Summer 2020

University of Idaho
College of Engineering

MECHANICAL ENGINEERING NEWS

COVID-19 RESEARCH AND RESPONSE

Using Expertise to Fight Back

Department calls on 3D printing and design expertise to partner with medical staff on personal protective equipment and UVC sterilization systems

By Alexiss Turner

Medical staff on the Palouse and in the Lewiston-Clarkston Valley continue to work with the University of Idaho to fulfill demand for additional personal protective equipment (PPE), including respirator masks and equipment sterilization systems at area hospitals.

The coronavirus COVID-19 had nearly depleted supply of needed PPE nationwide earlier this spring.

"We're all stuck at home, and we want to fix this in any way we can," said U of I College of Engineering associate professor Gabriel Potirniche. "We can't have COVID-19 overwhelm our healthcare system. If we keep medical staff safe, this is less likely to propagate in our community. Everyone has a duty to put a stop to this virus. Everyone is involved."

The U of I engineering faculty finalized a design for a 3D-printed filtering facepiece respirator mask, known as the Vandal Mask.

Prototypes of the design were delivered to medical staff in the Lewiston and Clarkston areas for validation and feedback.

The Vandal Mask has a breathing area about eight times larger than that of other open-source designs.

The snap ring that holds the filtration material in place attaches from the front, allowing this piece to be easily removed while keeping contaminants on the outside of the mask.

Assistant professor Joel Perry (left) and graduate student Chris Bitikofer discuss adjustments to the face seal of the Vandal Mask.

Other designs out there that have this piece being removed from the inside of the mask, increasing risk of contamination. This mask can be used with many filtration materials as well as straps, including tourniquet material.

"Through this whole process, we're building people who are much

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Research support scientist Chad Dunkel (right) and graduate student Hari Challa examine UVC light intensity.

IN THIS EDITION

COVID-19 RESEARCH AND RESPONSE

more knowledgeable in the design requirements for different PPE," said Christopher Bitikofer, a mechanical engineering graduate student who was part of the initial engineering team. "Everybody that's getting involved ends up being a lot more aware of how these systems work."

Since March, the College of Engineering has delivered about 700 face shields and 100 masks, working closely with the Public Health Idaho North Central District to distribute these to areas with the greatest need.

"I'm really impressed by this team and how we all worked together," said Robin Spooner area director for Infinity Rehab, who coordinated the work with medical staff at Valley Medical in Lewiston. "It's so important to work with people that think differently, that's where innovation rises up, when you have different thinkers."

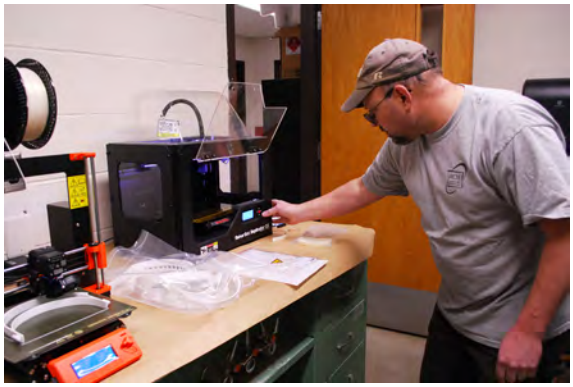
While boosting supply of reliable PPE, the College of Engineering is also working to ensure existing devices can be sanitized and reused.

Pre-built prototypes and kit materials for ultraviolet C (UVC) light systems have been delivered as far as New York.

Using the short-wavelength light, the system is capable of converting the coronavirus COVID-19 into harmless carbon compounds and water.

The box device plugs into a standard outlet and can disinfect about 15 masks at a time in just 17 minutes. And it uses only one-fourth of the power of a traditional microwave, keeping operation costs minimal.

"Our university is a place for incubating ideas and nurturing a safe, happy and healthy community," said research support scientist Chad Dunkel, who built the first prototypes. "We can do some pretty cool things, not just for Moscow communities, but beyond."



(Above) U of I scientific Instrument Maker Charles Cornwall prepares a 3D printer for face shield production. (Left) Darby Justis, a doctor at Valley Medical Center in Lewiston, Idaho, shows off an initial prototype of the Vandal Mask before updates were made to the breathing area.

TEACHING INNOVATIONS

15 Certified Solidworks Experts

Department adjusts coursework and provides exam vouchers to boost pass rates

By Dr. Edwin M. Odom, PhD, PE

This year we had fifteen students pass the elite Certified SolidWorks Expert (CSWE) certification exam. To get a sense of this achievement, consider the following. There are about 6 million users of SolidWorks in the world. There are about 3,200 individuals who have earned this achievement of which two-thirds work for Dassault systems. So, there are about 1,000 end users, such as industry CAD professionals and students like those at the University of Idaho who have this certification. To put it another way .02 percent of users in the world have this certification and 15 are at the University of Idaho.

To qualify to take the exam, students must have passed the three segments of the CSWP exam and four out of the five subject areas of the CSWPA exam. Finally, students have a Zoom meeting with their mentors, where they are assigned a component from SolidWorks model mania collection that must be completed in thirty minutes. This robust screening process is in place to ensure that students take the exam when they are truly ready.

Why do we focus efforts on SolidWorks certifications?

