

The Changing Face of Our Machine Shops

CAL POLY

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Letter from the Chair WWWWW

The 2018-2019 academic year has jumped off to a great start for the mechanical engineering department. This fall, we welcomed 206 academically talented freshmen and transfer students to our department. Mechanical Engineering is the largest department at Cal Poly with over 1250 undergraduates and is ranked as the 2nd best undergraduate focused mechanical engineering program in the country by U.S. News and World Reports. We have many new and exciting things happening in the department from the formation of new design-build clubs, new personnel and new research initiatives – it is hard to put this all in one newsletter!

In this issue of News-To-Me we are featuring many of our Learn By Doing activities and how we are investing in new initiatives to enhance mechanical engineering's "hands-on" approach. Inside you will read about how Cal Poly Racing is gearing up for this year's competitions using the redesigned machine shop spaces. We welcomed two new tenure track faculty, Dr. Lauren Cooper and Dr. Benjamin Lutz, who are bringing new ideas and energy to our hands-on design activities and major contributions to our efforts in diversity and inclusivity. Our student shop technician program has grown into an interdisciplinary crew of 55 students from across campus who keep the shops safe while gaining valuable experience that is sought after by industry. You can also read about how undergraduate research is playing a growing role in the experiences of our faculty and undergraduates as they break new ground in intelligent vehicle research and measuring systems for air flow on aircraft surfaces. We also feature our new alumni and the exciting things they are doing with their Cal Poly education and how the ASHRAE club is working with the Mechanical Contractors Association to provide real world experience to students.

All these activities share our common philosophy that real engineering work requires not only solid understanding of theory but also experiences and skills to finish the job. I know of no other undergraduate program in the country that so effectively combines these two elements to prepare students for careers in industry or graduate school. I want to give a very heartfelt thank you to our alumni, donors and corporate partners who provide support and the financial means for our students to do amazing things. Finally, I wish to extend my deep wishes for everyone to have a peaceful and relaxing holiday season filled with joy.

Sincerely,

Jim Widmann Professor and Chair



A Good Fellow

An advocate of evidencebased teaching practices whose classic dynamics textbook is used by students nationwide, Brian Self was recently named a Fellow of the American Society for Engineering Education (ASEE).

The ASEE, dedicated to the professional needs of engineering educators across all disciples, says fellows are chosen by its board of directors for outstanding and extraordinary qualifications and experience in engineering or engineering technology education. Fellows raise and deliberate key issues regarding engineering education and formulate position papers, sometimes proposing courses of action for the ASEE board.

Self, a mechanical engineering professor, said he has benefited much from his ASEE membership. "In my early career, presentations at ASEE gave me a number of great ideas to improve my teaching," he said. As a result of contacts forged



through the ASEE, he was asked to be part of a collaborative grant shortly after arriving at Cal Poly in 2006.

"That grant developed a number of project-based learning assignments in mechanical engineering," he said. "Our team also hired over a dozen undergraduate students over the years and had them present at ASEE conferences."

It was through his relationship with ASEE that he was asked to be a co-author a book, "Vector Mechanics for Engineers" (McGraw-Hill), which is used in classrooms nationwide.

Self previously worked in the Air Force Research Laboratories before teaching at the U.S. Air Force Academy for seven years. He has also taught at the Munich University of Applied Sciences and the Karlsruhe University of Applied Sciences. Not only is he a member of the ASEE – he was a board member from 2008-2010. The organization, he said, has taught him quite a bit of knowledge that he has been able to pass on.



Julia Roche '17

Technical Development Program Engineer, Edwards Lifesciences

Julia Roche graduated in 2017 with a mechanical engineering degree and is now a technical development program engineer at Edwards Lifesciences, a medical equipment company specializing in artificial heart valves and hemodynamic monitoring. In her current position, Roche rotates through four different facets of engineering including quality engineering, research and development, marketing, and manufacturing. Julia enjoys working for a medical device company because of the direct impact she has on people's lives. "The most rewarding part of my job is knowing that I'm a part of saving people's lives," said Roche.

