



University of Idaho  
College of Engineering

# MECHANICAL ENGINEERING NEWS

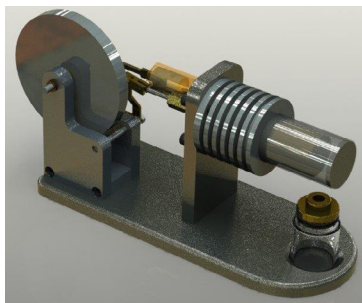
## TEACHING & LEARNING INNOVATION

### COURSE BRINGS CAD, MANUFACTURING AND LEADERSHIP SKILLS TO DESIGN SEQUENCE

Edwin Odom

Our popular technical elective course, ME 490 Solid Modeling, Simulation, and Manufacturing Capstone, has grown out of a need to infuse CAD, manufacturing know-how and leadership skills into our capstone design sequence. The course has been in development for more than four years, and ties together three important threads in project learning:

#### Solid Modeling



Stirling Engine Model

Solid modeling builds on our ME 301 Computer Aided Design Methods course for sophomores. After that course, many students take the CSWA certification examination administered by Dassault Systems. Passage of this exam is the first requirement to enroll in ME 490. In the first 5 weeks of ME 490, students study and

prepare to take the next level of exams called the Certified SolidWorks Professional (CSWP) exams.

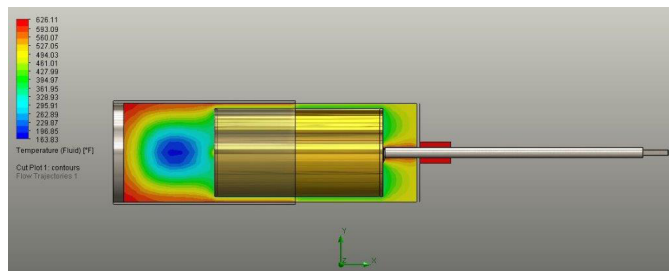
#### Simulation

Students spend three weeks in the machine shop building Stirling engines. They work from an initial set of engineering drawings and make decisions about tooling and fixturing associated with specific part designs. Students learn the ramification of these decisions and engage in team-building in a shop environment.

#### Manufacturing

The final 8 weeks of the course is spent working through the many simulation programs in Solidworks, including finite element analysis, computational fluid dynamics, kinematics and heat transfer. Students often use these programs in their final projects (see Examples of Final Projects, page 2).

Students also take a final round of advanced certification exams, known as the CSWPA exams, emphasizing topics related to drawing tools, sheet metal, weldments, surfacing and mold making. Passing four of the five exams at this level would allow a student, if they wish, to take the final certification exam at the expert level. While the first exams taken during



Side cross-sectional view contour temp

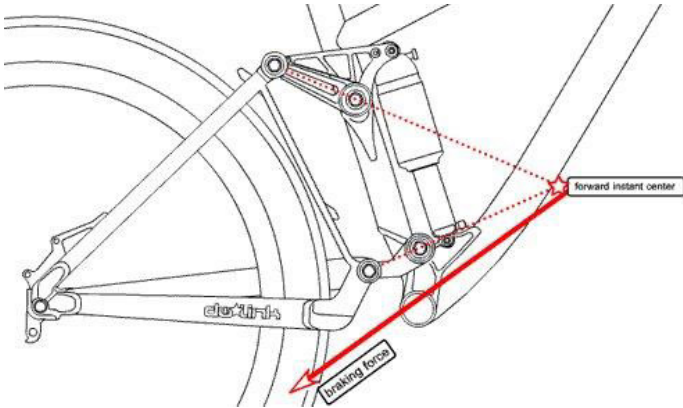
the semester are prepared for during class time, the last round are prepared for in pairs on their own schedule. This is to introduce the idea of setting aside time for lifelong learning.

ME 490 is not a replacement for our senior capstone design course. It was designed to run parallel and be supportive of the senior experience. We believe this experience helps seniors enrich their solid modeling, make better fabrication decisions and recognize opportunities for productive simulation in their capstone projects. Many graduates of this technical elective have found themselves behind the podium during the Engineering Design EXPO awards ceremony.

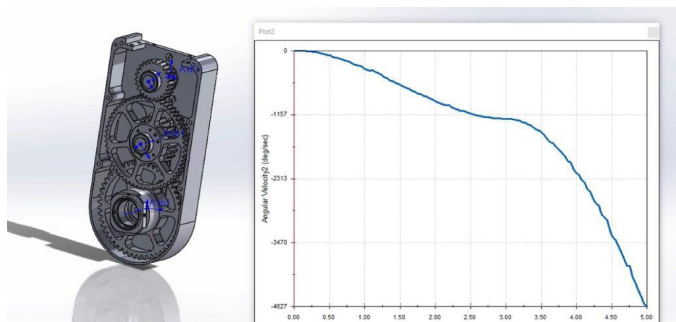
### TOPICS QUERIED BY CSWPA CERTIFICATION EXAMS

<b>CSWA</b>	Part Creation Global Variables Part Modification
<b>CSWP</b>	Create part from dwg global variables Configurations, design tables, part modification Assembly creation & modes, center of mass
<b>CSWSPA</b>	Weldments Drawings Sheet Metal Surfaces

## Examples of Final Projects



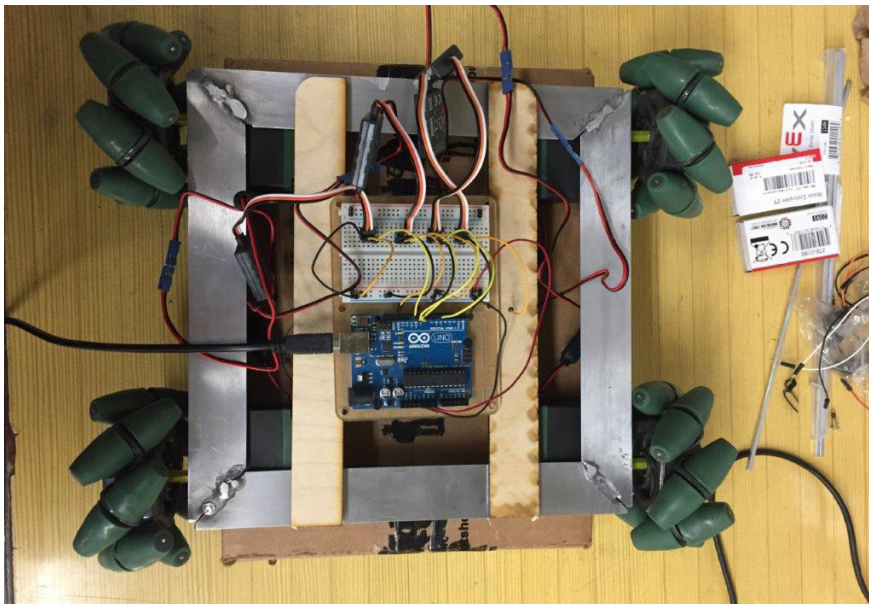
Bike geometry



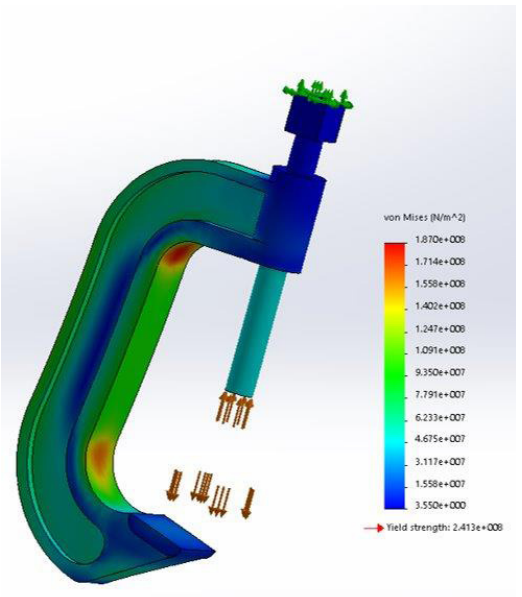
Gear Motion Study



Large Ball End Mill on Top Surface of Brass



Mecanum Wheel Prototype



FEA Analysis of a Clamp



## Industry Recognition of Our Innovative Design/Manufacturing Program



Quest Integration has been the SolidWorks provider for University of Idaho Mechanical Engineering department for many years. It is inspirational to see how far this department has come in their implementation of CAD modeling tools as part of design/manufacturing education. Not only are they extremely dedicated to teaching industry relevant technologies/tools, but they also excel in getting students professionally certified. They are doing a fantastic job of developing a homegrown, technically adept workforce for the Pacific Northwest.