The Mechanical Engineering Department uses certification exam vouchers (part of our yearly SolidWorks license) for two purposes. First, from a student perspective, passing the SolidWorks certification exams provides a way to differentiate their resume from others. Second, from a program perspective, the topics of the exams provide a window on what the world of CAD users believe is important.

How did we achieve these results?

We began small, first focusing on the CSWA exam. Initially, we had about a 50 percent pass rate. We modified our course content in ME 301 and raised our pass rate to over 90 percent. The missing topic was design tables. We then focused on the three segments of the CSWP and the five topics of the CSWPA exams, again our initial pass rate was about 50 percent but with development of pedagogical content, our pass rate is over 90 percent. Our records indicate that our students have taken 837 certification exams over the last five years with an overall pass rate of 78 percent.

Congratulations, students!

Students achieving the CSWE are Sean Blatner, Christopher Bitikofer, Nick Brubaker, Royal Elder, Selso Gallegos, Ian Glasgow, Ryan Gonzalez, Meridian Haas, Zachary Laymon, Andrew Neel, Tyson Ostberg, Paul Reibe, Will Skidmore, Kaitlin Tabaracci, and Zhihui Wang.

Nanoindenter Expands Research Capabilities

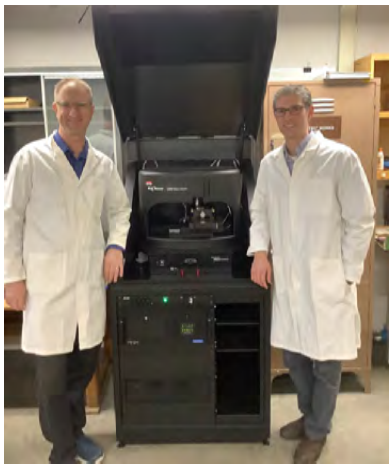
New equipment sees significant use by ME and other departments

Small-scale measurement of mechanical properties is increasing in importance in many fields of materials research and development. The ability to measure properties at a nanoscale enables unprecedented scientific discoveries in understanding the fundamental mechanisms of deformation and chemical behavior, while contributing to the development of advanced materials including microelectromechanical systems, biological coatings and radiation-resistant materials for advanced nuclear reactors.

Indentation hardness testing has been around since the early 1900s. The earliest and most commonly used approach is to simply press a hard steel sphere into the material to be tested with a specified force. Once the force and penetrator are removed, the size of the remaining impression is measured. Nanoindentation differs from other types of hardness testing by a) shrinking the process to penetration depths as small as single nanometers and b) enabling the position of the penetrator and the load to be known and controlled precisely at all times while it is being forced into the material.

The so-called nanoindentation technique enables researchers to gain insight into the basic mechanisms of deformation and allows testing of structures with extremely small dimensions such as scratch resistant coatings on eyeglasses or the cell walls of trees.

In early 2019, assistant professors, Michael Maughan and Matthew



Dr. Matthew Swenson (left) and Dr. Michael Maughan (right) with the new nanoindenter.

Swenson secured funding for and purchased a Nano Indenter G200 produced by KLA Inc, bringing the new capability our department. The $150,000+ G200 is a state-of-the-art indentation system that operates via electromagnetic actuation, allowing accurate force applications in micronewtons with nanometer displacement resolution. The G200 can be upgraded to perform high-temperature, cryogenic and dynamic nanoindentation experiments.

Since it was installed in April, the G200 has seen significant use. Dr. Swenson has students investigating the impact of simulated nuclear reactor damage on novel metals and Dr. Maughan's students are studying advanced additive manufacturing processes and exploring micromechanical behavior of metals. Other U of I researchers in materials science, and forest, rangeland and fire sciences also have plans to collaborate and use the new machine. Studies involving nanoindentation are now possible on campus.

Preparing for Engineering Practice

Finite element method assignment added to Intermediate Mechanics of Materials ME 341

By Dr. Gabriel Potirniche

We are continuously improving sections of our undergraduate and graduate curricula to provide our students with an academic preparation in line with the latest trends in mechanical engineering practice. Currently, the use of computational methods for engineering design and analysis pervades almost every industry. An example of such a computational tool is the finite element method, which is one of the most versatile procedures for solving problems from a wide range of fields.

Every physical process is usually modeled using a set of partial differential equations. The finite element method uses a special recipe to solve such equations and produces results of interest to an engineer.

The finite element method has a long history of development in both areas of mathematics and engineering, starting in the early 1900s. Today, research and design groups around the world use powerful computers to solve engineering problems of increasing complexity. In our department, graduate students in advanced finite element courses such as Finite Element Analysis (CE546/ME549) develop their own codes using programming languages like Matlab, Mathcad, Python, C++ or Fortran.

A finite element method assignment was recently added to the ME 341 course content. First-semester junior students in mechanical engineering learn how to use the commercial finite element software ABAQUS to solve mechanics of materials problems. These problems involve the computation of stresses and strains, plotting deformed shapes and computing stress concentration factors in mechanical components. Students have access to a free download of ABAQUS Student Edition (Dassault Systems Co.) and learn the software by solving the case of a rectangular plate with a central hole loaded in uniaxial tension. Then, they compare the results from the finite element method with those from analytical methods learned in Mechanics of Materials (ENGR 350), a course taught at the sophomore level.

