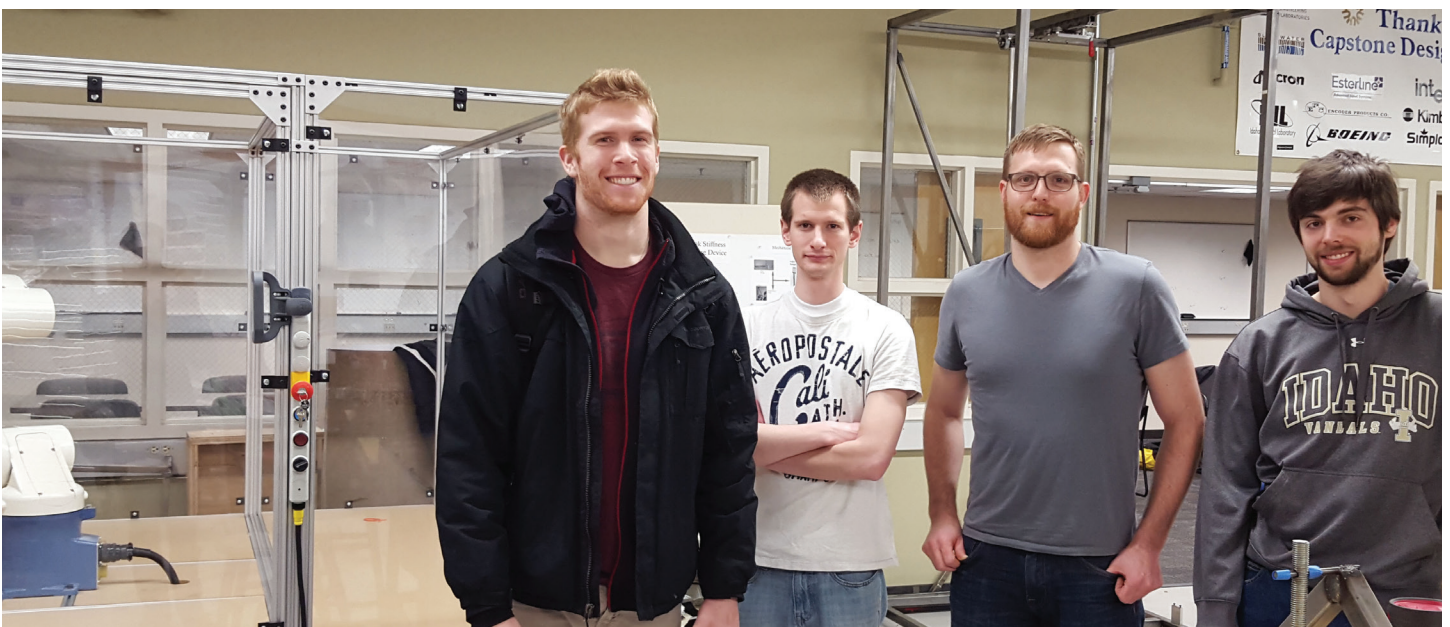


Installed probe

## ROBOTIC MANUFACTURING MOVES INTO THE SENIOR DESIGN SUITE

Mechanical engineering seniors Trent Dalton, Nick Howe, Dave Park, and Mike Wanless are Team VandalBot. They have relocated the Denso robot workstation developed by a previous senior design team into a corner of the senior design suite and are designing tooling as well as industrial automation for installing nut plates on sheet metal components. This operation is typically done by hand within the aircraft industry and involves a considerable amount of time-consuming, physically-taxing manual work. Because this work is so repetitive, it is an ideal candidate for automation. The team's

automation scheme involves: drilling rivet holes in the sheet metal part at specified locations, placing the nut plate and solid rivets, and squeezing the rivets to complete the installation. This project also involves creating user-friendly programming documentation for the Denso robot that can be easily used and extended upon by future mechanical and electrical engineering students. This is one of five Denso robots donated by The Boeing Company to support advanced manufacturing education at the University of Idaho. (Thanks to Dave Park for this article)