- Bobby Johnson, Education Coordinator, Quest Integration

## CULTIVATING CITIZENSHIP AROUND ENERGY POLICY

### *Departmental collaboration gives students perspective on energy consumption and proposed policy of seven western states*

Steve Beyerlein

For the second year in a row, Mechanical Engineering's Steve Beyerlein, Biological Engineering's Dev Shrestha, and U of I Facilities' Scott Smith collaborated in offering a spring semester short-course ISEM 301 Building Our Energy Policy.

The course culminated with a team-based project where students analyzed statewide energy consumption and proposed targeted policies associated with energy technology or energy management. Policies addressed demand-side energy management, solar microgrids, carbon export taxes, incentives for biofuel utilization, greater deployment of pump storage, passive heating/cooling systems for buildings, and modular nuclear power plants. In addition to understanding enabling technologies, teams were expected to integrate issues of energy security, environmental impact and economic impact as part of their energy policy proposals.

The Gauss Johnson Design Suite served as a poster presentation venue for student teams to show their critical thinking about energy policy initiatives for seven different western states. This year, we had several special guests in addition to the 22 students and three instructors associated with the course. These guests included Levi Westra, Resource Conservation Engineer with Avista Utilities; Fred Pollard, Resource Conservation Manager with U of I Facilities; and Dean Panttaja, Director of the U of I General Education Program. Our guests were complimentary of students' project work as well as their communication skills. They offered suggestions and entertained questions about final project reports as well as thought-provoking perspectives on regional implications of state-specific policies.



Students Present Their Project Posters

# EXPANDING INDUSTRIAL AUTOMATION EXPERIENCE

## *New technical elective focuses on robotic programming*

Ankit Gupta

ME research engineer Ankit Gupta created a new technical elective this past summer, ME 404 Industrial Automation. Designed with industry needs in mind, the course provides hands-on experience in designing high technology workstations. Students are given an overview of industrial automation and controls, with a focus on robotic programming, as well as data acquisition in LabVIEW with a focus on creating user interfaces and supervisory control. The Advanced CAD Lab and Boeing-sponsored manufacturing robots were instrumental in supporting this course.

Student feedback about the course was overwhelmingly positive. One student remarked, "I really enjoyed all of the projects we did and found them very helpful. Being able to see the code run on a robotic arm was extremely satisfying." Another said, "I really learned a lot. I've always found programming/coding hard and annoying to deal with, but that wasn't the case in this class."

Breaking down perceived barriers to realization of mechatronic systems and replacing these with multi-disciplinary skill-sets in sensor/actuator operation and customizing user interfaces is something members of our advisory board have encouraged research engineers to explore more aggressively in technical elective offerings.

# STEM EDUCATION FLOWS TO BOISE'S YOUTH THROUGH RIVER RESTORATION PROJECT

*Originally published in U of I's 2018 Research Report, courtesy of the Office of Research and Economic Development.*

An innovative program designed to pair elementary students with river restoration researchers illustrates just one way that our university helps Idaho develop a STEM-educated workforce. Through funding from the National Science Foundation, associate professor Daniele Tonina and Professor Ralph Budwig at U of I Boise's Center for Ecohydraulics Research have combined their interest in using plants to clean and restore rivers with their desire to train future scientists.

"It has been a joy to work with the students who are with us each month," said Budwig. "We hope their monthly hands-on participation will kindle a lifetime pursuit of learning and contribution in a STEM field, especially as related to stewarding our environment."

The lab facilities located at the U of I Boise Center include a large-scale stream laboratory with the ability to manipulate flow and sediment load to better understand stream dynamics. The modern laboratory facilities and direct interaction with U of I faculty provide an immersive and engaging environment for the budding researchers, many of whom are from underrepresented groups. The experience has helped inspire them to pursue higher education degrees in science, technology, engineering and math.





# UNDERGRADUATE STUDENT NEWS

## CELEBRATING OUR ME STUDENT ATHLETES

It takes a special commitment to excel as a student while competing in collegiate athletics. Follow the unique experiences and insights gained by several seniors from the class of 2019.

### *Kendall Gray*

My name is Kendall Gray, and I am a fifth-year senior in the Department of Mechanical Engineering. I spent the last four years as a member of the Women's Golf team, and this year I am working as the assistant coach.

Being a student-athlete as well as a mechanical engineering major has had its challenges, but I believe these challenges have better prepared me for my future career. Pursuing both of these paths during college has taught me how to manage my time well, how to communicate effectively with professors and classmates while on the road, and how to be proactive. The challenges I have encountered during college have made me a better engineer.

Although my journey through college may have been more difficult and stressful as an athlete, I wouldn't have wanted to do it any differently. I learned so many valuable skills by being a student-athlete and pursuing a difficult major that I may not have learned otherwise, and I will be a better mechanical engineer for it.



### *Edward Hall*

My name is Edward Hall, and I am from Chugiak, Alaska. In my time at the University of Idaho, I have enjoyed both the rigorous coursework of a mechanical engineering student and the challenge of competing at the collegiate level as a linebacker on the football team.

As an ME major, I try my best to stay organized and disciplined to meet all assignment deadlines. I have had success in the past by dedicating several hours a day to homework, projects and studying. However, with a very time-demanding sport like football, this can prove to be difficult.

As an athlete, I attend lifting sessions, practice, meetings, and opponent film study. A strenuous course load combined with athletics does not leave much time for distractions, which, to me, is advantageous. With careful time management, and a passion for my academic and athletic endeavors, I have nearly reached the end of a rewarding college experience.





### **Nikki Imanaka**

My name is Nikki Imanaka. I was born and raised in Hawai'i on the island of O'ahu where I learned of my love for the water and the mountains. I started swimming at a young age, which transitioned into spring-board diving by the time I was nine. My dad taught me how to surf, and I crave the waves whenever I am away from home.

I am finishing my last year at the U of I, and will be graduating with a Bachelor of Science in Mechanical

Engineering. I am now a Division 1 athlete on the Women's Swimming and Diving team. We practice 6 days a week starting in August and ending around spring break, depending how well we do in competition. I guess you could say I'm pretty good at managing my time. There are times when traveling and practicing makes me stress about not having enough time to do my school work, but the majority of the time it relieves my stress. It forces me to stop thinking about school for a second and be physically active. It challenges my brain in a different way, and it has given me another family here. Being a student athlete isn't for everyone, but it has been one of the greatest experiences of my life so far.



### **Emily Kliewer**

From a very young age I loved to swim. It was this passion that brought the University of Idaho to my attention and later encouraged me to make the long journey from my family in Florida to this university.