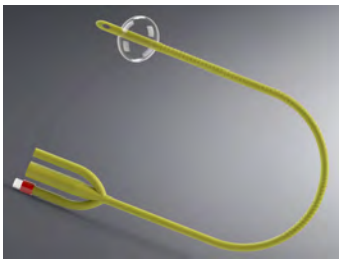
Through the experience, our students learn how to define material constants, setting proper boundary conditions, meshing a physical model and using specialized finite elements for each type of problem.

Saving Lives Through Sound Engineering and a Smart Business Plan

CatheterX team wins $16,000 total for prototype and business plan

By Alexiss Turner

Each year, more than 5 million patients in the United States require a urinary catheter during hospital stays. Eighty percent of long-term patients will develop a catheter-associated urinary tract infection (CAUTI). These infections are responsible for about 13,000 deaths in the U.S. each year and a $400 million increase in costs to hospitals.



(Top) The original senior design team includes (left to right) Elena Tipton '19, Amy Macias '19 and Ed Hall. (Left) CatheterX features an embedded spiral design that allows solution or antibiotics to be easily pumped through the catheter and released from the urethra.

"Nobody really knows about the dangers of CAUTI," said mechanical engineering senior Ed Hall, from Eagle River, Alaska. "That's why this problem has gone unsolved. The catheter designs haven't changed for so many years, and the problem has been around the entire time."

Hall is part of an interdisciplinary entrepreneurial team, including College of Business students, working to patent and finalize a business plan for CatheterX, an innovative urinary catheter designed to prevent infections, save lives and reduce hospital costs. The CatheterX team has won a total of $16,000 for their business plan through competitions like the 2020 Northwest Entrepreneur Competition and Idaho Entrepreneur Challenge, hosted by Boise State University.

The device features an embedded spiral design that, using a syringe, allows solution or antibiotics to be easily pumped through the catheter and released from the urethra. The design was created in 2019 by a team of engineering seniors, including Hall, Amy Macias '19 and Elena Tipton '19, for U of I's nationally recognized Senior Design Capstone Program.

A preliminary patent for CatheterX was submitted in early March, and Hall said competition earnings will go toward intensive testing of the device over the next year.

ASME Organizes Industry Visits to Four Locations

By Nick Brubaker, Jared Gray and Rachel Stanley

This spring, the ASME student organization visited four industry locations: Exotic Metals Forming, Janicki Industries, Sedron Technologies, and the Pacific Car and Foundry Company (PACAAR).

Exotic Metals Forming specialize in exotic metals for aerospace applications that have high tolerances and need to be quickly repeatable. Students were able to view the manufacturing of auxiliary muffler units for jet turbine engines.

Janicki Industries was founded in 1993 and is a manufacturing company that makes tooling for a wide variety of products such as Navy ships, windmills and aerospace parts. During the tour of the manufacturing floor, students saw the mills in action and learned about the concept of tooling. Students appreciated the opportunity to see a large-scale operation.

Students toured Paccar's state-of-the-art validation facility.

Sedron Technologies branched from Janicki Industries as Janicki Bioengineering in 2011 when the Bill & Melinda Gates Foundation approached the company with the challenge to address the universal problem of waste. Janicki Bioengineering separated and became Sedron Technologies in 2019 due its success. Students viewed the machine that was designed to turn waste into water, fertilizer and electric power.

The tour of **PACAAR** introduced students to the wide range of automotive applications available to an engineer. The Seattle facility is home to the renowned test track that enables PACAAR to run the vehicles through every conceivable stress that would be present on the road simultaneously in real-world settings.

Idaho Clean Snowmobile Team Places Fourth Overall

Third-quietest gasoline snowmobile in competition

By Alex Kiss, Team Co-Captain

The University of Idaho College of Engineering's Idaho Clean Snowmobile Team earned fourth place overall in the gasoline spark-ignited class at the 2020 Society of Automotive Engineers (SAE) Clean Snowmobile Challenge held March 9-14. The U of I team competed against 23 teams across the U.S. and Canada in a weeklong challenge to produce innovative solutions to make cleaner, quieter and more efficient snowmobiles that are practical for manufacturers and enthusiasts alike.

Among the projects developed was a custom rear-exiting silencer installed after the muffler to keep noise on the trail during sound testing.

Teams compete against 23 teams across the U.S. and Canada in a weeklong challenge.

Additionally, the team replaced the final drive chain and gear system with a toothed rubber belt and tensioner package to reduce contact noise, protected by an aluminum belt guard machined by students. These improvements made Idaho the third-quietest gasoline snowmobile (out of fourteen) at competition.

Other accomplishments include best endurance run fuel economy, best in-service emissions, best subjective handling, highest horsepower, second best technical presentation, third best design paper and the Best Value award, which considers the cost effectiveness of each engineering solution.

VISIT THE TEAM WEBSITE

idahocsc.wixsite.com/uicsc

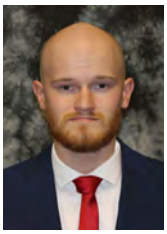
Outstanding COE Undergraduate Student Awards

Ian Glasgow and Kate Seegmiller received the 2020 Outstanding Senior award from College of Engineering.

READ MORE ABOUT OUR COLLEGE AWARDEES

uidaho.edu/engr-awards

Ian Glasgow



Ian Glasgow was born and raised in Anchorage, Alaska. In high school, Ian excelled in his classes, enjoying physics, chemistry, and calculus.