Mike Wanless, Trent Dalton, Dave Park, and Nick Howe with the robotic machine

## WOMEN IN ENGINEERING DAY

Women in Engineering (WIE) Day, a one-day program for young women to investigate careers in engineering or computer science through an interactive workshop and professional networking, was held on November 6. Working in teams, the challenge was to design a moving object on wheels (car) using an assortment of common materials such as tape, CD discs, straws, balloons, cardboard and paper cups. The final test of the “car” was its ability to stay together long enough to travel a certain number of feet propelled by air from the balloon. ME professor Beth Rezaie participated as a judge.

A highlight of the day was Sophie Milam’s presentation about her eight-month experience on a Mars simulation study team atop a desolate Hawaiian volcano. Team participants were allowed to venture outside their air-locked geodesic dome which functioned as home and study area once a week, and that was only in mock pressure suits to simulate life on an unpressurized planet like Mars. Sophie, who had just completed her Master’s degree in Mechanical Engineering, was chosen with two other women and three men from hundreds of applicants the world over for the Mars simulation. This study was of the human factors that contribute to astronaut crew function and performance in long-duration space travels.



## BE THAT PERSON/DON'T BE THAT PERSON: WHAT DO EMPLOYERS WANT IN NEW EMPLOYEES?



Three ME alumni (Paul Huber, BSME 88, Caitlin Owsley, BSME 12, and Kurran Kelly, BSME 13) participated in well-attended, high energy seminars sponsored by ASME on interviewing practices and project management in conjunction with the Career Expo in early October. All three were passionate about this subject and shared insightful anecdotes from their engineering careers. The session oriented students on project management essentials early in their capstone projects, helped refine our design review rubric to better include this professional issue, and energized our local ASME Student Section. Paul led a compelling discussion about his personal career journey to our Freshman Engineering students. If any of you would like to spend a day on campus participating in specially designed learning activities, meeting with student groups, and/or catching up with your favorite faculty/staff, let us know and we would be happy to craft a program that matches your skills/interests with the appropriate audience. (from Michael Maughan)

Associated with the above was a panel session specifically about project management. Industry experts Nate Bradbury (Wagstaff, Inc.), Caitlin Owsley (Janicki Industries), Paul Huber (The Boeing Company) and Kurran Kelly (British Petroleum) discussed their experiences and gave tips on how to effectively take charge of assigned projects.

# KATJA SCHUMACHER

## Exchange student from Germany

My name is Katja and I have been an exchange student at the University of Idaho for the past semester. I am in the Master's program "Management & Engineering" at the University of Idaho's Partner University in Lueneburg, Germany. Here at the University of Idaho I took Entrepreneurship, Advanced Computer Aided Design, Capstone, and Mechanical Engineering Analysis.

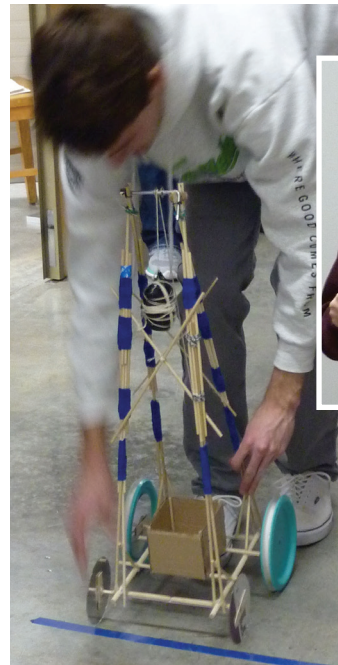
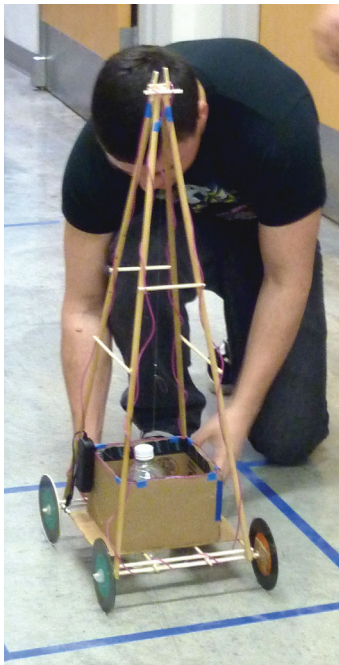
I enjoyed my experience at the University of Idaho very much. I was involved in the Capstone program and got to be part of a team that worked with a client on a very interesting matter. Also I participated in the Idaho Pitch, an event on campus where teams pitch their business ideas to judges in a one-on-one-conversation. All in all, I liked attending the many events that took place on campus during the semester. All my classes took place in a good learning environment and there was always an opportunity to get help from the teacher or the professor if needed. So even though there were, compared to Germany, a lot of assignments and homework during the semester, I always felt well taken care of.