The family I found in the team allowed me to grow comfortable here and learn to explore the many benefits of a smaller town and school.

Participating in both academic and athletic

activities provided a nice balance in my life and brought much needed perspective when either became too overwhelming. The fusion of topics also helped.

Engineering in swimming ranges from drag reduction to broken equipment due to fatigue. Finding those connections made my love for engineering grow and encouraged me to explore and learn as much as possible. Starting my senior year, I am quite thankful for all the opportunities. From doing research in Germany, to interning for a large company, it was the combined influence of academics and athletics that helped give me the confidence to try things outside my comfort zone.



### **Nathan Sherwood**

My name is Nate Sherwood. I am a senior in mechanical engineering and a member of the men's basketball team at the University of Idaho. Being a student athlete is very rewarding, but it has unique challenges. The last four years have taught me how to juggle a demanding schedule. Between practices, travel and academics I have learned to prioritize and manage my time efficiently. I believe this skill is one that will help me throughout life.

Another important factor in my success, in both engineering and basketball, has been supportive teachers, coaches and peers. I never could have done this on my own. I would like to thank all the teachers that have worked with me and made it possible for me to succeed.



# GRAND CHALLENGE SCHOLARS PROGRAM: FIRST OF ITS KIND IN IDAHO

## Program prepares students to solve top challenges of 21st century

The College of Engineering at the University of Idaho is one of the only colleges in the state and in the Pacific Northwest to offer a program designed to prepare students to solve the 14 Grand Challenges of Engineering in the 21st century, as established by the National Academy of Engineering (NAE).

## NAE GRAND CHALLENGES

<p><b>SUSTAINABILITY</b></p> <ul style="list-style-type: none"> <li>■ Make solar energy economical</li> <li>■ Provide energy from fusion</li> <li>■ Develop carbon sequestration methods</li> <li>■ Manage the nitrogen cycle</li> <li>■ Provide access to clean water</li> </ul>	<p><b>JOY OF LIVING</b></p> <ul style="list-style-type: none"> <li>■ Reverse-engineer the brain</li> <li>■ Enhance virtual reality</li> <li>■ Advance personalized learning</li> <li>■ Engineer the tools of scientific discovery</li> </ul>
<p><b>SECURITY</b></p> <ul style="list-style-type: none"> <li>■ Restore and improve urban infrastructure</li> <li>■ Prevent nuclear terror</li> <li>■ Secure cyberspace</li> </ul>	<p><b>HEALTH</b></p> <ul style="list-style-type: none"> <li>■ Advance health informatics</li> <li>■ Engineer better medicines</li> </ul>

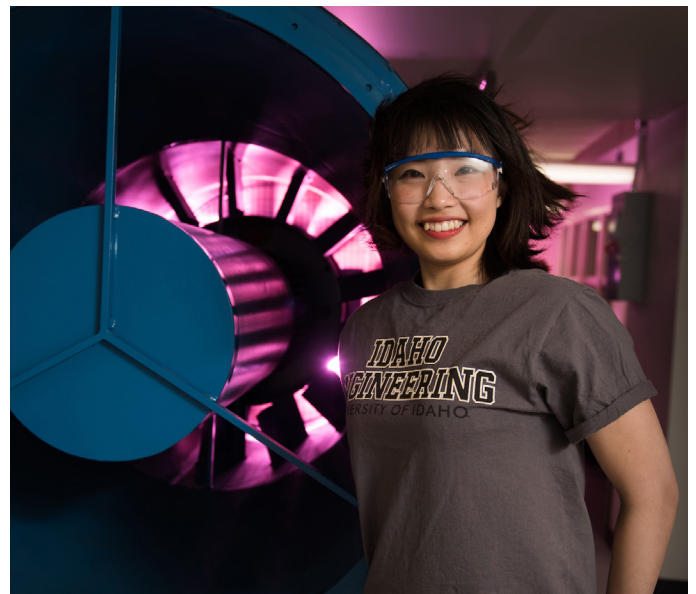
U of I is among a select group of engineering schools nationwide that plan to graduate more than 20,000 formally recognized Grand Challenge Engineers over the next decade. Learn more about two Grand Challenge Scholars from our department:

### Miyako (Mia) Nakayama

#### Senior

Miyako Nakayama chose wind turbines and their connection to sustainability as her Grand Challenge Scholars Program research topic. Last summer, she completed a theoretical study of wind turbines under the supervision of Dr. Tao Xing and evaluated the feasibility of onshore and offshore wind energy for the state of Texas based on Levelized Cost of Energy (LCOE), Capacity Factor (CF) and Annual Power Output (APO).

Nakayama applied her knowledge from two technical elective courses, Computational Fluids Dynamics and Turbomachinery offered by Dr. Xing. Nakayama presented her poster at the second International Conference on Renewable Energy and Resources in Boston in August 2018. Nakayama said it was a wonderful experience to present her research outcome in public and network with scholars from different countries.





## Anson Lunstrum

### Junior

I consider myself very privileged to live in my beautiful home state, and am grateful I have never had to worry about whether it was safe to ingest my own tap water. Thanks to the Grand Challenge Scholars Program, I was fortunate enough to study abroad this summer. As a member of the U of I Humanitarian Engineering Corps and having selected the focus area of providing access to clean water, I was eager to see the water crisis first hand.

With a group of five of my peers, I spent six weeks in China and was appalled at the things I saw. Nature had been brutally neglected in areas, and I soon missed the endless clean, green spaces of Idaho.

We studied and lived at Wenzheng College in Suzhou, a “small” city of 10 million and the eighth largest in China. There was visible smog every day we were there, and it was at unhealthy levels for over half our stay. We could only drink bottled drinks, and did not once see a clear body of water. I made an effort to jog and exercise each morning, but after two weeks was forced to quit due to a respiratory reaction. Despite this, I would highly recommend the study abroad experience to anyone who might be interested. It greatly impacted my outlook and preparedness level, and I am eager to continue to reap the benefits it has offered.

Unsurprisingly, China dwarfs the competition when it comes to environmental impact. To put some of the issues into perspective, China contains 20 percent of the global population, 7 percent of the land area, and 7 percent of the freshwater, which is the same as the U.S.. However, the levels of airborne contaminants hover around dozens over the healthy limit, over half the groundwater is toxic, over a third of the fish species have been wiped out, and a novel respiratory disorder, the Beijing cough, has become the de facto common cold of the people’s republic.

All these factors, while negative, had the effect of reinforcing one of my core beliefs: the ecosystem must be cared for. I left for China as a somewhat eco-conscious student, but I returned a full-blown

environmentalist. Since then, I have restructured my life in order to live in a more sustainable manner. At home, I have started a compost, eliminated my use of single-use materials wherever possible, and worked diligently to recycle every possible material. In my community, I have volunteered at recycling centers, attended workshops, and have worked to raise awareness about the state of global pollution. We all only get one earth, and it is our duty to take care of it.

As a native Idahoan, I love this beautiful chunk of rock, and I will work to ensure that it is still beautiful for the generations to come. Although it was hard on my body, I loved each and every bit of China for its uniqueness and significance, even if every landscape felt tainted. I intend to return post-graduation, and use my degree and skillset to help lessen the industrial impact and reverse the effects it has created. I’m sure if China was as green and clean as Idaho, I would have never wanted to leave. It is up to my generation to decide whether that clean future can be possible, and I plan to always be at the forefront of the movement.