During his years at the University of Idaho, he worked as a peer mentor, joined the honors program, and became the events coordinator for ASME. In his junior year, he performed research for Dr. Daniel Robertson on the relationship between turgor pressure and mechanical strength. Later that year, he acquired a job at the Industrial Assessment Center (IAC), performing cost-benefit analysis on implementing mechanical engineering solutions to reduce energy consumption and save money.

The main focus of Ian's college career was computer-aided mechanical design. He became a Certified SolidWorks Expert (CSWE) in July 2019 and is now teaching the advanced SolidWorks class at U of I.

For his capstone project, Ian was assigned to the Insulation Station capstone team, using his CAD skills to design an insulation cutting and measuring module for Boeing.

Ian plans to acquire a Master of Science in Mechanical Engineering at the University of Idaho under Dr. Edwin Odom, and then pursue work in the aerospace industry.

Kate Seegmiller

Kate Seegmiller was raised in Emmett, Idaho. During her senior year in high school, she took an introductory engineering class, which sparked her interest in design. Later, she won the National Merit Scholarship and decided to attend the U of I, where both of her parents had attended and where her grandfather had taught engineering courses for many years.

Kate began doing undergraduate research under Dr. Robertson during her junior year. Within her research, she studied the structural biomechanics of maize and co-authored several papers.

She joined the Grand Challenge Scholars Program in her junior year and became an engineering ambassador in her senior year.

During her senior year, she was involved in a capstone project with ATI, where she helped to design a new packaging system for volatile metal powders.

After graduating, Kate plans on moving to Washington with her husband.

Taking the Path Not Prescribed

Camille Eddy '20 finds expertise and academic support needed to reach career goals through non-traditional path to U of I

By Alexiss Turner

For Camille Eddy, success isn't about doing things the same way as everyone else.

The University of Idaho Department of Mechanical Engineering class of 2020 graduate is a product engineer for New York talent-matching startup Bloc and works part-time as a career coach for aspiring engineers. She has been recognized by former President Obama as proof why more women and underrepresented groups should take on STEM, and one of her first mentors was former NASA astronaut Barbara Morgan.

"Everybody has a valid path, but that path is not always prescribed to them," she said. "I have learned that my path is not going to look like everyone else's, and I shouldn't expect it to."

Homeschooled by her mother for 12 years, Eddy said her mother would regularly take her and her younger sister to visit professionals in STEM occupations, like the railway engineer in her hometown depot, just to gain experience asking questions and talking to new people.

"We had to learn how to communicate with professionals at an early age, and we learned it wasn't scary or hard to ask questions and learn," she said. "By the time I was in high school, I was really good at doing this on my own."

(Top) Camille Eddy poses for a photo with her mentor of six years former NASA astronaut Barbara Morgan. (Bottom) Eddy interned for HP, Google and NVIDIA, never having submitted an application.

Relationships she had built in high school led her to Boise State University (BSU). While there, she worked while attending classes, interning with Hewlett-Packard, Google and graphic processing unit tech company NVIDIA.

"I never applied to any of those internships, they came to me," she said. "The key to interviews is showing your thought process, not just getting right answers. When I go into interviews, I think about how I'm going to answer questions I don't have the answer for."

Eddy spent four years at BSU before coming to U of I.

"I got here, and I was like, 'Wow, this is the university experience I've been missing out on," she said.

During her internships, Eddy said she often struggled to "fill in the gaps" missing in her previous education.

"I sat down for my very first class and read the syllabus," she said. "Having already taken a version of all these classes, this was the deeper knowledge I was expecting to have."

U of I also offered the support system she needed.

"I understood what it meant to have a stakeholder in my education," she said. "Someone who made me feel like if I didn't succeed, it's not just my fault. It's also on the department to ensure I succeed, in actions and not just sentiment. I had never felt that."

WOMEN IN ENGINEERING EXPLORE 2020

Sixty high school students from across Idaho and Washington attended the 2020 Women in Engineering Explore in March.

LEARN MORE
uidaho.edu/wie-explore

GRADUATE STUDENTS

Graduate Student Highlight

Bishal Bhattarai, M.S., Mechanical Engineering

I came from a small developing country, Nepal, where I had been learning science and technology with very limited resources. My undergraduate study in mechanical engineering gave me theoretical exposure to interesting subjects like fluid mechanics, systems and design, thermodynamics and energy, and I developed great interest in fluid systems. My master's education at Wright State University in Dayton, Ohio, became an important part of gaining insights into research in fluid dynamics, where I worked on projects related to numerical modeling of wetting properties and re-entrant geometry of nanotextured interfaces and microfiltration of oil-in-water emulsions.

Since Summer 2019, I have been working on a project, "Biophysical Ecology of salmon redds", using Computational Fluid Dynamics (CFD) under the supervision of Dr. Tao Xing, Dr. Daniele Tonina from the Department of Civil and Environmental Engineering, and Dr. Ralph Budwig. Additionally, my research work is under critical assessment by Dr. William Reeder, who will be supervising the physical experiments that will be essential to validate my CFD models.

Bishal Bhattarai works at his computer. Bhattarai has been working on the biophysical ecology of salmon redds.