This semester abroad was my second time I gained an experience abroad. At the age of 16 I did a high school exchange. I stayed with a host family for 5 months and attended a high school in Austin, Texas. The experience back then, the opportunity to see Engineering and Business matters taught from an American point of view and the possibility to improve my English were the reasons I chose a semester abroad at the University of Idaho. I was really excited to get to know the Northwest of such a large country. And I did not get disappointed. The people in Moscow are very friendly, open and interested, so that at all times I felt very welcomed in this small city.



*Katja Schumacher, on exchange from Germany*

## ME 123 — WHERE IT ALL BEGINS



*Class mentors Brooke Deans & Jennifer Downen were the scorekeepers.*

*The starting line.....Suspense! Will it go the distance?..... perfect finish!*

ME 123 Introduction to Mechanical Engineering Design is the first hands-on course for entering freshmen. During the semester, they are faced with many challenges: teamwork, design, build, and compete successfully. For the final team competition in the class, students were pitted against opposing teams to build a gravitational potential energy vehicle that had to accomplish a few tasks. The energy source for their car was a mass that could be no more than a 20 fl.oz. bottle of water (~600 grams) that could start out no higher than 2 ft. above the centerline of the axles. Furthermore, the vehicles

had to be constructed of items like: cardboard, hot glue, popsicle sticks, and recycled materials (bottle caps, DVD's, etc.). The Fall 2015 class outdid themselves, making cars that drove a distance of over 100 ft, cars with passive braking systems that stopped at very precise intervals, and cars that were optimized for 25 ft. drag races—complete with multi-speed transmission, traction additives, and wheelie bars. Not only do the students have a fun time with the project, but they learn many valuable lessons: how to function on a team; how mathematical models can help guide design decisions; and how fabrication quality has a strong impact on product quality.

**The Idaho Pitch** was an event allowing innovators and entrepreneurs from across the university to practice their presentation skills, build confidence, and learn how to work a reception—while presenting their ideas to a group of business and professional judges. A pitch is a brief overview of an idea able to be delivered in a minute—in an elevator, for example, if you are lucky enough to step into one with the CEO of a major Fortune 500 company!

Participants were from a broad spectrum of fields, with ideas all the way from remodeling buildings, making ice cream on a cooled marble slab, biometric trigger lock for gun safety, solar panels on the back of phone cases to keep your phone charged throughout the day, purifying sea water using electrical and magnetic fields, a robotic painting pal, recovering wasted heat, parking space locator app, and many more. Many of our ME students took part, as did Beth Rezaie, Steve Beyerlein and Tao Xing as judges.

