

SANTA CLARA UNIVERSITY

ENGINEERING NEWS

School of Engineering

DEAN'S MESSAGE

This April, our engineering seniors faced a particular strain of “spring fever,” a burning desire to finish their senior design projects, even while distanced from their teammates during a pandemic.

With all the changes the last year has brought our stalwart and intrepid students, the senior capstone requirement has remained unchanged—since 1935. Teams of seniors have worked all year to bring their projects to fruition and will present their work at the (virtual) Senior Design Conference, May 13.

The projects students tackled this year would have been unimaginable to their distant alumni predecessors. Even the terms used to describe the work—biowearables, IoT—would have been Greek, and words like *Bluetooth* and *cloud*, ubiquitous in current vernacular, confounding.

If our student projects are signposts of advancement, so, too, are other happenings within the School of Engineering. We just wrapped up successful searching in Computer Science and Engineering and in Electrical and Computer Engineering with four new outstanding faculty joining us next year. Big changes are also afoot as the landmark STEM facility on campus nears completion; read about that and more in this edition of *Engineering News*.

Elaine P. Scott, Ph.D. | Dean
School of Engineering

A CAMPUS WITHIN A CAMPUS COMES TO LIFE

Palm trees make SCU feel like home and now that these icons are lining the courtyard of the STEM building nearing completion in the center of campus, legions of engineering and science students will feel right at home as they explore unparalleled opportunities for interaction and collaboration in the new Sobrato Campus for Discovery and Innovation (SCDI), opening this fall. Inside, many labs are complete—fume hoods, benches, and shelving units have been installed, classrooms and offices are being outfitted, and faculty from the School of Engineering and the College of Arts and Sciences are nailing down policies and procedures for maximizing use of this transdisciplinary space.

As exciting as the new building is, Electrical and Computer Engineering Professor Shoba Krishnan points out that the new integrated STEM complex includes the adjacent Heafey-Bergin Hall buildings which will be transformed this summer into an interdisciplinary hub for computing and mathematics. New labs and experimentation spaces will facilitate student and faculty use of data analytics, simulation, and modeling to address the world's deeply complex problems.

“The School of Engineering’s existing interdisciplinary labs—Robotics Systems Lab, Frugal Innovation Hub, Latimer Energy Lab, BioInnovation and Design Lab—will all have significant homes within the STEM complex and the brand new Innovation Zone maker space is sure to be a favorite. It’s all really cool to see how the campus is spurring creativity, collaboration, and innovation, and it will be exciting to see how our STEM students will make these spaces home,” Krishnan said.

[Watch Imagining Tomorrow @ SCDI, a Virtual Tour.](#)



Photo by Sean Collins, SCU Interim Director, STEM Operations

Santa Clara University
School of Engineering

Inputs for Batch Reactor and CSTR

- V : volume of anode
- S_0 and X_0 : initial concentrations of urea and bacteria
- μ_{max} : maximum growth rate for *E. coli* DH5 α (pKAU17)
- K_s : saturation constant for *E. coli* DH5 α (pKAU17)
- D : dilution rate or space velocity
- $Y_{x/s}$, $Y_{p/s}$: yield coefficients
- q_p : specific growth rate of product formation

zoom

SCHOOL OF ENGINEERING
SENIOR DESIGN
CONFERENCE

May 13, 2021 | 2:15 P.M.

[MORE INFORMATION](#)

ENGINEERING WITH
A MISSION

SENIOR DESIGN SNAPSHOT

WITH MORE THAN 80 TEAMS FROM 6 ENGINEERING DISCIPLINES PRESENTING IN THIS YEAR'S SENIOR DESIGN CONFERENCE, THE RANGE OF PROJECTS RUNS THE GAMUT FROM BIOWEARABLES TO AGRIBOTS, AND FROM SAFE DRINKING WATER TO CYBERSECURITY.

In this year when wildfires, virtual healthcare, and media misinformation became daily concerns, our students turned their time and talents to solving these and so many more challenges. Here are a few examples, but you may find the full list of projects [here](#).