In my current project, I am working to solve a real-world problem of salmon egg survival. I utilize CFD to study the pressure exerted by river water flowing over salmon redds that gives rise to hyporheic exchange, oxygen transport and temperature that has a huge impact on the embryos inside redds. These conditions are typical for the embryo's survival, and we can predict these parameters with the aid of CFD. I have validated the CFD model using the experimental study on dune shaped waterbeds that was performed by another study. We are now extending our research to use CFD for salmon redds for various water depths, water velocities, surface roughness and slopes. This parametric study will improve our understanding of the flow physics for salmon redds and help design the experimental study in the Flume on the Boise campus.

Outstanding Master's Student: Selso Gallegos

Selso Gallegos

Selso Gallegos was born and raised in the small town of Parma, Idaho. He and his eight siblings are first-generation college students. From a young age, he was determined to further his education and become an engineer. In 2017, he obtained his undergraduate degree in mechanical engineering from the University of Idaho. After graduating, he started his career at Intel Corporation as a supply chain engineer, where he worked until he returned to the University of Idaho in 2019 to obtain a Master of Science in Mechanical Engineering. As a graduate student, he collaborated with Dr. Edwin Odom and Western Trailers to develop and implement a structural design tool.

During graduate school, he also served as a mentor for various engineering capstone projects and helped teach students about manufacturing using the department Machine Shop. Selso is extremely motivated to continuously learn and develop himself as a professional. He is passionate about giving back to his community by sharing his success and knowledge throughout his educational and professional journeys.

After obtaining his master's degree, Selso is moving to Boise and plans to pursue a career in engineering research and design.

FACULTY & STAFF

Professor Ralph Budwig Receives Two Awards

Ralph Budwig, Director of the Center for Ecohydraulics Research, received the 2019-2020 Donald Crawford Graduate Faculty Mentoring Award. This award was established in 2006 to honor the efforts of graduate faculty who excel as mentors of graduate students and was named for its first recipient, Donald L. Crawford.

Ralph Budwig

Budwig started working for University of Idaho as an assistant professor in 1985 and worked at the main campus in Moscow for more than 20 years, including six years as chair of the Department of Mechanical Engineering. Since 2007, Budwig has been at the University of Idaho Boise Center. He is the director of the Center for Ecohydraulics Stream Laboratory, a $2 million facility with multi-university, agency and company participation.

Budwig enjoys doing project work with graduate students and has been a major professor for more than 40 graduate students.

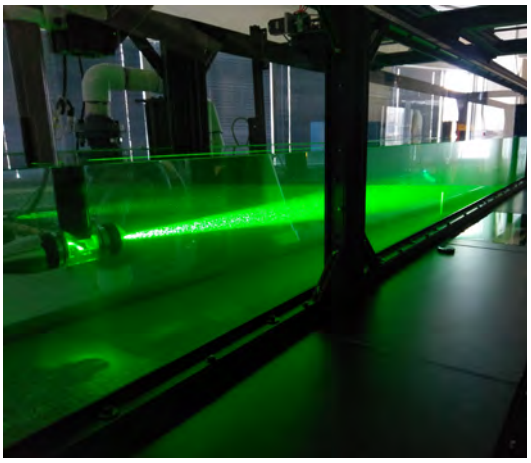
Budwig also recently received the Murdock Charitable Trust Partners in Science Award. This two-year award will engage local science teachers in Dr. Budwig's research, with the goal of the teachers using what they learn in their high school classrooms.

Boise Water Center Acquires Aquatic Imaging Flume

New features include optical access for Particle Imaging Velocimetry

The University of Idaho Center for Ecohydraulics Research (CER) has finished building a new Aquatic Imaging Flume (AIF) at the Idaho Water Center in Boise. The new flume features large tempered glass side windows and floor for optical access to conduct Particle Imaging Velocimetry (PIV) and other optical measurement techniques. The AIF is 7 meters long with width configurable between one half meter or one meter. Water will be recirculated through the flume from the approximately 1,000 gallon reservoir box at up 500 gallons per minute. The flume was designed and fabricated by Jeff Reeder, a post-doctoral student with CER with funding from the National Science Foundation. The flume is being used by CER faculty and graduate students including professor Ralph Budwig and his doctoral student Brandon Hilliard.

PIV is a technique in which neutrally buoyant particles are suspended in a flowing fluid of interest, in our case, water. A thin slice of that flow is illuminated with a laser sheet and images of the suspended particles are analyzed statistically to discern the details of complex flows. Experiments at the AIF flume will be focused on the details of the flow into and through the sediments that make up the stream bed. Using the clear sediments that CER staff have developed, they hope to learn the details of chemical and biologic processes that occur within the stream bed and about interactions between the water column and the stream bed. Specifically, Hilliard's dissertation project will focus on the flow through the sediment of a simulated salmon redd, or egg nest. The details of the flow are important, because they transport dissolved oxygen to salmon eggs buried in the redd.



(Above) Doctoral candidate Brandon Hilliard shows visitors how the the Aquatic Imaging Flume works. (Left) The system use Particle Imaging Velocimetry and other optical measurement techniques.

Round-Robin Testing of IN 718 Creep-Fatigue Crack Growth

A testing frame for creep-fatigue crack growth is shown, capable of measuring crack face openings and crack growth rate.