## SABBATICALS

### From John Crepeau

Fulbright Scholar currently on sabbatical through spring semester in Guayaquil, Ecuador

So far, my sabbatical at the Escuela Superior Politécnica del Litoral (ESPOL), in Guayaquil, Ecuador is going very well. We arrived here in September, and the faculty and staff have welcomed us with open arms and generous hospitality. I am teaching a graduate course in turbulent flow, and the students here are great. I am pretty impressed with their level of sophistication and ability to work in this area. I am participating in a research group which is trying to use microencapsulated phase change materials in fluids to help insulate buildings, thereby making them more efficient and reducing the cost to maintain them. It is hot and humid here, and a lot of energy is used to power air conditioning systems. By making the buildings more energy efficient, the cost is significantly reduced. The mechanical engineering program is also preparing for an ABET accreditation visit in a couple of years, and I have been able to help them with their assessments and preparation.

I presented some of my research work (in Spanish!) at a Latin American Mechanical Engineering conference which was held here in Guayaquil, and began spreading the Vandal brand throughout South America. My conversational Spanish was pretty good, and I am learning all sorts of words that engineers take for granted but are not taught in most Spanish classes, like derivatives, ramjet engines, and boundary layer profiles, but with the help of the students and faculty members, I am making my way through. As a result of my presentation at the conference, I have been invited to give talks at other schools in the region, including Colombia.

Ecuador is a beautiful country. I have seen some gorgeous orchids, mountains and volcanoes. They are nuts about their soccer (fútbol) team here, which is currently undefeated in the 2016 World Cup Qualifiers for the South American region. The city came to a standstill yesterday during their match against Venezuela. It has been a great experience!



*John and Maarn by the entrance to the Escuela Superior Politécnica del Litoral.*



*The local student chapter of ASME asked that I give a little workshop on writing technical reports and papers in English. I had a great time and the kids were very responsive. I will be giving a few more of these workshops throughout the semester.*

### From Don Elger

On sabbatical Fall 2014 and Spring 2015

CourseBuilder and The BookCourse, Technology Products for Improving Learning

Most university students are not learning the main ideas from their courses well; nor are students learning professional skills well. To solve this problem, a technology product called a BookCourse, was developed. Unlike present textbooks which focus on coverage of topics, a BookCourse focuses on students reaching goals (i.e., attaining course learning outcomes). Thus, a BookCourse results in students who know and skillfully apply the topics of the course. Since BookCourses cannot be created effectively with present-day technology, a second product called CourseBuilder was created.

Unlike today's technologies, CourseBuilder allows an author to build educational materials with agile design and then to continuously improve these materials. With CourseBuilder, the author pushes one button and produces publication-quality materials. With CourseBuilder, the author can publish educational materials using simpler and faster workflow.

Because of this sabbatical project, we now have a technology product, the BookCourse, that will result in students reaching course learning outcomes. We also have a technology product, CourseBuilder, that will automate the production of BookCourses and other educational materials.

### From Michael Anderson

On sabbatical Spring 2015

Michael J. Anderson was granted a sabbatical leave for the period Jan-May 2015. The intended objective was to write a textbook on Dynamic Systems for junior-level Mechanical Engineering Students. A draft textbook consisting of eight chapters and an Appendix was generated during the sabbatical period. Included was a version in 8.5x11 format for use by UI ME 313 students for Fall Semester 2015, available for purchase for \$26. In this format, the draft was 197 pages, including 149 figures and 99 homework problems. Future revisions of the draft will be used by ME313 students Spring and Fall Semester 2016, with publication intended shortly after that. An option for publication is to use a venue such as Amazon CreateSpace as an alternative to traditional textbook publishers. It is thought that the textbook will become available through this publication method for ~\$35-\$40/copy, much less than current textbook costs.



## FACULTY

The ME Department is pleased to welcome three new faculty members Fall 2015.



### Behnaz Rezaie

Originally from Iran, Behnaz Rezaie earned her BSME degree from Iran University of Science and Technology, her MS in industrial management from Lulea University of Technology in Sweden, and an MSME and Ph.D. from the University of Ontario Institute of Technology. Her research interests are in many aspects of energy: renewable energy, district energy, thermal energy storage,

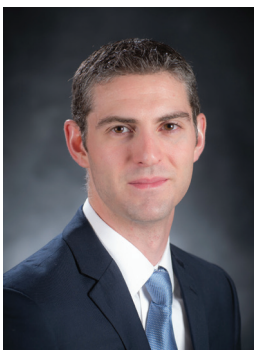
environmental impact assessment, integrated energy systems, modeling and simulation of energy systems, thermodynamics, and heat transfer. At the University of Idaho she has involved herself in Women in Engineering, Idaho Pitch, and other special programs on or off campus, often as a mentor or judge.



