

NEWS BRIEFS

TOWARD EQUITY AND EQUALITY

In the wake of the nationwide protests that followed George Floyd's death at the hands of police in Minneapolis on May 25 and continue today, UC Santa Barbara and the College of Engineering, like institutions across the nation, took action to begin to address the problems of enduring societal and institutional racism that stand in the way of full equity, inclusion, justice, and opportunity for all.

Some important actions were taken immediately, while others will occur more slowly, over time, to ensure appropriate responses that point toward meaningful, sustainable, effective action and reflect an ongoing and expanded commitment to ensuring that diversity, equity, and equality are demonstrably present in every corner of our university and our college.

Perhaps the single most important action the university has taken was to name **Dr. Belinda Robnett** as Vice Chancellor for Diversity, Equity and Inclusion, effective Sept. 1, 2020. The culmination of a national search that began long before the events leading to last summer's protests, Dr. Robnett's hiring at the highest level of university administration reflects the seriousness of UCSB's commitment to progress.

Dr. Robnett, formerly Associate Dean for Faculty Development and Diversity in the School of Social Sciences at UC Irvine, where she had been a professor in the Sociology Department since 1999, will lead the university's efforts to coalesce existing campus diversity and equity programs and shape future initiatives.

In the wake of the spring protests against injustice, UCSB launched a process of self-study, with the intention of identifying where it might be falling short in areas of diversity, equity, and inclusion and working with key stakeholders to address them.

Rod Alferness, dean of the College of Engineering, sent letters to university constituents and to CoE alumni and the greater CoE community expressing solidarity with all people, and especially with people of color, who were feeling the weight of societal injustice and inequality.

In the weeks immediately following George Floyd's death, the CoE drafted a statement of its commitment to diversity, which begins with the words, "We believe in the inherent value of diversity and the value of all people." It is presented prominently in the new Diversity section of the CoE website, reached via the "About" page.

Included there, too, is a collection of evolving content describing many existing programs, indicating areas where progress can be made, and listing resources to serve diverse constituencies as well as protocols for responding to acts of aggression, violence, and bias against any student.



On September 1, Dr. Belinda Robnett assumed her new position as Vice Chancellor for Diversity, Equity and Inclusion at UC Santa Barbara.

ALUMNI WIN AWARD FOR VENUS ROVER SENSOR DESIGN

Venus, the "Evening Star" planet, is Earth's closest planetary neighbor and the hottest planet in the solar system, with a surface temperature of about 900 degrees Fahrenheit. Many spacecrafts have been sent there; the longest any of them survived on its surface was a little over two hours. In 1989, NASA's *Magellan* orbiter used radar to generate a high-resolution map covering 98 percent of the planet's surface.

Now, NASA wants to return, on a mission named for the vehicle being developed for it, the Automaton Rover for Extreme Environments (AREE). The challenges are enormous, and the rover would need to be fitted with non-traditional sensors that could survive Venus's harsh environment and allow the vehicle to traverse the surface safely.

To that end, NASA launched a global competition, the suitably named Exploring Hell Challenge, asking inventors and scientists to design a novel sensor for the rover. Organizers received 572 submissions from 82 countries, and when it was all over, the judges awarded second place, and a prize of \$10,000, to Team Rovetronics, comprising **Martin Grabau** and **Eric Seeberger** (both BME '17), the only American entry to place in the top five.

"I almost couldn't believe it when I saw our name listed next to second place," said Grabau, now a mechanical engineer at Goleta's FLIR Systems, where he works on cryocooler designs for cooled infrared cameras. "We knew we put together a strong submission that we were both proud of, but there are a lot of very talented people out there, so it's a huge honor that our work was considered some of the best."