BIOENGINEERING

EnclIDE: Encellin Implant Delivery System

John DePalo, James Peterman, Isabelle Vidamo

Advisors: Ashley Kim, Verna Rodriguez

We set out to develop a minimally invasive subdermal implant delivery system to deposit Encellin's therapeutic device for the treatment of Type 1 diabetes. Following an initial incision in the forearm, our tool dispenses the implant at a standardized depth and orientation in an effort to reduce procedural variability and associated patient risks.

CIVIL, ENVIRONMENTAL, AND SUSTAINABLE ENGINEERING

Water Treatment Solutions for Wildfire Impacted Watersheds

Michael Reyes, Jackson Shank, Mai Sinada, David Villani

Advisor: Aria Amirbahman

In watersheds affected by wildfires, contaminants are delivered to water treatment plants or supply reservoirs at extreme and unmanageable concentrations. To assist treatment plants in St. Helena, California, this team proposed solutions targeting the removal of sediments, increased nitrates, and fire-retardant chemicals from runoff.

COMPUTER SCIENCE AND ENGINEERING

Alzheimer's Disease Diagnostic Support Tool

Chelsea Fernandes, Aiyushi Kumar, Shreya Venkatesh

Advisors: Ahmed Amer, Julia Scott (BioInnovation and Design Lab)

This project aims to develop a web-based diagnostic support tool physicians can use in a clinical setting to increase the efficiency and accuracy of diagnosing Alzheimer's Disease. Their solution uses a machine learning model to classify patients into one of three possible stages of Alzheimer's Disease using multiple clinical parameters.

ELECTRICAL AND COMPUTER ENGINEERING

Telehealth Sensor Authentication Through Memory Chip Variability

Gordon Holden, Calvin Kimbro, Thomas Lyp

Advisor: Fatemeh Tehranipoor

As the world of remote patient monitoring grows, so too does the threat of malicious third parties abusing remote sensor security vulnerabilities. The focus of our research is to find hardware components and processes that can be used for security purposes. The research is especially applicable for remote sensors and IoT devices.

GENERAL ENGINEERING

Dynamic Solar Shading System

Walker Battey, Alexander Kravtsov

Advisor: Jes Kuczynski

This team is creating a Dynamic Solar Shading mechanism for SCU's Kids on Campus daycare playground to reduce the exposure of dangerous UV-light on children's skin. The solar-powered system is designed to be fully-automated and virtually maintenance cost-free.

INTERDISCIPLINARY ENGINEERING

Adaptive Robotic Chassis (ARC): RoboCrop A Smart Agricultural Robot Toolset

Brooke Broszus, Steven Bucher, Alejandro Gutierrez, Krissy Ikeda, Ariana Low

Advisor: Christopher Kitts

Addressing critical labor shortages in agriculture, the RoboCrop team is developing a modular system supporting agricultural tasks such as pruning strawberry flowers. This system is being integrated with an agricultural rover prototyped by a previous capstone team and being refined and fielded by a research team in the [Robotics Systems Lab](#).

MECHANICAL ENGINEERING

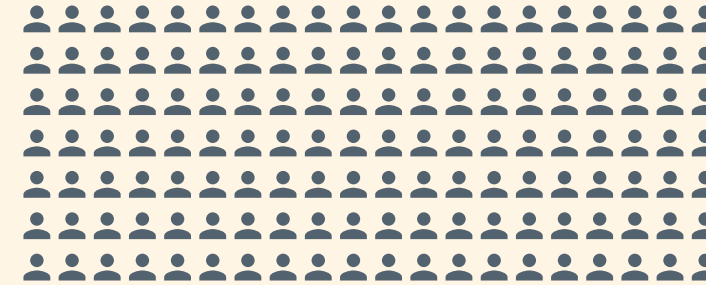
The Drier Dryer

Daniel Anderson, Justin Lee, Thomas Morey, Josh Sunada

Advisor: Hohyun Lee

Increasing the efficiency of a dryer by removing moisture from the incoming air is the aim of this project. Minimizing the air's relative humidity will maximize the amount of water that can be removed from clothes, thereby reducing the dryer's operating time and increasing its efficiency.