### Kamal Kumar

Kamal Kumar received his B.Tech in Energy Engineering from the Indian Institute of Technology, Kharagpur. He obtained his M.S. and Ph.D. degrees in mechanical engineering from Case Western Reserve University. His research interests are in the field of alternative fuel combustion chemistry, and energy conversion systems. Prior to joining the University of Idaho, he worked

as an associate professor-in-residence in the mechanical engineering department at the University of Connecticut. He has also worked in the electric power industry as a plant performance and electrical maintenance engineer (1998-2002).



### Michael Maughan

Michael Maughan earned B.S. and M.S. degrees in Mechanical Engineering at the University of Idaho. He spent five years in industry, working for both Fortune-50 and startup companies as a mechanical design engineer and engineering manager. Michael then attended Purdue University where he received a Ph.D. in materials engineering. He has published seven papers and holds

five patents. His research spans the fields of mechanical and materials engineering, studying the microscale properties, behavior, and failure of materials and mechanical systems.

## NEW TOOLS AND RESEARCH SUPPORT

From Joel Perry

With the help of a UI Seed Grant, faculty startup, and some COE funds, the ME department has recently purchased a new VLS6.60 60-Watt laser cutter from Universal Laser Systems. It has a material processing bed of up to 32"x18." The system can cut a variety of flat materials such as fabric, leather, wood, and acrylic. Engravings can also be made on a variety of metal and non-metal materials. The cutter is housed in Gauss Johnson 123 (across from the Machine Shop). This company link gives specs and selling-points of the laser cutter.

<http://www.ulsinc.com/products/vls660/>



*Dillon Savage, Shawn Trimble, Stephen Goodwin, Justin Pettingill and Ronnie Ross show off the fun things the laser cutter will do!*



*If you look closely you can see Russ Porter captured in wood.*

## FACULTY EARN GRANT FOR RESEARCH ON CREEP-FATIGUE BEHAVIOR

An interdisciplinary team from the University of Idaho (UI), Purdue University and Idaho National Laboratory (INL) has recently secured an \$800,000 grant from the Department of Energy, Nuclear Engineering University Programs (DOE-NEUP) to perform experimental and modeling research on the creep-fatigue behavior of austenitic Nickel-Chromium Steel Alloy 709. The leader in this research is the UI team, which includes Gabriel Potirniche and Robert Stephens of Mechanical Engineering and Indrajit Charit of Materials Science and Engineering. The other two researchers are Akira Tokuhiko of Purdue University and Michael Glazoff of INL. The research project is scheduled to last three years and it will focus on the understanding of crack growth mechanisms in Alloy 709 at high temperatures. Alloy 709 is considered by the DOE as a possible structural material in the next generation nuclear power plants.

## ALUMNI

Here is a product engineered by Amanda (Bolland) and Zach Battles. Quinton Elliott Battles was born September 11th 2015 to Amanda (BSME 2011 and MSME 2013) and Zach Battles. Amanda is a mechanical project engineer at Clearwater Paper Company in Lewiston, just back to work full time December 16 after being off for maternity leave.



Amanda with newborn Quinton

A smiley two-month-old Quinton

## EDUCATING ENERGY ENGINEERS WHILE PROMOTING REGIONAL ECONOMIC DEVELOPMENT



### Academic/Industrial Partnerships with the UI Industrial Assessment Center

To stimulate workforce development in energy engineering, the Department of Energy continues to support its 20+ year old Industrial Assessment Center (IAC) program. This program provides educational experiences for engineering students in the context of energy conservation outreach to mid-sized manufacturing facilities. Nationwide, there are more than 30 university-based IAC units, one of which is at the University of Idaho. This program has been running since 2012 and has involved more than a dozen Mechanical Engineering students in addition to peers in Electrical Engineering and Biological Engineering. Faculty advisors for the IAC program are Dev Shrestha (Biological Engineering), Steve Beyerlein and Beth Rezaie, (both Mechanical Engineering).