"We spent a lot of time on this project, and it's extremely rewarding

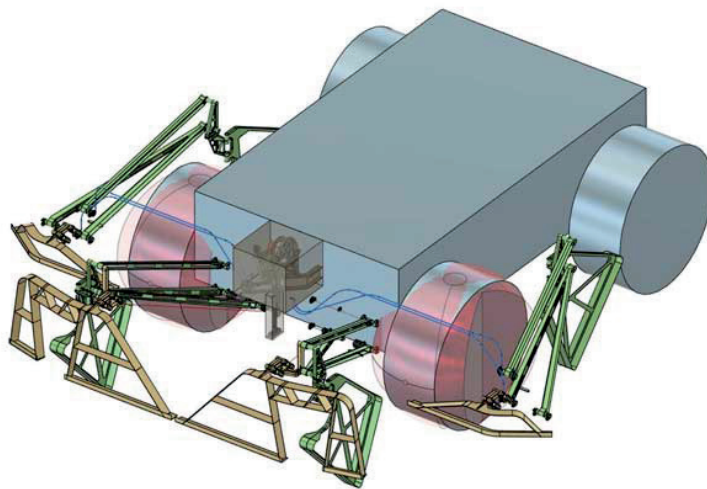
to have something to show for all the work we did," said Seeberger. "I was a bit surprised that we were the only American team to place, but it shows how powerful the internet is at connecting people world-wide and how much respect NASA has throughout the international community."

"The biggest challenge early on was coming up with a solid design for the rover to detect holes on the surface of Venus, because the vehicle could get stuck or miss an obstacle," said Seeberger, who is a structural-design engineer on the F-35 program at Northrop Grumman. "There were also some flaws with the trigger mechanism, which we discovered a few days before the deadline and had to scramble to resolve."

Their final design was an all-mechanical, mostly passive sensor that they call "Skid 'n' Bump." The hinged metal unit, attached to the front of the rover, "feels" upcoming obstacles so that the machine knows what lies ahead. When the sensor detects an obstacle, it alerts the rover by pushing down on a pin protruding from the body of the vehicle. That triggers a sequence, which causes the rover to back up and then turn to avoid the obstacle.

"We're most proud of the effort we put into thinking of all the scenarios that would cause our designs to fail and coming up with elegant solutions to those issues," said Grabau. "The NASA team mentioned how impressed they were with how well we addressed problems that they hadn't fully considered."

A video featuring members of the five winning teams explaining their designs can be viewed on the competition website, www.herox.com/VenusRover/updates. NASA scientists will consider each of the top-five designs as the AREE project continues to develop.



A rendering of Team Rovetronics' sensor design, which features a hinged metal unit attached to the front of the rover to identify obstacles.

Illustration courtesy of Martin Grabau and Eric Seeberger

SPINJET3D WINS VIRTUAL NEW VENTURE COMPETITION

On May 21, the Spinjet3D team won the 2020 Technology Management New Venture Competition (NVC) and the \$10,000 First Place Award, besting four other teams in the finals of the eight-month business-plan competition for aspiring tech startups. With the UC Santa Barbara campus closed during the coronavirus outbreak, the annual competition was held remotely and viewed live by people around the world.

Team members **Anurag Pallaprolu**, a PhD student in the Electrical and Computer Engineering Department; physics major **Noah Treiman**; mechanical engineering student **Yiling Yang**; and **Piergiacomo Palmisani**, a technology management graduate student, were recognized for the new type of 3D printer they have developed.

Making metal parts, especially those that are not produced at large scale, is expensive and time-consuming. Molds have to be made by hand before the metal is poured in to create the part. Sand-mold 3D printers, which print the mold directly from common sand materials, are a time-saving alternative, but their size and hefty price tag put them beyond the reach of many metal-parts manufacturers.

The students say that their fully automated sand-mold 3D printer is faster, cheaper, more precise, and more eco-friendly than existing technology.

"We are extremely grateful to the Technology Management program for this incredible experience and opportunity," the team said in a written statement. "Our team met through NVC events, and the mentorship the program provided was invaluable. We look forward to making a positive change in the metal manufacturing industry, and we are excited to start our journey here in the Santa Barbara community."

The Spinjet3D team intended to use their winnings to finish developing the product, raise capital, and perform prototype testing over the summer.