U of I one of two universities invited to perform crack growth testing

Technical staff from Siemens Co. and Rolls Royce have approached Dr. Robert Stephens and Dr. Gabriel Potirniche to participate in a round-robin testing program that will focus on the creep-fatigue crack growth in IN 718, a nickel base superalloy used in turbine engines for aircraft. This invitation was extended after an engineer at Siemens read a recent technical report submitted by the two faculty members to the Department of Energy. This report was the result of their work on a sponsored research program on creep-fatigue crack growth in Alloy 709, an austenitic stainless steel used in nuclear reactor structures. The invitation to participate in the round robin program is a recognition of the expertise and state-of-the-art experimental and modeling technology on high-temperature crack growth that our department has built in recent years through the work of professors Stephens and Potirniche, and graduate students Nicholas Shaber, Jose Ramirez and Colin Burkhalter. In addition to the U of I, the only other U.S. university invited to participate in the round robin program and perform crack growth testing is the Georgia Institute of Technology.

As part of the round robin project, several laboratories around the world will measure the crack growth resistance of IN 718 at a temperature of 600°C using servo-hydraulic testing frames that can apply both steady and fluctuating loads and are equipped with heating chambers. So far, Siemens Co. has provided four IN 718 compact tension specimens, which will be tested in the Fatigue and Fracture Lab of our department. The results from all test teams will be compared and used by the American Society for Testing and Materials.

Maughan Earns ASME Advisor Honorable Mention

Assistant professor Mike Maughan was selected by the American Society of Mechanical Engineers (ASME) General Awards Committee to receive Honorable Mention for the 2020 National Outstanding Student Section Advisor Award.

As the University of Idaho American Society of Mechanical Engineers (ASME)advisor since 2015, Maughan is known for recruiting student members and leaders through innovative sophomore and senior design experiences, promoting student, faculty, and alumni engagement by mentoring a vibrant student section and collaborating with industry partners in advancing manufacturing infrastructure. This year, Maughan is helping the team complete a redesign of the ASME lounge space in the Engineering-Physics Building.

Maughan conducts research in the areas of mechanics and manufacturing, with emphasis on advanced manufacturing and mechanical behavior in extreme conditions. His publications share new phenomena and techniques as well as provide important material properties for a range of applications. He is also an active contributor in the area of teaching and learning. He has published several papers focused on learning associated with the college's interdisciplinary capstone program.

Maughan is co-principal investigator on an NSF-funded grant designed to launch engineering students' careers by reducing their financial burden and extracurricular jobs while they are in school. He also conducts research in the area of engineering documentation, having developed unique tools and lessons to teach modern documentation to students.

The Outstanding Student Section Advisor Award recognizes the leadership and service qualities of a Student Section Advisor who has completed at least three academic years as a Student Section Advisor prior to nomination for the award.

Faculty Present at APS Division of Fluid Dynamics Meeting

Ralph Budwig and Vibhav Durgesh were on the organizing committee for the 72nd Annual Meeting of the American Physical Society's Division of Fluid Dynamics (DFD), partially sponsored by U of I and held at the Washington State Convention Center in Seattle on Nov. 23-26, 2019. The DFD annual meeting is one of the largest conferences in fluid dynamics, with more than 3000 attendees expected from around the world. The objective is to promote the advancement and dissemination of knowledge in all areas of fluid dynamics.

LEARN MORE AT
apsdfd2019.org

Assistant professor Vibhav Durgesh (pictured here) and professor Ralph Budwig served on the organizing committee for the 72nd Annual Meeting of the American Physical Society's Division of Fluid Dynamics.

Dr. Tao Xing Earns Design, Teaching Certificate

Tao Xing

Dr. Tao Xing earned the Design and Teach Online (DTO) Certificate issued by the University of Wisconsin-Madison. Dr. Xing completed the University of Idaho DTO course from September 2019 to February 2020. The goal of the course is to provide a foundational understanding of the pedagogy of online teaching and facilitating, focusing on key principles and practices that can be applied to online courses. During this course, Dr. Xing engaged in a variety of online learning activities, including readings, discussions, reflective and interactive activities, and assignments that allow him and his colleagues to apply what they learn to their individual course design and teaching plans.

Dr. Xing has been active in offering his courses online through the Engineering Outreach (EO) program since he joined the university in 2011, including ME 541 Mechanical Engineering Analysis, ME 450 Fundamentals of Computational Fluid Dynamics, and ME 417/517 Turbomachinery. Starting in fall 2020, he will offer ENGR 335 Engineering Fluid Mechanics through EO as well. The DTO course will help leverage his collective knowledge, experience and expertise to create great learning experiences for our students.

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uidaho.edu/me-newsletter

ALUMNI

Caitlin Owsley Earns Brave and Bold Award

2012 graduate finishes final year as ME Advisory Board Chair

Caitlin Owsley

Mechanical engineering graduate and Advisory Board member of six years, Caitlin Owsley '12 has been selected to receive the Brave and Bold Young Alumni Award for her outstanding career achievements or record of volunteerism.

Awarded through the U of I Office of Alumni Relations, this award will be presented to Owsley during an award ceremony tentatively scheduled for fall 2020, pandemic permitting.

Owsley has worked for advanced composite aerospace tooling and parts manufacturer Janicki Industries since graduating from U of I, and has worked as a design engineer, project manager and project engineer.

Owsley said she became interested in engineering thanks to pushing from several of her high school math teachers. When she heard about U of I's Women in Engineering Day, the Moscow native said she was initially more intrigued by the opportunity to skip classes for a day, but seeing student projects and talking with current students at the event cemented her decision to attend U of I.