235 Students



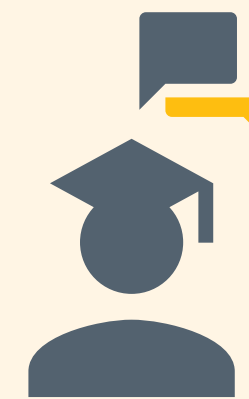
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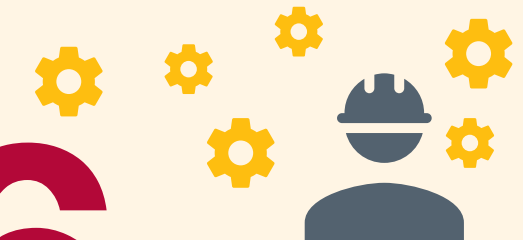
Project Teams

42

Academic Advisors



6 Engineering Disciplines



FROM DESIGN TO DEPLOYMENT

One of last year's projects, Omwana Thrive—developed in the [Frugal Innovation Hub](#) and designed to help decrease the infant mortality rate in sub-Saharan Africa—was successfully deployed in Uganda last fall. While students were unable to travel due to the pandemic, FIH's partner, Rose Academies, was able to launch the app in country, with community workers teaching mothers how to use it.

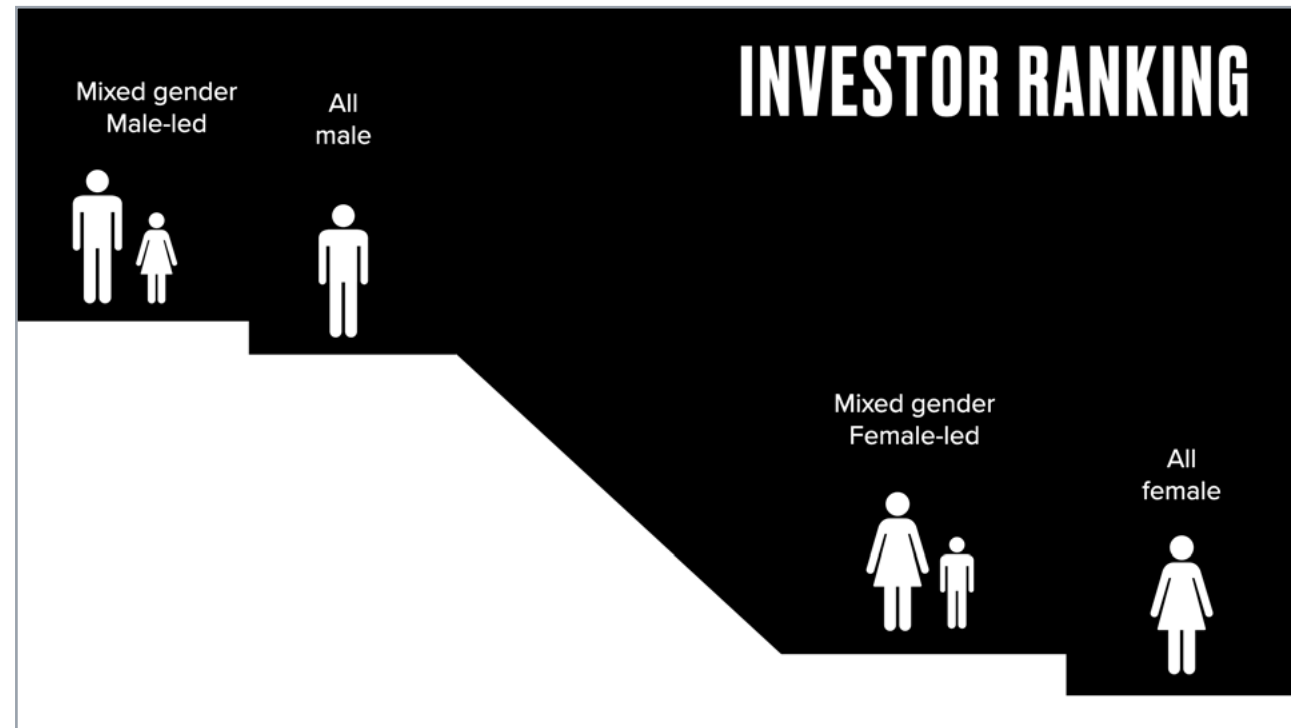


CLOSING THE GENDER GAP IN VC FUNDING

When it comes to securing venture capital for a burgeoning startup, it turns out that having a Y chromosome pays off. In fact, despite well-intentioned efforts to even the playing field, funding for female entrepreneurs is on the decline.