The second-place finisher in the competition was Legtrek, which offers a new medical device combining a powered wheelchair and a powered gait trainer to serve patients who have challenges with lower-limb mobility. They earned \$7,500.

Third place and a check for \$5,000 went to Genesis, an AI-based startup that uses high-quality data annotation to solve the problem of bad data in machine learning. Two honorable-mention awards and \$2,500 apiece went to Deadstock and Thermaform Technologies. The Thermaform team, which created a compression device to benefit seniors and others affected by circulation deficiencies, also received the People's Choice and Best of Fair awards, worth an additional \$5,500 in prize money. Deadstock built an application enabling users to verify whether luxury goods, such as high-end sneakers, are authentic.

The online nature of the 2020 events still allowed students to think on their feet while interacting live with judges and audience members and answering their questions. The virtual fair attracted a global audience of 620



Photograph courtesy of Spinjet3D

Over the summer, the members of Spinjet3D built a prototype of their printer to test different binder solutions.

people from as far away as Nepal. "I salute all of our students," said **Dave Adornetto**, technology management's entrepreneurship director, during the online finals. "You all did an excellent job through very difficult challenges and circumstances. You guys never wavered, and you pushed through."

Mentored by a team of more than forty individuals who have thrived in the fast-paced world of tech entrepreneurship, students in the competition receive valuable first-hand knowledge and the opportunity to hone their entrepreneurship skills, refine their business plans, and practice pitching their stories and ideas. Pitches for all fifteen teams that participated in the New Venture Fair (from an initial field of thirty-five) can be viewed at newventure.live.

During the finals, teams were judged by a panel of tech entrepreneurship experts and investors made up of: Bei-Jing Guo, a graduate of UCSB's Electrical and Computer Engineering Department and an investor with Seattle Alliance of Angels, who founded her own artificial intelligence start-up after spending twenty years at Microsoft and Amazon Web Services; Kenny Van Zant, a software company executive for more than twenty years and an active angel investor; and Kevin Zhang, a partner at Upfront Ventures, the largest and longest-serving venture capital firm in Los Angeles.

"I was very pleased with the performance of all of the teams," said Adornetto. "It was a tough field this year. Ultimately, the judges honed in on the industry most ripe for disruption, but recognized the potential of all of the finalists."

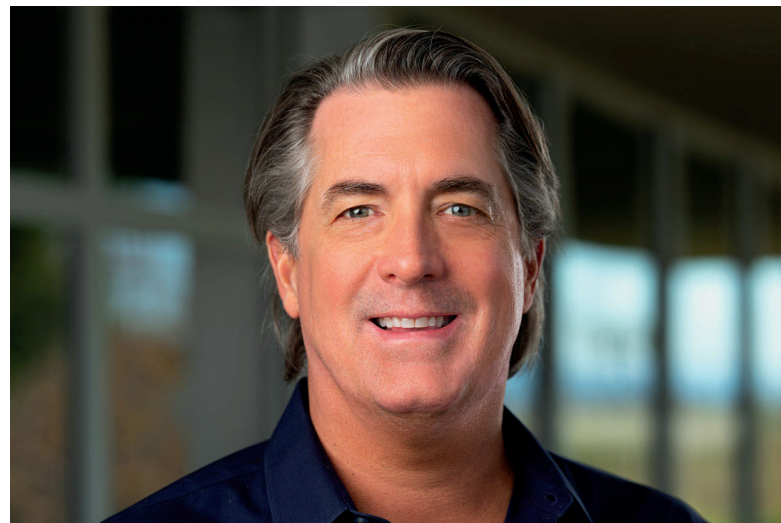
PROCORE FOUNDER WINS 2020 VENKY ENTREPRENEURSHIP AWARD

The Venky Narayanamurti Entrepreneurial Leadership Award is conferred annually by the UC Santa Barbara College of Engineering to recognize an individual who has demonstrated success and leadership in the high-technology entrepreneurial community of the Central Coast. This year's winner, **Craig "Tooey" Courtemanche**, founder and CEO of Procore, a construction-management software company headquartered in Carpinteria, California, says that, for him, the first step to success is not to create a spreadsheet or go on a number-crunching bender. Rather, he says, "If you have an idea, the first thing to do is to literally go sit on the beach for a few days and think about your strengths and weaknesses. Examine who you are as a person, and don't fool yourself."