## SME INDUSTRY TOURS

### Zakaria Alghamdi

A dozen international and domestic students have begun the process of becoming a Society of Manufacturing Engineers student organization. This professional association helps students learn about emerging manufacturing technologies and network with manufacturing experts in the Northwest. It strengthens relationships between the U of I ME program and industry partners around modern design and manufacturing education. This past summer, U of I SME members visited Extreme Industrial Coatings in Spokane, Wash., where students witnessed first-hand different types of coating deposition.

In June, the group toured Ground Force Worldwide in Post Falls, Idaho, and learned how this company assembles large-scale mine support equipment. The company offers a diverse product line for surface and underground mining and has trucks working in over 60 countries worldwide. The third trip was to the annual SME BBQ event held by the senior section in Spokane.







Phoenix Duncan on the snowmobile "Spectre," just before winning the acceleration event.

## CLEAN SNOWMOBILE TEAM BRINGS MOST POWERFUL ENGINE TO COMPETITION

Ian Sullivan

In early March, the University of Idaho Clean Snowmobile Team, comprised of freshmen up to senior-level students, made the nearly 1,700-mile drive to Houghton, Michigan. This was the 15th time the team had made this trip since the Society of Automotive Engineers' Clean Snowmobile Challenge (CSC) moved from Jackson Hole, Wyoming, to the Keweenaw Research Center at Michigan Technological University in 2003. The team has been competing in the challenge since 2001.

Every year, team members put in countless hours working in the machine shop, Small Engines Research Facility and computer labs to make a competitive snowmobile that is clean, quiet and fuel-efficient, but still fun to ride. This year was no different. The rules required that we retire "Voodoo," a 2013 Ski-Doo MXZ with an 800cc E-TEC engine, so we took the opportunity to update to a 2017 model with the next generation 850cc engine. Since we had four years of experience with the old chassis and eight years with the old engine, a lot of learning had to go into making the new snowmobile ready to compete.

Unfortunately, the in-lab emissions event continued to haunt us. This year, we didn't pass the strict requirements due to an issue in our fuel system and took seventh place overall, but there were still many highlights.



The UICSC team (from left to right): Jared Kellerer, Alex Kiss, Jason Maas, Colin Parke, Cade Smith, Zach Lipple, Tyler Rieken, Patrick Paulus, Brian Gift, Phoenix Duncan, Levi Vogel, Ian Sullivan

The team managed to bring the most powerful snowmobile at the competition while still achieving third in the fuel economy event. The team scored highest out of all the teams with our technical design paper and presentation, and won awards for best handling, best acceleration, and best value, as well as one for our controls. It was also exciting to network with professionals and students from other schools and see the new developments that they brought to the competition. Most importantly though, judges continued to be impressed by the caliber of students, and, dare I say, engineers, that represented U of I.

Now that the team has returned, we're looking ahead to next year. We'll continue to develop the ME 201/401 class that we use to teach engineering and technical skills while passing down knowledge from older members to underclassmen. Many members have already begun work on new projects to address areas that cost us points during the competition and continue to drive innovation within the power-sports industry. The team is looking forward to seeing our

followers and sponsors at snowmobile shows and other events throughout the northwest and is excited to see what our competitors bring to the 2019 Clean Snowmobile Challenge to be held March 4-9.

# AWARDS AND SCHOLARSHIPS

Congratulations to all of the award winners. Find detailed profiles on each of the winners at [uidaho.edu/engr/events/college-awards](http://uidaho.edu/engr/events/college-awards).

## OUTSTANDING SENIOR AWARDS



### **Brandon Hilliard**

I was born and raised in Boise, Idaho, working on cars and excelling in school. Ever since I can remember, I've always been interested in mechanical things – how parts worked together, what went in to a part design and why certain materials were used in specific applications. I spent a lot of my childhood days watching my father work on his own cars in our garage. While doing so, my interest for mechanical things grew.

Once I got to high school, I enrolled in automotive technology training for my sophomore, junior and senior years. After graduating high school, I decided that I wanted to design and create the parts I had been working on for those three years. At the time, my sister was enrolled at the University of Idaho, and I had heard great things about the College of Engineering. I chose to enroll in the mechanical engineering program in the fall of 2014. Ever since then, the Mechanical Engineering Department has been very welcoming and helped me excel throughout my college career, from creative and in-depth coursework to endless opportunities for involvement. As I progressed through the mechanical engineering program, I became much more interested in fluid mechanics, while still learning about the many design aspects of mechanical engineering. Once I graduate, I will be returning to the University of Idaho to pursue a Master of Science in Mechanical Engineering with Dr. Ralph Budwig, with an emphasis in fluid dynamics.



### **Kierra Ryan**

I was raised in Clarkston, Wash.. Throughout school, I gained a love for math and science that lead me to engineering when I came to college. Growing up, I always wanted to know how things worked, and I would take them apart to figure it out. I chose to go in to mechanical engineering because I enjoy the hands-on aspect.

I chose the University of Idaho

not only for its well-known engineering program, but also because I was excited to be a part of the honors program, and I loved the small classes offered within my major. I love this area and all of the nature that is incredible close by. I appreciate how close everything is in Moscow and enjoy walking almost everywhere.

I have enjoyed the opportunity to work on many projects as well as intern at Schweitzer Engineering Laboratories throughout my time in college. I believe the mechanical engineering department does a fantastic job. They have managed to find a large group of staff and faculty members that genuinely care about their students. I would like to thank my family, friends and the university faculty that have supported me throughout my college journey. I will be graduating this spring with a bachelor's in mechanical engineering, and I am excited to be taking a position with NAVSEA after graduation.



### **Nick Shaber**

Born and raised in the Inland Northwest, I've always had a passion for the outdoors. From an early age, I worked in the shop with my dad. I've enjoyed delving into projects and solving challenging problems. Throughout my college career, the most valuable skill for me has been the ability to solve problems and the desire to do my absolute best in everything I do.

I decided early on in my college career to focus on academics rather than splitting my focus between athletics and academics. As a result, I became an active member of the Engineering Scholars program, participating in many undergraduate projects. I have had the opportunity to learn to work with a team, especially in an interdisciplinary fashion. Through all the projects and classes I have taken, I feel I have developed a large variety of skills with much hands-on experience. I hope to continue to develop my skills as an engineer as I work to complete my Masters of Science in Mechanical Engineering through this next year, and I look forward to learning more as I move into industry next year.



## OUTSTANDING MASTER'S STUDENT AWARD



### *Coleton Bailey*

I was born in Michigan, but I was raised in Hailey, Idaho. With the outdoors in our backyard, my brother and I spent plenty of time riding bikes, skateboards and motorcycles. Our natural curiosity meant that we had put a wrench on all three at one time or another. As we got older, I started spending more time in my stepfather's body shop, working on cars and engines alike. These experiences and understanding of mechanical systems sparked my interest in studying mechanical engineering.

As I moved through the program at the University of Idaho, I felt like I had found my calling. The math, problem-solving, and challenge of the field are all things I enjoy. When I graduated with my undergraduate degree, I didn't feel like my time at the University of Idaho was complete. There was so much more that I wanted to learn from the people here, so I stayed for my masters. Now that I am finishing my second degree, I am confident in my ability and skills, but also have an appreciation for everything that I still must learn. I will always value my time at the University of Idaho, and will always be a proud vandal.



## OUTSTANDING DOCTORAL STUDENT AWARD

### *Damon Woods*

Growing up in Boise, Damon has long-cultivated a passion for the natural beauty of Idaho's landscapes. The trout streams of the Rockies guided him to Montana State University in Bozeman.

After trying out a few majors, involvement in the MSU chapter of Engineers Without Borders opened his eyes to the practical ways engineering could improve people's lives. This led him to a Bachelor of Science in Mechanical Engineering with minors in aerospace and English literature. Damon came back to Boise to pursue a mater's

at Boise State University, where he studied wind and hydrokinetic turbines, culminating in a six month internship at Alstom Power in Switzerland.