Road to Sweden

Alec Bialek and Eric Griess traveled from Cal Poly across the globe on two separate career paths only to reconnect again years later in Sweden.

Bialek graduated from Cal Poly in 2017 with a degree in mechanical engineering. He's best known for constructing a full-sized, functioning R2D2 during his undergrad. Bialek studied abroad for 6 months at the Munich University of Applied Sciences and interned at BMW doing engine calibration with the inline six cylinder group. After connecting with Eric Griess, who was working for a company in Sweden at the time, Bialek sought out to get a job there as well. Bialek is now a software integration engineer at Koenigsegg, a Swedish manufacturer of high-performance vehicles, headquartered in Sweden. Bialek is responsible for vehicle software application and ensuring they are safe to drive.



ME Alumni Alec Bialek (left) and Eric Griess (right).

Eric Griess graduated from Cal Poly in 2014 with a bachelor's and master's in mechanical engineering. While at Cal Poly, Griess was a shop technician and part of Cal Poly Racing. During his master's, Griess conducted research on FreeValve, a Swedish technology company specializing in camless engine technology. He discovered his passion for the company and sought out to work for them after graduation. After many failed attempts, Griess finally got an interview with FreeValve and started out as a design engineer. Griess is now the Chief Technology Officer at FreeValve.



Since the start of the machine shops, the shop technician experience has been an important facet of the mechanical engineering department. Being a shop technician provides a unique opportunity for Cal Poly undergraduates to Learn by Doing and develop their skills as engineers.

Kyra Schmidt is a fourth year mechanical engineering student concentrating in manufacturing and is maintenance supervisor for Mustang 60. For many students like Schmidt, being a shop technician provides unique hands-on learning opportunities to put into practice engineering concepts learned.

The Changing Face of Our Machine Shops

"You can learn about concepts in class and go through the calculations and draw these parts on paper but having actually rebuilt these machines and seeing these components is much more rewarding," said Schmidt.

Schmidt came to Cal Poly without any prior machine shop or hands-on engineering experience and has learned everything she knows on-the-job. Working with the different machines and observing how other students accomplish similar tasks or designs has enriched Schmidt's engineering curriculum.

"Over time, I started to develop an intuition for best practices in engineering and then was able to come to class to understand the math behind these concepts," said Schmidt.

As a maintenance supervisor for Mustang 60, she is responsible for ensuring the shops are running safely and efficiently. She manages maintenance shifts, trains rookies, keeps machines leveled, and identifies preventative solutions in the machine shop. Schmidt noticed long lines at the mill in Mustang 60 during busy times of the quarter and searched for a solution. She discovered a second mill that had been broken for some time and took it upon herself to fix it. Over the span of a month, she tore apart the mill and fixed almost every part including the clutches and high/low gears. This was her first time doing a complete rebuild of a machine like this.

"Sometimes my job is frustrating but once I finish a project and see students using the machine I rebuilt, It makes it all worth it," said Schmidt.

SUPPORT

For more information on supporting our machine shops and ways you help continue this tradition, visit me.calpoly.edu/support.



New Shop Technicians 💥

This fall, we welcomed eleven new shop technicians to help ensure proper machine use, maintain equipment, and guide students through their project needs in the machine shops. We asked our new shop technicians to share what inspired them to take on their new roles.



Jarod Lyles Mechanical Engineering Second Year

"I become a shop tech because the machine shops are the very essence of Learn by Doing. I want to give back to other students the phenomenal experiences the machine shops gave me during my first year at Cal Poly.



Madeleine Rossitto Mechanical Engineering Second Year

"I become a shop tech because I learned a lot from the shop techs in my first year, and I wanted to help other students in the same way that they helped me."



Robyn Ribet

Mechanical Engineering Third Year

"I chose to be a shop tech because I love getting the opportunity to teach and help other students in the shop as they work on their individual and class projects.