"On behalf of the UCSB College of Engineering, I offer sincere congratulations to Tooey Courtemanche for being named the recipient of the 2020 Venky Award," said **Dean Rod Alferness**. "It takes immense courage, originality, and energy to accept the challenge of steering one's startup into largely uncharted entrepreneurial waters. Dean Venky understood that, and Tooey Courtemanche embodies it."

Courtemanche began by working in construction and was later a software engineer. He founded Procore in 2002 and has since grown it to over two thousand employees operating out of fourteen offices around the world. More than one million construction projects have run on the Procore platform, which is used daily by more than 1.3 million people in over 125 countries. Courtemanche has been credited by *Forbes* with building the Cloud's hottest technology "unicorn" by bringing software to construction sites.

"We were born in the cloud in 2002, and that's something I'm really proud of," he says. "The whole concept of Procore has always been to connect everybody in construction on a platform. There was no way we were



Craig "Tooey" Courtemanche's software has changed the construction industry.

going to do that if every client had to have its own server.

"But I knew how to deploy a cloud server, an ASP server, as it was known back in the day — and I knew how to create multi-tenancy [so that multiple users could work off one server simultaneously] — and it was something I was kind of passionate about," he continues. "It was a very new idea in the late nineties. I had seen it deployed in a company called Edify, and I thought, *What a novel way to work*. It was also way less expensive to buy one computer than to buy multiple servers and databases and everything else."

When the company began, Courtemanche and Procore president (and employee number two), Steve Zahm, would go to job sites to install internet Wi-Fi access points and routers so that the builders could use their software for \$95 a month.

"At the time, I was summarily known as being an idiot," Courtemanche laughs. "Who builds collaboration software for an industry that doesn't even have the internet? How is that even going to work?"

But then the iPhone and the iPad came out in 2007, and internet servers became common on job sites. "The advantages of being connected on the network were suddenly apparent," Courtemanche recalls. "Instead of logging data in job-site trailers, construction workers were actually collaborating with the data and using their device to get the job done. When we had twenty-three customers, we thought Procore would be this small business that we would use to do a cloud experiment. Looking back, we describe it as a business that went horribly right."

In receiving the Venky Award, Courtemanche said, "I am tremendously honored. I've lived in Santa Barbara for twenty years and have watched this award go to people I admire and look up to. For a guy who is a college dropout to receive this is kind of mind-blowing to me. It is really a special honor."

Courtemanche, who employs many UCSB graduates, says that he tells would-be entrepreneurs that being an entrepreneur is not the goal, but rather, what you do to accomplish the goal of bringing an idea to market. Other suggestions include, "Don't assume you know all the answers or know what you're doing; you don't. Don't be afraid of self-doubt. Ask a lot of questions of many different people. Raise enough money; no one ever raises enough money. Assume it's going to be harder and take longer than you would ever imagine."

And most important: start at the beach.

GPUs ACCELERATE RESEARCH

Researchers at UC Santa Barbara are already reaping the rewards of a new state-of-the-art graphics processing unit (GPU) computer cluster that was installed on campus in August. Originally designed to advance video games and on-screen three-dimensional rendering, GPUs are now powering scientific data processing and academic research, dramatically accelerating modeling and computations. Because it is specifically designed for basic mathematical operations and some codes, a GPU-based system can perform computations thirty to fifty times faster than conventional central processing unit (CPU) hardware can. GPUs are more efficient — performing multiple calculations simultaneously, while CPUs work through calculations a few at a time — and as a result have turbocharged computational research in a growing number of fields.