Returning home, he started his Ph.D at the University of Idaho and began work as a research assistant in the U of I Integrated Design Lab (IDL). The IDL facilitates collaboration between engineers and architects to promote efficient and healthy buildings. The work is at the intersection of his passions of environmental and fiscal sustainability. After graduation, Damon plans to continue at the Integrated Design Lab, where he researches technologies that benefit both building owners and occupants. None of this would be possible without the tremendous support of family, friends and the faculty at U of I.

## FRANK WESELY CHILD IV MEMORIAL SCHOLARSHIPS

### *Jake Elliott*

At a young age, my interest in the fire service was sparked when I got to watch firefighters put out a small building burning near my childhood home. I was in awe of all of the interesting tools and machines they used to quickly put out the small blaze. I had always thought that they just used hoses with water, but as I watched them use saws, fans and thermal imaging cameras, I realized that the job is more complex than I had imagined.

Since then, I have become very passionate about fire and emergency medical services. Today, I am fortunate to work at the Moscow Volunteer Fire Department. Through my experiences, I am constantly in awe of the many incredible technologies integrated in the tools and machines that firefighters utilize.

There have recently been impressive modifications and improvements to the tools of the trade and,

as a future engineer, I hope to one day use my education to help further advance the level of safety of firefighters utilizing these tools and the communities they serve. It is my goal to work for a company that designs and improves devices such as the self-contained breathing apparatus, vehicle extraction tools like the Jaws of Life, thermal imaging or possibly emergency medical equipment. These are used on emergency scenes every day around the world. Improving the efficiency and effectiveness of these tools could help save lives and help make an inherently dangerous job safer.





### **Beau Nuxoll**

I'm a 34 year old non-traditional student who returned to school after working over ten years as a certified automotive technician. I have lost several friends to cancer and know many technicians who have had job-related health issues from the physically demanding work and chemicals exposure. After my wife, Alicia Nuxoll, and I had children I decided to return to school to study engineering, hoping to improve the longevity of not only my career, but others' as well. Ultimately, I would like to create new designs or modify existing designs to improve conditions for the end user. I love learning and I'm having a great time at the University of Idaho!

Our four year old twin girls, Adalyn and Brielle, turned four years old in October. Commuting from Clarkston, WA is the quietest and most restful two hours of my day!

## **ME ADVISORY BOARD SCHOLARSHIPS**

***Congratulations to the 2018 ME Advisory Board Scholarship recipients. Richard Baptista, Jared Kellerer, An Le, and Ian Sullivan were each awarded \$500. A special thank you to Assistant Professor, Michael Maughan for facilitating the application process.***



An Le



Jared Kellerer



Ian Sullivan



Richard Baptista



# INFRASTRUCTURE IMPROVEMENTS

## ADVANCING WEARABLE ROBOTICS THROUGH 3D PRINTING

*Assistant Professor and IREK12 Scholar Joel Perry plans to use new printer to advance state of wearable exoskeletons*

In the fall of 2017, Mechanical Engineering Assistant Professor Joel Perry was named an IREK12 scholar. The IREK12 program, funded by the National Institute of Health, provides career development opportunities for promising researchers focused on interdisciplinary rehabilitation engineering topics. The award includes discretionary funds that can be used to support the scholar's research activities. Dr. Perry used a portion of these funds to purchase a MarkTwo composite 3D printer from Markforged, Inc. The MarkTwo has the unique capability of embedding strands of continuous fiber between layers of plastic. The embedded fiber provides structural reinforcement to the parts and can be modified through software to customize part properties. Continuous fiber options include fiber glass, Kevlar and carbon fiber. Embedding carbon-fiber printed-parts can achieve strengths and rigidities that rival tempered aluminum such as 6061-T6. The print bed accommodates build volumes of up

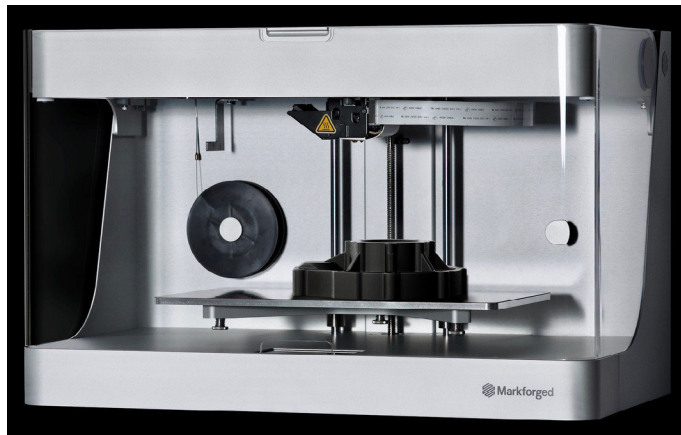


Image courtesy of [markforged.com/mark-two](http://markforged.com/mark-two)

to 320mm x 132mm x 154mm, with a vertical layer resolution of 100 microns.

Dr. Perry's team plans to utilize the new printer's capabilities to advance the state of wearable exoskeletons for individuals with mobility deficits in the arms and hands. Wearable exoskeletons have the potential to provide mobility assistance for a large population of individuals with neurological impairment. One of the main challenges in developing such technology is manufacturing custom shapes that have desirable properties of weight, strength and rigidity. The use of widely available 3D printing with plastics made from PLA or ABS provide easy access to customizable form factors, but with strengths and rigidities that limit their applicability in the field of upper-limb wearable robotics, particularly for the shoulder. The ability of the MarkTwo to reinforce structural components with continuous fiber offers exciting opportunities to advance wearable robotics as well as a wide array of other research fields where minimizing weight and

maximizing stiffness are crucial. The printer will be housed in the Rehab Robotics Lab in the Integrated Research and Innovation Center (IRIC).

## NEW UNIVERSAL TESTING FRAME FILLS INFRASTRUCTURE GAP

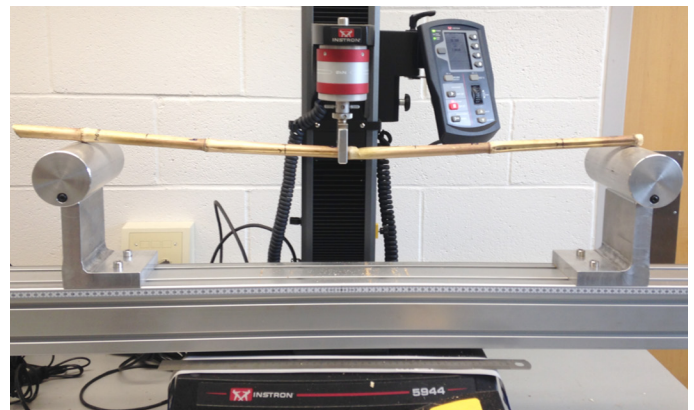
*Mini-Instron Universal Testing System allows for applying precise loads and displacements to fragile materials*

*Daniel Robertson*

Several members of the engineering faculty were recently awarded a grant to acquire a new Universal Testing Frame. Since the test frame's installation in summer 2018, student researchers have used the machine to characterize the material response of everything from pig lungs and corn stalks to high-performance, carbon-reinforced 3D prints.

The new machine is specifically designed to apply very precise loads and displacements to delicate or fragile materials and fills an important infrastructure gap at the university. Other test frames found on campus are all large-force, dual-column machines (20-100 kN) and are not optimally equipped to test small or delicate materials. The new machine is a single-column 2 kN test frame with accompanying workflow software.