Seeking to “demystify how bias against women in venture manifests,” Margareta (Maya) Ackerman, assistant professor of computer science and engineering, a Silicon Valley Business Journal “Woman of Influence,” and her team of student researchers studied 48,000 companies on Crunchbase to look for patterns of gender bias in VC funding. Taking it a step further, they developed and applied machine-learning models to predict funding success beyond seed stage.

“Our findings showed that investors prefer men not only when all other factors are equal, but rather, highly qualified women are turned away in favor of less qualified men. Simply put, if you’d like to raise money, the best thing you can do is to be a guy,” Ackerman said.



Maya Ackerman, Computer Science and Engineering Assistant Professor

As Step One in changing the system, Ackerman recommends forming VC firms mandated to invest in female-founded companies led by female CEOs. “Investing in women-led, mixed-gender teams should allow investors to benefit from the performance boost of gender diversity, while helping to correct the long-standing bias against female business leaders,” she said.

Ackerman and her team recently published their research at the EAI Intetain 2020 Conference ([find it here](#)). Plans are underway to expand on their work with a multi-year project focused on studying and correcting not only gender, but also racial bias in startup funding.

[Read a summary of Dr. Ackerman's work here.](#)

MODELING THE FUTURE OF BIOPHARMACEUTICAL MANUFACTURING

OVER THE PAST YEAR, AS WE WATCHED THE NUMBERS OF COVID-19 CASES SKYROCKET, THE IMPORTANCE OF BRINGING A SAFE AND EFFECTIVE VACCINE TO MARKET AS QUICKLY AS POSSIBLE HAS BECOME ABUNDANTLY CLEAR.

Massive strides in biological research have come, in part, from the use of advanced data analytics, and trends indicate that a digital transformation in the bioprocessing and manufacture of these new discoveries is also in the offing. Improving the way scientists and engineers are trained for this revolution can hasten progress.

To address this opportunity, Santa Clara University has partnered with Genentech to create the West Coast Biomanufacturing Consortium for Analytics and Data engineering (BioCAD). Funded by a \$300,000 grant from the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), a primary goal of BioCAD is to upskill working engineers and scientists, enabling them to make data-informed manufacturing decisions.

With bootcamps to broaden local engineers’ knowledge and skills already in the works, the long-term vision is to build toward an industry-academic consortium that supports multiple training and education needs related to data analytics across West Coast biopharmaceutical manufacturing hubs and around the world.

[Read much more about BioCAD here.](#)



“BY INCLUDING DATA ANALYTICS AND ENGINEERING AS A PART OF WORKFORCE TRAINING PROGRAMS, AND EQUIPPING THE CURRENT AND EMERGING WORKFORCE WITH NEW SKILLS, THE POTENTIAL GAINS IN QUALITY, PRODUCTIVITY, COST-EFFICIENCY, AND SPEED-TO-MARKET CAN BE REALIZED.”

Prashanth Asuri

Associate Professor of Bioengineering
Director of the BioInnovation and Design Lab
NIIMBL Grant Primary Investigator



NEW SCHOLARSHIPS ADDRESS PANDEMIC INEQUITIES



A year ago, when universities around the world closed their campuses to try to stem the spread of COVID-19, everyone felt the pain. But some felt it more deeply.

Many students of color, women, low-income, and working-class students in the Santa Clara community reported a lack of access to campus computers and high-speed internet, as well as difficulty paying for tuition, books, food and housing now that their campus or off-campus jobs were also lost.

“In times of COVID-19 financial support of our underrepresented students is particularly important. The pandemic has shown the inequities in our country and the School of Engineering is addressing that with four new scholarship funds established to help recruit, retain, and educate underrepresented students,” said Elaine P. Scott, School of Engineering Dean.