"The best engineering school in Idaho is in my hometown, so I couldn't justify going anywhere else," she said. "I remember it being extremely affordable. I had friends attending private schools, and I was hearing about how much they were spending on tuition and housing. When they heard how much I was paying for school, they were shocked I could get such a great education for such a bargain."

Active in the U of I chapter of the American Society of Mechanical Engineers (ASME) while in college, Owsley played a key role in the organization of the 2019 ASME student and alumni social during the group's annual company tours in the area.

Boston Earns White House Teaching Award

Sean Boston

University of Idaho College of Engineering alumnus Sean Boston was recently awarded the Presidential Award for Excellence in Mathematics and Science Teaching (PAEMST), the highest award given by the U.S. government to K-12 teachers of mathematics and science, including computer science.

Boston, who graduated with his Bachelor of Science in Mechanical Engineering in 2002, teaches physics and advanced placement physics at Timberline High School in Boise. Boston began teaching at Timberline in 2018 and previously taught at Boise's Capital High School for seven years.

"This award empowers me to be an agent of innovation in education," Boston said. "Education has enriched my life greatly, and this award helps me leverage my teaching gifts to pay that enrichment forward to succeeding generations."

Boston helped write the AP physics one course for Khan Academy, an education nonprofit that provides educational lessons for students and educator tools.

FACULTY & STAFF

Beyerlein Earns 2020 Outstanding Faculty Award

Steve Beyerlein

Steven Beyerlein, professor and outgoing department chair, received the College of Engineering 2020 Outstanding Faculty Award during the recent virtual awards ceremony.

Dr. Beyerlein joined the University of Idaho in 1987. He has taught mechanical engineering courses in freshman design, sophomore design, computer aided design, fluid mechanics, heat transfer, senior design, lean manufacturing, and combustion engine systems. He has both a practitioner and research interest in instructional design, active learning strategies, assessment for learning and faculty development.

Since 2015, Dr. Beyerlein has served as the mechanical engineering department chair, where he has diversified the industrial advisory board, spearheaded major shop and lab infrastructure improvements, and connected with many U of I alumni through visits, as well as social events around the Northwest.

READ MORE AT
uidaho.edu/engr-awards

Donald Blackketter Inducted Into 2019 Academy of Engineers

Donald Blackketter

As chancellor of Montana Tech (MTU), Donald M. Blackketter established standalone mechanical and civil engineering programs, MTU's first doctoral program in material science, and helped raise $10 million in state and private funding for MTU's Natural Resource Research Center. With more than 30 years of experience, Blackketter also served as dean of the College of Engineering from 2008 to 2011.

READ MORE AT
uidaho.edu/AOE

LETTER FROM THE CHAIR

Steve Beyerlein Outgoing Chair

Gabriel Potirniche Incoming Chair

Pandemic Teaching Insights & Path Forward

Department welcomes incoming chair Professor Gabriel P. Potirniche

We are writing to you as outgoing and incoming chairs of the department. Steve Beyerlein's term is ending at the end of June, as he transitions to phased retirement (half time for the next two academic years) where he will be collaborating with Dan Cordon on our freshman and sophomore engineering experience and continuing to be part of the inter-disciplinary capstone design teaching team led by Matt Swenson.

Gabriel Potirniche's term will begin in July, and he has some exciting ideas that build on our long-standing strengths in teaching and advising, our substantial investment in educational infrastructure, and our commitment to shared governance. These include innovations in outreach to prospective students, curricular integration, and expanded research opportunities for undergraduate as well as graduate students. Look for details in upcoming chair letters.

Spring 2020 has been a challenge for students, staff, and faculty alike, adjusting to the rapid mid-semester transition to distance delivery dictated by the COVID-19 pandemic. We appreciate the patience and perseverance of all involved. We were pleasantly surprised at the level of educational outcomes achieved, but at the same time, we were concerned about the reduction in hands-on learning and face-to-face interaction that is a hallmark of our program. We are devoting this column to analyzing alternate class organization structures that will be used across campus in fall 2020 as we continue to be under the pandemic cloud.

Transitional

This was effectively the model used by everyone in March 2020 when on-campus class meetings were suspended. It began with traditional face-to-face instruction and then moved quickly to an alternate teaching mode that posed significant challenges and frustrations to students and faculty alike. Planning is underway to avoid this situation in organizing fall 2020 classes. One exception will be small seminar classes and team meetings that can occur in spaces with considerably reduced occupant loads to ensure social distancing with use of masks. This mode would switch to one of the other modes if another "stay at home" mandate were to reappear.

Pre-Recorded Lectures

This is best exemplified by our traditional Engineering Outreach courses. Full-length class sessions recorded with a live audience from a previous class implementation are available in high-definition and streamed to students at a distance on-demand. While this works well for off-campus graduate students whose work schedules are widely varying and who are comfortable learning in a highly self-directed manner, it does not offer interactivity and personalized instruction desired by most undergraduates. This delivery option is further compromised by home video production exclusively using PowerPoint or Zoom recording features without deployment of writing pads or real-time question and answer. Based on end-of-course teaching evaluations, the larger the number of 50-75 minute pre-recorded materials that comprise undergraduate coursework, the less satisfied the student body. Some students appreciated the opportunity to engage in class sessions asynchronously at the time of day they found most convenient. Some students expressed appreciation for the opportunity to rewind and review portions of the lecture they found confusing. Other students liked the opportunity to submit technical presentations in recorded form for easier peer review and more efficient use of classtime. Not surprisingly, students found it annoying to have an abbreviated viewing window for pre-recorded materials before these were taken down.