The new machine has enabled our faculty to pursue new research directions and secure external funding. In particular, Dr. Daniel Robertson has used the machine to acquire a Seed Grant from the University of Idaho and a \$6 million award from the National Science Foundation that will provide funding for several ME graduate students.



Mini-Instron Universal Testing System

# FACULTY AND STAFF NEWS

## MOSCOW ME DEPARTMENT WELCOMES VIBHAV DURGESH



My name is Dr. Vibhav Durgesh. I hold a bachelor's degree in mechanical engineering from the Indian Institute of Technology (IIT) Kharagpur, and Master of Engineering and Ph.D. in Mechanical Engineering from the University of Wyoming. After completing my doctoral research at the University of Wyoming, I worked as a researcher at the Michigan State University and the Pacific Northwest National Laboratory in Richland, Wash.

My research interests include both fundamental and applied topics in the field of fluids/aerodynamics. Some of my past research projects include studying flow in an aneurysm,

developing optical diagnostic techniques for aerodynamics measurements, designing field measurements for marine renewable energy research, wind tunnel investigations on drag reduction, low-Reynolds number aerodynamics studies with UAV applications, and application of advanced data analysis techniques for large experimental data sets. I was been awarded the Future Technology Leader award in 2016 by the San Fernando Valley Engineers' Councils for my effort in the field of experimental fluids/aerodynamics research.

Prior to joining the University of Idaho, I was an Assistant Professor at California State University, Northridge in Los Angeles. During my time living in Los Angeles, I enjoyed exploring hiking trails in the San Bernadino Mountains, the Big Sur region, and along the SoCal coast, as a respite from the bustle of the city. In Moscow, I plan to explore various hiking and biking trails in the region. I spend my free time playing with my one year old daughter, learning photography and sketching, building electronic gadgets, and cooking.



## OUTSTANDING FACULTY AWARD

### RICHARD CHRISTENSEN, IDAHO FALLS

Richard Christensen joined the University of Idaho faculty as the Nuclear Engineering director in 2015. He is currently also serving as the U of I associate director the Center for Advanced Energy Studies (CAES). He is a professor emeritus of nuclear engineering in the Department of Mechanical Engineering at Ohio State University Columbus, Ohio, where he served on the faculty since 1978. Christensen is an internationally recognized scholar and leader in a wide range of nuclear and thermal sciences research areas. His research spans diverse areas such as nuclear thermal-hydraulics, nuclear waste isolation, advanced reactor concepts with a focus on inherently safe nuclear reactors, thermally activated heat pumps, waste heat recovery and a variety of fundamental convective and radiative heat transfer investigations. The unique aspect of his research is that it has invariably resulted not only in contributions to the archival literature but has also always resulted in practical implementations and commercialization of energy efficient and safer technologies. He has pioneered the establishment of multi-disciplinary teams for large externally funded research programs with participants and support from universities and their consortia, large corporations such a nuclear vendors, utility companies, small businesses, regulatory agencies and state and federal agencies. He received his doctorate in nuclear engineering from Stanford University in 1974.

## TAO XING APPOINTED ASSOCIATE EDITOR OF ASME JOURNAL



Associate Professor of Mechanical Engineering Dr. Tao Xing has been appointed an Associate Editor of the ASME Journal of Verification, Validation and Uncertainty Quantification (JVUQ). The JVUQ is a peer-reviewed academic journal that disseminates original and applied research,

illustrative examples and high-quality validation experimental data applied to: design of experiments; computational models; and analysis of experimental results. The JVUQ is cross-cutting and serves an audience of engineers and scientists. It provides special issues featuring challenge problems and discipline-specific applications. Dr. Xing's role is to identify reviewers and get the review process completed in a timely fashion, send recommendations to the editor, and represent the journal by meeting with conference and session chairs to solicit quality papers for the Journal.



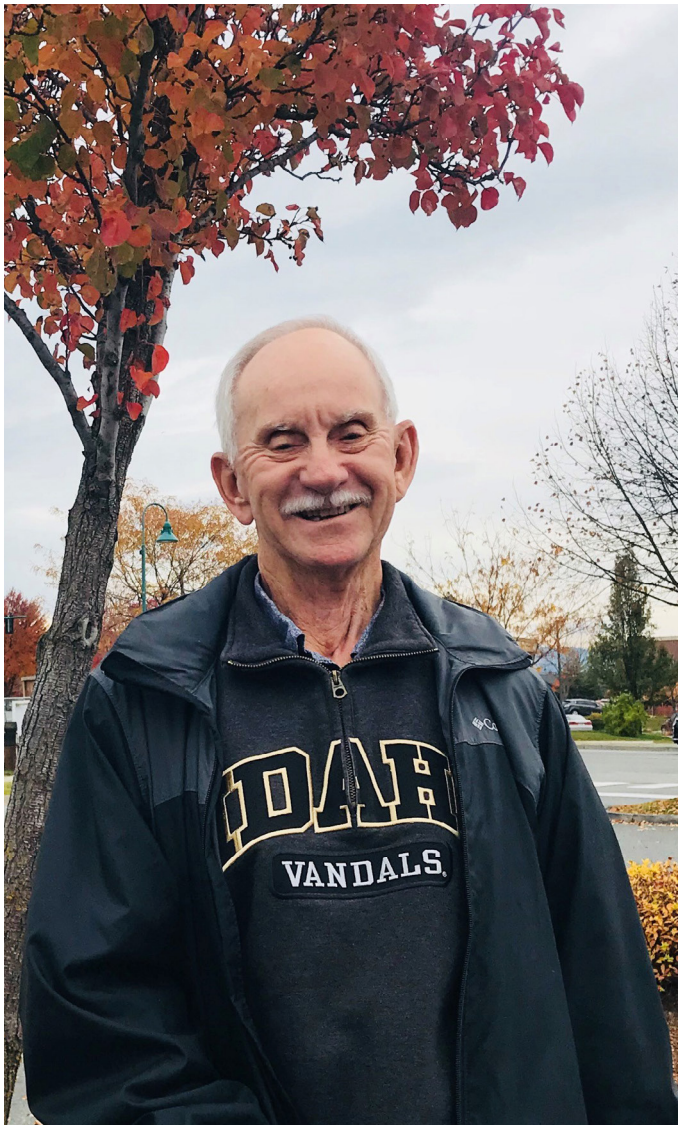
## DONATION FROM ALUMNI BILL MCDUGALL

William (Bill) McDougall, B.S. Mechanical Engineering, 1969, has included the Mechanical Engineering Department and the College of Engineering Dean's Excellence Fund in his estate plan. His generous and sizeable gift will help many of our students.

Bill's professional career was mainly spent working in Boeing's Military Group, specifically working on F-22 Raptors. During a recent visit to campus, Bill met with Chloe Rambo, College of Engineering Associate Director of Development, and Steve Beyerlein, Mechanical Engineering Department Chair, to discuss his time as a Vandal.

### *Why did you choose the University of Idaho for your college education?*

Bill said that he wasn't sure he really had a choice, as his parents attended the U of I. His mother grew up on a farm in Juliaetta, Idaho, and his father in Kellogg, Idaho, so U of I was a natural choice.



### *Why did you choose Mechanical Engineering as your major?*

A love of all things mechanical inspired Bill to pursue Mechanical Engineering as his college major. He was an avid snowmobiler, who often worked on his sleds. In addition, he was heavily involved in regional car racing, winning a championship in 1980.

### *Did you consider any other areas of study instead of Mechanical Engineering?*

Bill struggled with math during his freshman and sophomore years and considered changing his major to business. His professors and friends encouraged him to stick with it, since he had such a strong interest in mechanical things.

