

MANUFACTURING



OPPORTUNITY

Donations from Alumni and Industry Helped Make the Mustang '60 Lab a Reality

MARY MCNALLY PHOTOGRAPHY BY BRITTANY APP

"If you can think it, you can make it," said Katie Ruhm, a junior mechanical engineering major talking about the Student Fabrication Lab called the Mustang '60 on the ground floor of the Bonderson Projects Center.

Part of the Mechanical Engineering Department, the shop is a creative bastion for hands-on projects, open to anyone on campus including faculty, staff and students from any major.

If you think of yourself as a tinkerer, as one student put it, the machines and equipment will make your eyes light up. But even more impressive are the opportunities the shop affords students to discover new interests, unleash their creative potential and develop as leaders.

Open Door Policy

Ruhm originally came to Cal Poly as an education major. Both of her parents are teachers, and everyone assumed she would teach kindergarten. But during her first quarter at Cal Poly, friends got her involved constructing the Cal Poly Rose Parade float. She said, "I thought welding was the coolest thing I'd ever done."

From that experience, she caught the bug to build and told her parents she wanted to change majors to mechanical engineering. She mastered the calculus, physics and chemistry required and transferred majors by the end of her freshman year. Now she's a shop technician, sponsored by Solar Turbines to teach others how to use the equipment.

"I love the hands-on part of it," she said, and the comprehensive perspective she gains by making things she envisions. Because of her firsthand experience, she understands the trade-offs in the manufacturing process. "Just because a computer can make it doesn't mean a machine can do it or do it efficiently," she said. "There are costs to every design decision."

"Cal Poly is one of the few campuses to have a shop like this," she said. "If other schools do have one, you have to be associated with a class to use it, and you have to pay to use it. Here, you can be any major and use it for any project and there's no charge. It's mind-boggling."

Specifications

The Mustang '60 shop has two main rooms. One is outfitted for wood with a table saw, compound sliding miter saw, routers, planers, sanders and a band saw. The other is for metal, with lathes, mills, drill presses, welding equipment and three state-of-the-art CNC machines (computer-controlled machining devices).

While many of the projects are sponsored by industry and cloaked by non-disclosure agreements, the projects they can talk about include an electronically actuated prosthetic hand that was fabricated and assembled by students on the QL+ team, and a closed-loop coolant simulator that PG&E uses at Diablo Canyon power plant to train nuclear engineers.

Graduates have gone on to companies including Apple, General Atomics, and SpaceX (PayPal founder Elon Musk's start-up now contracted by NASA to deliver payload to the International Space Station).

Forging a New Future

The Mustang '60 shop was just a big empty space before John Nielsen (B.S., Mechanical Engineering, 1964) and his wife, Connie, made a gift that provided funds to equip the shop. Senior technician George Leone tapped former student Eric Pulse (B.S., Mechanical Engineering, 2005) to outfit and manage the facility.

The Niensens also funded an endowment that will pay the manager's salary into perpetuity. "The Niensens basically changed everything for us," said Leone. "We realized if we could have a sponsored staff position, we could have sponsored student tech positions, too. For \$5,000, someone can pay a student's employment for the year."

Solar Turbines took it a step further and set up an en-

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Mechanical Engineering student Katie Ruhm at work in the Mustang '60 Lab.

dowment to fund a student tech position; the interest will pay the annual salary indefinitely.

Other companies have joined in: Haas Machining and Miller Welding “lease” equipment to the shop for free – and then replace it with ever-more advanced machinery every two years.

“I’m really excited about the commitment from industry and the surrounding community,” said Nielsen.

Nielsen retired from General Mills after designing, building and managing the engineering functions in plants throughout the U.S. He attributes his success to the hands-on education he got at Cal Poly and says that of all the engineers he has hired, the most successful were those who could relate to the people making the products the engineers designed. He believes the Mustang '60 shop and its aging counterpart, the AERO Hangar, position Cal Poly students for just that kind of success.

A member of the Industrial Advisory Board, Nielsen is adamant about the breadth of learning experiences the Mustang '60 shop and the AERO Hangar provide but maintains they are only a launch-pad to the Student Project Center, the next iteration of student fabrication labs now in the planning phase.

“The hangar was dated in 1980 and it’s slated to become a parking lot,” said Nielsen. “We need the new facility to be a viable operation – expanding capabilities and ensuring it’s available to everyone – before we lose the hangar. The learning experiences these shops provide are just too important.”

Since senior projects have become more complicated, many programs have incorporated industry-sponsored, team-based projects and those require more complex space to house them. The concept for the Student Fabrication Center is a 35,000-square-foot

building equipped with traditional and emerging technologies and an emphasis on peer teaching and cross-pollination between majors from artists to biologists to engineers. Nielsen said, “It’ll be the hangar on steroids.”

Building New Leaders

Robby Nielsen (no relation) was a mechanical engineering major before his experiences in the shop helped him find a fit in a more systems- or process-oriented major: industrial and manufacturing engineering. He worked as a shop technician for about a year before asking if he could redesign the shop for greater efficiency and presented his plan to management. Leone said he considered it for about a second before agreeing. “If they’re up for the challenge, we’re willing to support them in any way we can,” he said, explaining that those opportunities foster initiative and entrepreneurialism. “We want them to be adaptable and have exposure to different things so when they are out in the workforce, they have a bigger toolbox in their brain.”

Robby Nielsen said the opportunity “started the supervision and project management side of my career.” One of the things he assessed was staffing, realizing that student demand grows as the quarter and school year progresses. He re-engineered the student shop technician’s work shifts to align with the demand curve, saving labor costs.

He also recommended increasing the number of student shop technicians and creating designated specialties to serve a growing demand for the shop. He wrote job descriptions for all the positions including scheduling, maintenance, inventory, CNC and lead technician.

He is now working with a group of faculty, staff, students and alumni to design the new Student Fabrication Center. The concept was provided to the College of Architecture and Environmental Design, where 12 teams developed renderings for the new facility – already an interdisciplinary Learn by Doing experience.

For his outstanding contributions, he was recognized in 2010-11 as Student Employee of the Year (SEOTY) at ever-increasing levels: first at Cal Poly, then the Northern California region of schools, the western state region and first runner-up in the national SEOTY competition.

“The opportunity here is greater than the sum of its parts,” said John Nielsen. “The flexibility allows students to find their true strengths.” □