Isaiah Penzell Mechanical Engineering Second Year

"I chose to become a shop tech because I loved using the shops my first year, and decided that I wanted to help teach new students how to use the incredible tools available to them.'



Connor Gigone Mechanical Engineering Second Year

"Shop techs help create the true hands on style of learning that Cal Poly is known for throughout the country, and that draws many students - including myself - to come here."



Kayla Collins Mechanical Engineering Third Year

"I remember being a freshman and wanting to use the machine shops but feeling intimidated. I want to provide a friendly and helpful experience to new students who may have felt the same way so that they want to keep coming back.'



Rose McCarver Mechanical Engineering Second Year

"I remember being a freshman and wanting to use the machine shops but feeling intimidated. I want to provide a friendly and helpful experience for students who may have felt the same way so that they want to keep coming back.'



Nichole "Nikki" Arm Mechanical Engineering Second Year

"The shop is my happy place and I have been known to spend more time there than my own home. I love the process of building my own creations and learned early on that I enjoyed sharing this passion with others too.



"I chose to become a shop tech because I wanted to get involved with shop and educating the next generation of shop users. I got a great education using shop tools and I wanted to cultivate the same experience."

WWW NEW FACULTY



Lauren Cooper Assistant Professor

Lauren Cooper joined the department this fall as an associate professor. She has a B.S. in mechanical engineering, M.S. in building systems, and Ph.D. in mechanical engineering with a research emphasis in engineering education. Cooper has industry experience in renewable energy and residential energy efficiency. She started her teaching career as a middle school teacher before returning to school to receive a Ph.D.

As an educator, Cooper hopes her students take away three things - confidence, personal responsibility, and sense of caring. She aims to build confidence in students by creating hands-on design projects that challenge them to learn and apply real-world skills like creativity, brainstorming, ingenuity, prototyping and fabrication, team work, and project communication. Cooper encourages personal responsibility in students by engaging in active learning and using the flipped classroom approach.

"I see my role not as the deliverer of knowledge but as a facilitator who engages students in activities and experiences that give them opportunities to grow and learn," said Cooper.



Benjamin Lutz Assistant Professor

Benjamin Lutz joined the department this fall as an associate professor. He has a B.S. in aerospace engineering, MEng in mechanical engineering, and PhD in engineering education. Lutz is a qualitative researcher and his work typically focuses on student voices and perceptions to better understand how to motivate and enhance learning and cognition.

As an educator, Lutz has three main goals:

 Enhance students' engineering mindset and approach to problem solving,

- Increase students' capacity for teamwork and communication across diverse groups
- Critically engage with course content in ways that produce social consciousness and ethical reasoning.

Lutz recently won the best paper award at the American Society for Engineering Education (ASEE) conference. Lutz worked with Dr. Marie Paretti to document the lives of 12 recent mechanical engineering graduates through the initial stages of their jobs, exploring their significant challenges, accomplishments, and realizations as they navigated their new roles.



Cal Poly Hosts First MAC Competition

The first annual MAC (Mechanical Contractors Association-ASHRAE) Competition took place on October 6 and 7, 2018.19 students from mechanical engineering, bioresource & agricultural engineering (BRAE), and construction management on four teams competed for the top prize of \$1750.

The competition simulated real problems that engineers could experience when designing HVAC systems. The teams were tasked with designing a duct size and location, choosing an Air Handling Unit (AHU) based on cooling load calculations, doing an economic analysis, completing a crane lift plan for installation, constructing safety plans, designing a schedule for installation and coming up with a final cost for the entire project.

On Saturday morning, the teams were given the design problem. Their solution and all project documents were due back to the judges at 5pm that same day. The students had less than 9 hours to understand the proposed problem, come up with a solution and put together the supporting documents. The next day, each team gave a 25 minute presentation on their design solutions.

Midway through the competition the teams were given an unexpected surprise; equipment was being delayed by two weeks, but the project end date remained the same. The students had to change crane plans and calculate the impact on the project schedule and budget.