### *What were the hallmark features of your Vandal experience?*

U of I offered excellent learning opportunities, providing Bill with a fun and marketable background. He was able to develop strong friendships, especially with other ME students. Passing the first half of the FE exam and graduating were definitely highlights of his time at U of I. Bill passed the second half of the FE Exam in 1977.

### *What excites you about the current direction of the Mechanical Engineering Department?*

Bill was happy to see that the department is forging ahead to incorporate new technologies, such as computer controls, in the curriculum. He was also impressed with the department's 3D printing capabilities, having seen 3D printing during his professional tenure at Boeing. Bill also served as a judge for the Engineering Design EXPO and was very impressed with the projects presented.

### *What do you do for fun?*

Boating and golfing are two of Bill's current interests. He is a snowbird, spending winters in Palm Springs, California. Producing engineering sketches is a favorite pastime. He has taken up woodworking, building display cases for his 1/18th scale die-cast car collection.

### *What motivated you to give back to the College and the ME Department?*

Bill said he was fortunate that his parents were able to help him financially while he was in school, and he realizes that is not the case for all students. He was given so much and feels that he should help others in return.

### *What advice do you have for current students and alumni?*

"If you really have a desire to do this kind of work, stick with it and tough it out through the difficult times. It is well worth it!"

# ADVISORY BOARD REPORT — SPRING 2018

## KUDOS

- Caitlin Owsley was elected as the incoming chair for the ME Advisory Board. Her term as chair is a two-year commitment ending in spring of 2020 per the AB charter.

## RECRUITMENT AND ENROLLMENT

- ME recruits 120-130 new freshman and transfer students each year and graduates 80-85 students/year.
- Over the course of the last year, 78 prospective students visited with department faculty and participated in a facilities tour, 55 applied and were accepted to UI, and 25 were registered in classes.
- Our ratio of enrollment to admitted students is twice the U of I average, underscoring the value of getting students to campus for a department visit.
- Support for graduate students will improve dramatically in fall 2018. Some examples are: \$115,000 in TA stipends compared to \$65,000 previously and \$63,000 in tuition waivers compared to \$18,000 previously.

## DEVELOPMENT

- Stacy Rauch has accepted a new position with Gritman Medical Center.
- Chloe Rambo was introduced as her replacement as the go-to person in charge of ME development.
- Vandal Giving Day was a success. The ME AB Scholarship was noted within the COE advisory board meeting as a great example of giving.

## PRESENTATIONS

- Matt Swenson and Daniel Robertson each made presentations regarding their teaching philosophies and engineering activities.
- The Clean Snowmobile Team (Colin Parke, Jared Kellerer, and Ian Sullivan) presented the results from this year's competition.
- Emily Chambers and Nicholas Sentieri shared the ASME highlights from the year (most notably the Portland Alumni Social) and the fulfillment they have gotten by serving as COE Ambassadors.

## ACCREDITATION

- John Crepeau is making preparations for the 2019 ABET accreditation. The Advisory Board approved the rationale statements as written for our ABET program educational objectives (PEOs). Thank you to Jamie Slippy and Steve Beyerlein for writing the statements and to Jonathan Richards for his thoughtful review.



Caitlin Owsley '12, Janicki Industries, incoming ME Advisory Board Chair



Todd Swanstrom '85, Western Trailer Company, outgoing ME Advisory Board Chair



## ADVISORY BOARD MEMBER PROFILES



### *Sharon Eroschenko*

Sharon Eroschenko works for the U.S. Bureau of Reclamation's Pacific Northwest regional office in Boise, Idaho, as the Regional Technical Services Manager. In this position, she oversees many of the technical programs for the region. They include the Design Group, River Systems Restoration Group, Facility Operations and Maintenance Group, the Geology

Group and Drill Crew, Physical Security, and the Value Engineering Program. Prior to this position, she led the design group. When she first worked for the Bureau of Reclamation, she performed water rights, water quality and hydrology modeling for various studies and projects. She started her career at Metriguard in Pullman, Wash., designing destructive and non-destructive lumber testing equipment.

Sharon moved to Boise, Idaho, and performed mechanical design work for water and wastewater projects for Jacobs CH2M. While there, she did some design projects on the University of Idaho's Moscow campus steam and water distribution systems. Sharon worked for Idaho Power Company and became involved in the numerical modeling of dam operations and water quality for relicensing projects. She also worked for Tetra Tech prior to joining the Bureau of Reclamation.

Sharon earned her Bachelor of Science in Mechanical Engineering at the University of Idaho, an master's in biological and agricultural engineering, and a Ph.D in Civil Engineering in 2013. She was invited to join the Mechanical Engineering Advisory Board in the spring of 2018, just in time to judge the Engineering Design EXPO. She is excited to be a part of the board, to give back to the university and share the experiences she's had over her career. Her youngest daughter is currently attending graduate school at the University of Idaho, which makes mom very proud of her.



### *PJ Henscheid*

PJ Henscheid is the Manager of Mechanical and Civil Engineering for Avista Utilities in Spokane, Washington. PJ also serves as the utilities Chief Dam Safety Engineer. In his leadership roles, he oversees and aligns engineering expertise on a vast array of projects across Avista's generation fleet, with a primary focus on its hydro generation facilities. In his role as Chief Dam Safety

Engineer, PJ guides Avista's Dam Safety Team within to ensure public safety, dam safety and regulatory compliance.

PJ has worked in a variety of different fields since his graduation – from designing HVAC systems for schools and large commercial buildings and performing energy audits for same, to designing explosion proof surge suppression enclosures for the military and aerospace industry. The variety of experiences has afforded travel

to China, Japan and Europe and has provided the experience of working through the difficulties faced when working with international suppliers.

PJ earned his Bachelor of Science in Mechanical Engineering from the University of Idaho in 2004. He maintains close ties with the university through the Mechanical Engineering Department, as well as being an active alumni member of the Sigma Nu fraternity, including holding a chapter advisor role for seven years after graduation. PJ is excited for the opportunity to provide his industry knowledge and experience to the Mechanical Engineering Advisory Board. He looks forward to helping to guide the department and its focus to help its students prepare for what industry is looking for in new graduates.

## MECHANICAL ENGINEERING MATCHING CHALLENGE

### *Initiative to purchase new engine lathes for student use*

Hands-on design and manufacturing experience is a hallmark of the U of I Mechanical Engineering program. Help us leverage funds to buy two new engine lathes for student use in the machine shop.

The department's current lathes are 50+ years old, have worn chucks, significant backlash on all axes, headstock bearing play of .003", tail stock quill play of more than .01", and way wear of .003". New lathes will enhance student learning of machining operations, elevate the quality of prototypes fabricated in the machine shop, and increase opportunities for stakeholder engagement around mutually beneficial design projects.

### *Make a Gift*

To make a gift, visit [uidaho.edu/giving/make-a-gift](http://uidaho.edu/giving/make-a-gift) and select "Make a Gift Online." Select "ME Laboratory Equipment Acquisition Fund" as your designation on the form.

For every dollar we raise, we will unlock \$1 from the U of I Mechanical Engineering Equipment Fund, up to \$10,000. Our goal is to raise an additional \$20,000 by May 2019. Alumni who contribute \$200 or more and corporate partners who contribute \$1,000 or more will be recognized on a plaque that will be displayed next to the new shop equipment.

Gifts can also be mailed by check to University of Idaho College of Engineering, ATTN: Chloe Rambo, 875 Perimeter DR MS 1012, Moscow, ID 83844-1012. Please write "ME Laboratory Equipment Acquisition Fund" in the memo on the check.