IAC students receive inter-disciplinary training in energy auditing (air compressors, boilers, ventilation systems, lighting, and implementation of combined heat and power), hands-on experience with field instrumentation (infrared imagers, combustion analyzer, air velocity monitors, temperature, and pressure measurement devices, and current loggers), opportunities to interact with regional clients (with annual energy bills of \$100k or more), and experience in preparing a comprehensive energy assessment report for each client. The IAC model is built around a full-day energy audit each month followed by data analysis and report writing. There is no cost to the client except the time spent with students/faculty on the site visit, and responding to some post-visit follow-up questions. The final product delivered to each client within 60 days of the visit is typically a 60+ page report that outlines monthly energy usage from diverse sources, current best practices, a half-dozen energy saving suggestions, an estimate of payback associated with each energy saving recommendation, and some general recommendations about places for even greater energy savings. To date, the IAC team at the University of Idaho has visited over 40 regional facilities, made energy saving recommendations that exceed \$2M/yr, and helped clients implement plant improvements that collectively save more than \$500k/yr in regional energy bills. If your organization is interested in saving money while helping to educate next generation engineers who possess heightened awareness of energy technology, please contact us at [iiac@uidaho.edu](mailto:iiac@uidaho.edu).

## THE MECHANICAL ENGINEERING INDUSTRY ADVISORY BOARD

Jeff Smutny (1994, 1998), Board Chairman  
Manufacturing Engineering Manager, Wagstaff, Inc.

The principal function of the Board is to impart our varied industry experiences and insights to help tailor the Department's offerings and to better serve the students. Industry advisory boards are a requirement for ABET accreditation. We typically meet on the Moscow campus in the fall and spring of each year and assist with other department business such as student design reviews, accreditation visits, and the annual engineering and design expo. The Board also funds a scholarship for deserving students.

I would like to introduce the Mechanical Engineering Industry Advisory Board: Tim Crawford (Xerox Corp., past chairman), Greg Hall (Power Engineers), Ron King (formerly of Idaho National Laboratory), Caitlin Owsley (Janicki Industries), Mike Thompson (Wagstaff, Inc.), Myles Brown (The Boeing Company), Ralph Barker (Hecla Mining Co.), Shawn Riffe (Encoder Products Co.), Todd Swanstrom (Western Trailer Co.), Kurran Kelly (British Petroleum), and Tom Pfeiffer (Idaho National Laboratory, past chairman). I have served on the Board since 2006 and became the chairman in 2013.

Recent former members are Mike Maughan who finished his Ph.D. at Purdue and has now joined the U of I faculty, and John Jordan of Hecla who left the board due to new job responsibilities and extensive business travel. Paul Huber is now serving on the U of I College of Engineering Board. We very much appreciate their service with the board and wish them well in their new endeavors.

We are always on the lookout for new board members. If you are interested in serving the Department and joining the Board, please contact me ([jsmutny@wagstaff.com](mailto:jsmutny@wagstaff.com)), Steve Beyerlein, M.E. Department Chair, or any of the current board members. In future newsletters we will feature Board initiatives, board member biographies, and profiles of Board scholarship recipients.