The judging was based on the submitted documentation and the presentation. The winners of the competition were Soojin Park (4th year BRAE), Tae Hun Kwak (2nd year construction management), Eric Ramos (2nd year mechanical engineering), Emily Gavrilenko (1st year mechanical engineering), and Daisy An (4th year mechanical engineering).

"It was rewarding to part of this competition and I could tell the underclassmen learned a lot from participating," said Daisy An, team project manager.

SURP Summer Undergraduate Research Programs

The Summer Undergraduate Research Program (SURP) is a unique opportunity for undergraduate students to engage in hands-on research while using critical thinking, collaboration, and entrepreneurial skills to help solve major societal challenges.



Zachary Dworaczyk Intelligent Mobility Course Development

Zachary Dworaczyk is a graduate mechanical engineering student with a general concentration. Dworaczyk worked with Dr. Charles Birdsong to develop the mechanical design of the chassis on a small-scale autonomous vehicle. Originally, the chassis, which holds all the electronic components including the suspension and steering, was designed and manufactured out of a nylon polymer. Because of the vibrations in the vehicle from motors and rotating parts, the

Zachary Wilson Boundary Layer Data System

Zachary Wilson is a senior mechanical engineering student concentrating in mechatronics and will be starting the blended mechanical engineering graduate program next quarter. Wilson worked with Dr. Russell Westphal to design the first-ever Boundary Layer Data System (BLDS) instrument that can acquire non-flow measurements. The prototype device that he designed can acquire mechanical strain and acceleration measurements for static and dynamic structural data during in-flight testing of

chassis was beginning to chip and fail. Dworaczyk's goal for the summer was to investigate the effect of chassis stiffness and consider other materials and designs to increase the reliability and function of the existing nylon polymer chassis. Dworaczyk compared a variety of materials and designs to optimize performance, cost, and ease of manufacturing.

The end goal for this autonomous vehicle to be part of the first undergraduate course in intelligent mobility.

I an aircraft. Wilson served as the lead designer on the project and was tasked with the software design, hardware selection and implementation, and testing of the prototype. Through this project, Wilson learned the C++ programming language, how to design a printed circuit board, and gained experience in operating a wind tunnel.





Racing Forward

Cal Poly Racing is the largest student chapter of SAE International in California. Over 125 students from various majors contribute to designing, manufacturing, and testing three innovative racina vehicles. Months of hard work culminate at SAE's Collegiate Design Series (CDS) competitions at the end of the school year. These competitions give students an understanding of industry standards and challenge them to apply skills and concepts learned in the classroom. Cal Poly Racing is the only California team to field vehicles in all of the major CDS competitions including Formula SAE, Formula SAE Electric, and Baja SAE. The team sspend approximately six months designing and manufacturing the vehicles to prepare for testing and competition in the spring and summer.

This summer, the Formula SAE team competed in Lincoln and won third place in the design challenge for their combustion vehicle. Both the combustion and, electric vehicles placed 13th overall. The Baja SAE competed in Oregon and placed third in maneuverability and fifth place overall.

This year's Baja team is aiming to make their vehicle's weight 15 pounds lighter, move the vehicle's weight distribution into the 44-46% forward range, and establish a testing minimum for every critical part. The team added a Crew Chief to oversee driver training, freshman retention, and competition preparedness. The Formula team is hoping to place in the top three of the upcoming competition in the combustion and electric categories.

Upcoming Competitions

Baja SAE
Gorman, California
May 16, 2019

Formula SAE Lincoln, Nebraska June 19-22, 2019

New York City June 6, 2019



Jessalyn Bernick Baja Technical Lead 6th-year, Mechanical Engineering

"Our leads have been working hard this year on testing and validation. This is the most thoughtfully designed car our Baja team has yet to produce, and it will pay off both in vehicle performance and in the design competition." Mechanical Engineering Cal Poly San Luis Obispo 1 Grand Avenue San Luis Obispo, CA 93407

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