Gift of stock, in-kind or other assets are also accepted.

Email Associate Director Of Development Chloe Rambo at [crambo@uidaho.edu](mailto:crambo@uidaho.edu).



## DEFINING ENGINEERING STUDENT SUCCESS

### *Risk Factors for Engineering Students*

FACTOR	DESCRIPTION
Struggles with Mathematics:	Has difficulty comprehending the physical implications and functional behaviors that mathematical relationships imply.
Trouble Reading Engineering	Needs to be taught how to read and understand technical written information to augment their learning efficiency in class.
Low Tolerance for Frustration/Anxiety	Unable to convert failure or negative feedback to learning; lets emotion interfere with accepting new challenges.
Minimal Problem-Solving Experience	Has limited exposure to multifaceted, multivariable, multistep engineering problem solving strategies.
Isolated Learning	Does not see added-value in working with others while learning.
Concrete Thinker	Misses important aspects of situations/ environments by focusing on specifics and details.
Confused about Engineering Discipline	Does not recognize educational and occupational differences between technicians and engineers.

A lively campus discussion has emerged in the wake of the U of I Student Success Conference last May, including a thoughtful inventory of strategies for supporting student success. Over the summer I've spent time reflecting on these strategies, questioning colleagues, and searching for underlying principles.

I've concluded student success begins with genuine belief in the learning potential of each student and is fully realized through a coordinated effort on the part of faculty/staff/student peers to foster a quality learning environment. It is a reciprocal relationship that is the responsibility of multiple parties.

In an engineering context, educational institutions need to help students overcome key risk factors. However, we need not become overly distracted by objectifying each risk factor and trying to separate these from our students.

A more efficient and enduring way to empower the collegiate learner is to focus on developing productive academic behaviors, learning strategies and social skills with a growth mindset. This applies both to general education as well as developing an engineering mindset, including the ability to visualize problems, think analytically, experiment and find solutions.

## CREATING QUALITY LEARNING ENVIRONMENTS

The way to recognize risk factors and embrace professional growth is to create a quality learning environment that both challenges and supports student development.

Some beliefs about student performance that are helpful in navigating this territory include:

- **Every Learner Can Learn Better** - Regardless of current level of achievement, one's potential is not limited by current ability. This applies to teachers as well as students.
- **Becoming a Lifelong Learner is Key** - Everyone requires help with learning at times, but the goal is to become a capable, self-sufficient and lifelong learner. Learning is both personal and social, and everyone needs to exercise ownership of their learning.



- **Successful Learners Generalize Knowledge** - To develop expertise in a discipline, a learner must develop a specific knowledge base in that field, but also acquire generic, lifelong learning skills that relate to all disciplines. Highly successful learners regularly generalize previous knowledge, use established learning processes and deploy self-assessment to improve future performance.

### Our Role as Educators

Equally important is an identity of educators as not only disciplinary experts, but also as facilitators of student success. Key roles of faculty/staff within a quality learning environment include:

- **Assessment Mindset**- Educators should assess student performance by measuring accomplishments, modeling learning processes, providing timely feedback and helping students improve their own reflection/self-assessment skills.
- **Continuous Improvement**- Learning facilitators model disciplinary content and efforts to improve specific lifelong skills through timely, appropriate and constructive interventions.
- **Mentorship** - Mentors help mentees formulate powerful life visions that provide a long-term direction for cognitive, social and affective development.

### Our Role as a University

Overall institutional effectiveness in fostering student success can be amplified in several reinforcing ways:

- Aligning institutional, course and program objectives.
- Investing in faculty development, curricular innovation and design of performance measures.
- Pursuing “built pedagogy” that authentically brings together teachers, learners and tools around ideas that matter.
- Embracing a mindset of continuous improvement.

As illustrated in previous newsletters, our department has been active in promoting a growth mindset within our students and ourselves, creating a quality learning environment that includes widespread mentoring as well as state-of-the-art design/manufacturing tools, and measuring and synergizing learning outcomes across our program.

We are humbly aware there is more that we can do and should do in each of these areas. We value stakeholder input and collaboration as we take next steps in educating the next generation of Vandal engineers. We invite you to share your stories and your secrets as to how you have achieved personal/professional success. If you are passing through Moscow, we would enjoy hosting you in a department tour and hearing your ideas/insights about engineering student success – in the past, in the present or in the future.

## SPECIAL THANK YOU TO OUR 2018-19 EXTERNAL CAPSTONE PROJECT SPONSORS

We appreciate generous contributions of time and financial resources by partners outside the College of Engineering in enriching our nationally acclaimed capstone design experience. Progress on these projects will be summarized along with those for the last 20 years at [mindworks.shoutwiki.com](http://mindworks.shoutwiki.com).

ATI Specialty Alloys and Components	Niobium Alloy Sampling Device
Avista Corporation and DryWired	NanoTint Window Insulation
Bastian Solutions	Robotic Tote Extractor
BiMBy	Delivery and Dispersion of Concentrated Sunlight
Boeing	Tube Insulation Installation
Hyster-Yale Material Handling	Lithium-Ion Battery: Heavy Duty Cooling Package
Idaho National Laboratory (INL)	Met Box Remote Visualization System
Inceptus, Inc.	Electric Airplane Tug
Itron	Smart City Water Sustainability
National Institute for Advanced Transportation Technology (NIATT)	Clean Snowmobile Challenge
Nightforce	Automated Thread Burnishing
Schweitzer Engineering Laboratories (SEL)	Circuit Board Cg Measurement System
Schweitzer Engineering Laboratories (SEL)	Circuit Board Tray Ejector Latch
UI Center for Excellence in Teaching and Learning (CETL)	Lightboard
UI Faculty	Catheter Redesign to Prevent In-situ Urinary Tract Infections
UI Facilities	Enthalpy Flow Measurement System for UI Wood Boiler
Vista Outdoors	Aerodynamic Jump And Bullet Stability

For more information about being a sponsor, view our capstone brochure at [http://www.webpages.uidaho.edu/mindworks/Capstone%20Design/capstone\\_sponsors.htm](http://www.webpages.uidaho.edu/mindworks/Capstone%20Design/capstone_sponsors.htm) or email Capstone Design Coordinator Matt Swenson at [swenson@uidaho.edu](mailto:swenson@uidaho.edu).

# SAVE THE DATE!

## 26TH Annual Engineering Design EXPO

April 26, 2019 | 8 a.m.-4 p.m. | Pitman Center

### ME Award Winners at the 2018 Engineering Design EXPO

ME Senior Design student John Gergen shows his team's elbow rehabilitation prototype to Dr. Perry at the 2018 Engineering Design EXPO.



AWARD	PROJECT	SPONSOR	ADVISOR
People's Choice & Booth	Wireless Forklift Height Encoder	Hyster-Yale Group	Matthew Swenson
Booth & Technical Presentation	Biochar Production System	IAC- U.S. Department of Energy	Dev Shrestha Steve Beyerlein
Booth & Technical Presentation	Project A.R.M.: Assistive Rehabilitation Monitor	UI College of Engineering	Bruce Bolden, Joel Perry
Booth	Team Crumbletech's Temperature Array	Forest Concepts	Dev Shrestha
Technical Presentation	An Aerodynamic Study Of Bulk Commodity Trailers	Western Trailers	Steve Beyerlein

## MECHANICAL ENGINEERING NEWS

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[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: Debbie Edwards*

## 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 email: [medept@uidaho.edu](mailto:medept@uidaho.edu)

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.

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Employer \_\_\_\_\_

Position \_\_\_\_\_

Comments \_\_\_\_\_

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