### MECHANICAL ENGINEERING NEWS

is the newsletter of the University of Idaho Mechanical Engineering Department  
PO Box 440902  
Moscow, ID 83844-0902  
Phone (208) 885-6579

[www.uidaho.edu/engr/me](http://www.uidaho.edu/engr/me)

*Any opinions expressed herein are those of the writers and do not necessarily represent the official position(s) of the university or its Board of Regents.*

Editor: Elaine Queener

# LETTER FROM THE CHAIR



Steve Beyerlein

Dear Alumni and Friends of Mechanical Engineering,

Last June I began my term as Department Chair of the Mechanical Engineering Department. I am excited to serve our students, faculty, staff, alumni, industry partners, and the state of Idaho in this role. I am thankful for the thoughtful stewardship of the previous chairs under which I have served for the last 28 years. I appreciate the availability of John Crepeau and Ralph Budwig in freely sharing their advice. I am especially indebted to our outstanding administrative staff (Molly Steiner, Becky Schoenberg, and Elaine Queener) who have taught me previously

unknown intricacies of UI systems for admission, course scheduling, financial management, employee record-keeping, and accreditation. I've visited face to face with over 100 UI ME alumni during the last six months and, based on your input about the future of the engineering profession, have composed the following vision for design and manufacturing education that I will use to guide our program development efforts.

My educational vision is to cultivate engineers for the future who actively engage with project stakeholders around meaningful engineering projects, resulting in innovative products that can be rapidly prototyped with high-speed manufacturing and assembly of parts. This involves bringing together today's students with professional practitioners in an enriched environment that supports hands-on learning with modern metrology, machining, rapid prototyping, robotic assembly/industrial automation equipment, and instrumentation for electro-mechanical performance testing. **Realize this vision by Integrating the following 5 C's for hands-on project learning:**

**CAPTURE IT:** Actively immerse students in design thinking by studying and recreating legacy drawings, parts, and mechanisms to discern design intent, taking physical measurements and encoding surface details using a highly-accurate coordinate measuring machine as well as 3D laser scanning equipment, and replicating key geometric/kinematic features in SolidWorks and CATIA.

**CREATE IT:** Design leveraged products using our National Academy of Engineering recognized Capstone Design Program process, leading to next generation solid models, assemblies, drawing, and renderings in our IdeaWorks Laboratory (with CATIA, SolidWorks, and Rhino).

**CRAFT IT:** Realize prototypes from solid models using state-of-the-art material removal processes along with additive manufacturing as well as state-of-the-art electro-mechanical hardware/controls/automation.

**CHECK IT:** Verify the design using metrology, design of experiments, documentation of lessons learned (on our widely-used Mindworks website), and presentation of the final product to the public in our signature Design Expo event.

**COMMERCIALIZE IT:** Proactively interact with a broad spectrum of internal and external stakeholders to assure timely, cost-effective implementation as well as to initiate development of derivative products, seeking to generate maximum value-added through collaboration with colleagues in business, agriculture, natural resources, and government agencies.

Modern infrastructure for design and manufacturing education goes hand in hand with sound pedagogy in insuring that our students are adequately prepared for the modern workplace. The Dean's Letter that you received this past fall contained a wonderful illustration of this in the picture of Russ Porter consulting with current students in front of the Haas CNC Mill. A number of Idaho Engineering Works members were part of the initiative with Schweitzer Engineering Laboratory and with NIATT that secured this piece of equipment. The machine is one of our newest and most heavily-used in our shop, yet it is now 15 years old.

This newsletter reports on our brand new laser cutter system that was acquired and brought online in Fall 2015 by Assistant Professor Joel Perry. The laser cell was quickly embraced by our students, well-documented as a by-product of a number of class projects, and there are already many laser-cut prototype pieces around the design suite and in various research laboratories. I envision that this cell will be a centerpiece for many kaizen projects in the upcoming 2016 rendition of our lean manufacturing short course.

During my term as chair I will be devoting considerable energy toward acquiring coordinate measuring machine capability, addition of a high-speed mini mill, replacing our 40 year old manual lathes, and adding laser scanning capability. I invite you to join me in this effort by being a regular contributor to our annual fund, connecting us with engaging capstone project opportunities that generate demand as well as resources for manufacturing innovation, sharing your professional expertise during on-campus visits, and lending a hand in crafting proposals for corporate discounts/matching funds associated with acquisition of new shop equipment.