A take-away from spring 2020 that can positively impact future instruction is that there were a sizable number of U of I faculty who began experimentation and increased confidence in making just-in-time videos. This led to the creation of supplemental teaching resources (many as short as 3-5 min focused on a particular topic/problem) that can easily enrich the other forms in instruction described below. Successful implementation of prerecorded course components requires faculty to be more deliberate in course organization as well as more explicit and compelling in communication of expectations. Both of these are significant measures of student satisfaction with instruction, whether it be face-to-face or at a distance.

Virtual Meeting

This mode was chosen by several of our most dynamic faculty who also elicited more than 50% participation in spring 2020 teaching evaluations and who earned the highest scores in overall course organization and delivery. This mode was done in real-time using ZOOM, ideally with diverse screen sources (slides, real-time writing, videos, discussions in grid view). Asking students to keep their videos on provided stronger connection and engagement in class activities, including non-verbal feedback from body language. Considerable excitement was expressed about the use of built-in tools (chat window, polling, breakout rooms) as well as having session recordings available for post-class reuse. Virtual meetings were also effectively used by some faculty for recitations, office hours, and team meetings. Email traffic and phone and text communications were also reported to be more frequent between students and faculty using the virtual meeting class model.

An extension of this model included setting up remote access to our computer labs with high-end software. Students could then log in from their home computer as a remote desktop to run complicated CAD models in SolidWorks and in CATIA, just like if they were physically in GJ 114/115. All ME students had access to VLab, and many used that vehicle to perform modeling in EES, ANSYS, and MatLab. Our large allotment of personal copies accompanying our annual SolidWorks license allowed us to provide a copy to all sophomore, junior, and senior students who desired one for home use.

Hybrid/Flex

This mode was not an option during the

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Virtual Engineering Design EXPO Welcomes K-12 Across Three Countries

Judges score 41 virtual capstone presentations during 20 hours of simultaneous Zoom sessions

This year's virtual Engineering Design EXPO had more than 14,000 unique visitors log on to explore capstone projects, and judges scored 41 virtual capstone presentations during 20 hours of simultaneous Zoom sessions. This year's virtual K-12 program, the EXPO Extended Experience, welcomed fifth through 12th graders to participate in hands-on activities and submit completed projects to win prizes and a $4,000 U of I scholarship. Participants were also able to explore capstone projects through videos generated by EXPO interdisciplinary teams.

Hundreds of students from areas including the Pacific Northwest, Poland and Nigeria participated. Of the 189 participants from 114 schools, 55% were women. Eighty-four percent of participants said they were more likely to pursue STEM and had an interest in attending the U of I College of Engineering after participating in EXPO.

EXPO is the longest-running student engineering and technological innovation showcase in the Pacific Northwest. The event, normally held on campus, welcomes hundreds of K-12 students, industry partners and community members to explore industry-sponsored projects designed by current U of I students in our nationally-recognized senior design program. With safety a top priority in 2020, the event was re-envisioned as a virtual experience.

The college would like to thank its 2020 sponsors: Wagstaff, Idaho STEM Action Center, Avista, the Coeur d'Alene Tribe, DC Engineering, GeoTek, Inc., Idaho Power Company, Itron, Idaho National Laboratory, J-U-B Engineers, the Micron Foundation, ON Semiconductor, POWER Engineers and J.R. Simplot Company Foundation.

Plans are already in the works to create a virtual experience during next year's EXPO, scheduled for April 30, 2021.

LETTER

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COVID-19 isolation, but is a synthesis of the best aspects of the previous modes, plus some hands-on shop and lab activity and thoughtfully planned face-to-face interaction in smaller groups. Building on new curriculum design and recording capabilities, there is likely to be a multitude of just-in-time videos and electronic resource materials for class preparation. For moderate to large-sized classes, there will be alternating in-class and ZOOM sessions providing synchronous access for students in the classroom, lab and at a distance. We can also envision utilizing of dedicated ZOOM numbers for impromptu project work, instructor meetings and client reviews. There will also be 24-7 access to computer labs via remote access in addition to VLab. We also might anticipate greater use of online quizzes for pre-class and post-class assessment (freeing up class time for more interactive learning).

There are several universal truths, no matter how coursework is delivered. Faculty who are passionate about their subject and its application inspire students to move from just being "knowers" to being "learners" (aka maximizing teachable moments). Faculty who also take a personal interest in student goals and concerns while learning via regular one-on-one communication are vital in promoting self-confidence and perseverance needed for academic success (aka maximizing growable moments). Course designs and deliveries that provide asynchronous course elements that support and enrich meaningful sequences of synchronous activities provide a stronger map for achieving desired course outcomes (aka growable experiences).

As outgoing and incoming department chairs, we want all of our faculty/staff to be realizing as many teachable and growable moments as possible.

SAVE THE DATE

ENGINEERING DESIGN EXPO

Friday, April 30, 2021

UIDAHO.EDU/EXPO

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