“This is a game-changer for researchers at UCSB,” said **Kris Delaney**, a co-principal investigator on the grant and project scientist with the Materials Research Laboratory (MRL).

The **Center for Scientific Computing (CSC)** at the California NanoSystems Institute (CNSI) at UC Santa Barbara and the MRL are managing and maintaining the new system, which was funded by a \$400,000 grant from the National Science Foundation to accelerate scientific computing. The upgrade includes twelve compute nodes, with each one supporting four high-end NVIDIA Tesla V100 GPUs that are equipped with hardware double-precision processing, large (32 GB) memory, and NVLink for fast inter-GPU communications. Ten of the nodes were added to the existing High Performance Computing (HPC) campus cluster “Pod,” which has three GPU nodes as part of its complement of computing nodes and is available to be used by all UCSB researchers. The two remaining nodes became part of the delocalized Pacific Research Platform Nautilus cluster, which connects a few dozen universities along the West Coast, including UCSB.

“The improvements of GPUs are happening very fast, so we need to be constantly upgrading equipment if we want to do the latest GPU-enabled research,” said CSC director, **Paul Weakliem**.

Nathan “Fuzzy” Rogers, CSC co-director, adds, “With many researchers restricted from working in their labs due to the COVID-19 pandemic, there has also been an increase in demand as they explore their research with new computational techniques.”

Faster computational speeds enable not only higher throughput, but also opportunities to address new research questions. The expansion will enhance efforts to develop novel bio-based materials in the new **BioPolymers, Automated Cellular Infrastructure, Flow, and Integrated Chemistry: Materials Innovation Platform** (BioPACIFIC MIP), a collaboration between UCSB and UC Los Angeles established with a \$23.7 million NSF grant. (Read more about the BioPACIFIC MIP in the special “FOCUS ON:” section, which begins on page 17.)

“These computing resources will support the computation, simulation, and data science aspects of BioPACIFIC, and they will be critical to the project’s success,” said **Tal Margalith**, CNSI’s executive director of technology and executive director of UCSB’s BioPACIFIC MIP operation.

The new cluster will also drive the development and application of novel computational research techniques in three specific projects associated with the grant.

One project, led by Delaney, is intended to develop a unique simulation methodology to predict the structures and



State-of-the-art nodes installed in the High Performance Computing campus cluster “Pod” in Elings Hall.

properties of complex polymer formulations found in various consumer products, including cosmetics, liquid soaps, detergents, and paints. The methodology, which also supports efforts of the BioPACIFIC MIP, bridges pioneering simulation techniques developed by UCSB chemical engineering professors **Glenn Fredrickson** and **M. Scott Shell**. (Read more about the techniques on page 22.) Computationally intensive simulations will be used to model the molecular structures and chemistry of new materials and suggest how design criteria can be met.

“By using the cutting-edge GPUs, very large simulations become more manageable,” said Delaney.

The new resources have also been directly coupled to a revolutionary microscope, the TriBeam, designed by materials professor **Tresa Pollock** and now being commercially manufactured by Thermo Fisher Scientific, the world’s leading microscope manufacturer. (Read more about the instrument on page 26). The new computer cluster will help to process the terabytes of imaging data generated by the TriBeam.

“These new processing capabilities will increase the fidelity of the data gathered and provide feedback for real-time instrument control, which will allow us to hone in on specific property-controlling features in materials,” said **McLean Echlin**, a research scientist in Pollock’s group.

The cluster has also allowed **Yufei Ding**, an assistant professor in the Computer Science Department, to process data in her research on machine learning and quantum computing. Ding’s group seeks to facilitate faster and more energy-efficient neural-network training and inference by minimizing the size of the network and modeling the associated architecture and framework.

“This new GPU cluster enables a tremendous amount of research to be completed that would not be done or would take too much time to fulfill,” said Ding.

The center estimates that up to three-fourths of the people using the expanded cluster will be UCSB students. The shared resource will also be available to high school and community college students and teachers who participate in campus-sponsored programs.