## KEEP IN TOUCH! We want to hear from you!

**MAIL TO:** Mechanical Engineering Department, University of Idaho, 875 Perimeter Dr. MS 0902, Moscow, ID 83844, or e-mail: [medept@uidaho.edu](mailto:medept@uidaho.edu).

Name \_\_\_\_\_

E-mail \_\_\_\_\_

Phone \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

UI degree & year \_\_\_\_\_

Employer \_\_\_\_\_

Position \_\_\_\_\_

Comments \_\_\_\_\_

Donate to the ME Department to the address listed, or at [www.uidaho.edu/engr/give](http://www.uidaho.edu/engr/give)

Click "Give Now" and "Select a Fund Priority," type "mechanical" to search funds.

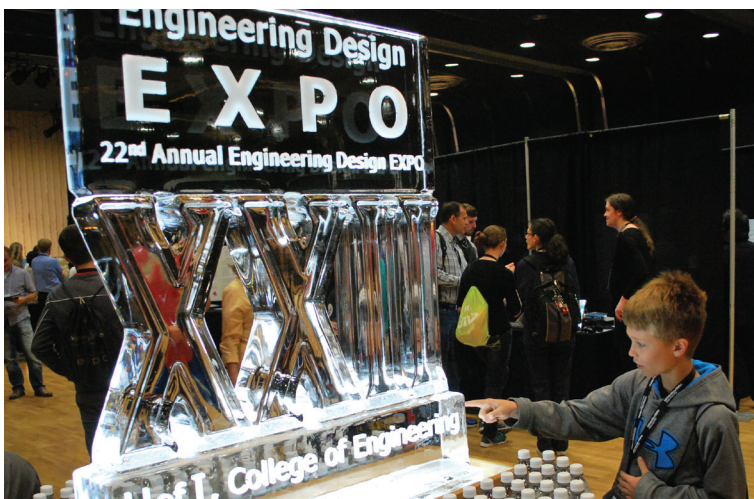
- ✓ Mechanical Engineering Scholarships
- ✓ Endowed Chair for Mechanical Engineering
- ✓ Mechanical Engineering Senior Design Projects
- ✓ Collegiate Competition Teams
- ✓ Shop/Lab Infrastructure



## COMING UP: EXPO XXIII, APRIL 29, 2016

The Engineering Design EXPO showcases our senior engineering capstone projects, and is the Northwest's longest-running, interdisciplinary initiative featuring student innovations. The National Academy of Engineering has recognized our capstone program as one of the best in the nation, an honor that is a testament to the hard work and talent of our students, faculty, industry partners, and staff.

The EXPO is held on campus in the Bruce M. Pitman Center (formerly the Student Union Building) and all events are free and open to the public. Many visitors to EXPO are students from area schools—grade school through high school.



## Design Projects on display at 2016 Design EXPO that include ME students

Next Generation Bandbeesten, Vandal Marching Band & College of Engineering  
Flight Management and Data Acquisition for Dynamically Scaled Model Airplane, Quest Aircraft  
Robotically Assisted Manufacturing, Boeing Company  
Persistence of Vision Machine, Computer Science Dept  
Microbaja Vehicle, ASME Student Section  
Tube Extraction Technology, Colmac Coil  
Trunk Bending Stiffness Measurement Machine, UI Psychology Dept  
RoboSub, NAVSEA  
Wingbox Assembly Tool, Boeing Company  
Automated Shade for Poinsetta Greenhouse, CALS  
Impact Testing Device, Nightforce Optics  
Hybrid Solid Ramjet, John Crepeau  
NEW Wastewater Treatment, CALS  
Biodiesel Reactor Modifications, Biological Engineering  
Formula Hybrid SAE Vehicle, College of Engineering  
Clean Snowmobile, College of Engineering  
CSC Traction Control System  
Desalinator, Vorsana  
CO<sub>2</sub> Scrubber Design, Vorsana  
Waste Heat Thermoelectric Generator, Global Technology Connection