“It is incumbent upon us to help where we can. Women and students of color often don’t have the safety net nor the financial cushion needed to respond to an unexpected upheaval such as what we have experienced over the past year, and the emotional toll levied by financial instability makes learning a far greater challenge for these students,” said Dean Scott.

Much gratitude to our alums: Renee (Bader) Niemi '86 helped launch the Women in Engineering Excellence Scholarship, and Joseph Harkins '76 seeded the School of Engineering Diversity, Equity, and Inclusion Scholarship.

If you would like to support one of these new funds, please visit our [Giving Page](#).

THE SCHOOL OF ENGINEERING HAS RECEIVED BRONZE LEVEL RECOGNITION FOR THE ASEE DIVERSITY RECOGNITION PROGRAM

for “significant, measurable progress in increasing the diversity, inclusion, and degree attainment outcomes.” While this marks achievement, we pledge to continue our **diversity, equity, and inclusion efforts** to make SCU Engineering a more welcoming and supportive environment for all.



EXPANDING THE PICTURE OF SUCCESS

“YOU CAN’T BE WHAT YOU CAN’T SEE.”

MARIAN WRIGHT EDELMAN

“It can be a challenge to envision your own career success when you don’t see leaders in your field who look like you,” said Electrical and Computer Engineering Professor Tokunbo Ogunfunmi. To help bring that image of success into focus, Ogunfunmi created a new speaker series that launched this spring. The Diversity, Equity, and Inclusion Distinguished Lecture Series shines a light on what’s possible and inspires the next generation of STEM professionals with quarterly presentations by successful underrepresented engineering leaders. Guest lecturers from industry, academia, and research share their experience of overcoming obstacles and lessons learned throughout their careers and offer their thoughts on how to increase diversity, equity, and inclusion in STEM.

[More information here.](#)



Tokunbo Ogunfunmi

Professor, Electrical and Computer Engineering

Advisor, National Society of Black Engineers Student Chapter



BUILDING CONNECTION

Chief among the many benefits of a Santa Clara engineering education is the network of alumni/ae and affiliated Silicon Valley industry leaders who can help pave the way for our students and graduates. But tapping into that network can be daunting for someone fresh out of high school, or even for graduate students or alums—especially those traditionally underrepresented in engineering.

To foster a sense of community and strengthen our SCU network, the School of Engineering has started a new Diversity, Equity, and Inclusion Speaker Series: Engineering Connections.

The idea for the series originated from the School’s **Engineering Advisory Board (EAB)**. Last year, a working group within the EAB was established to address diversity, equity, and inclusion issues in engineering. Comprised of faculty, alumni/ae, and staff, the group’s work focuses on issues related to women and other underrepresented groups in engineering, from pre-college through graduation and entering the workforce.

“These issues are extremely important to our students, our campus, and the nation overall. I am so grateful for the work the EAB is doing to build stronger ties within our community and for their generosity in sharing their knowledge and experience with our Bronco engineers,” said School of Engineering Dean Elaine P. Scott.

The first interactive session, “The Importance of Networking and Building Your Personal Support System,” was held in April. Check [our website](#) for future events.



WHAT’S GENDER GOT TO DO WITH SOLVING THE WORLD’S PROBLEMS

Plenty, says Bonita Banducci, who teaches Gender and Engineering for the School of Engineering Graduate Program and is an in-demand speaker and Silicon Valley consultant.

“IMAGINE WHAT THE WORLD COULD BE LIKE WITH FULL PARTNERSHIP OF MEN AND WOMEN AND THE FULL SPECTRUM OF GENDER FROM ALL CULTURES, BRINGING THE VALUE OF THEIR INDIVIDUALISTIC AND RELATIONAL COMPETENCIES TO THE DECISION-MAKING TABLES AROUND THE WORLD. IMAGINE MEN AND WOMEN IN 50/50 PARTNERSHIP CREATING A WORLD OF PEACE, PROSPERITY, AND PARTNERSHIP, IN HARMONY WITH NATURE.”

- BONITA BANDUCCI



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The Jesuit University in Silicon Valley

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ACADEMICIAN ACCOLADES

The School of Engineering honors top faculty on an annual basis with awards for both teaching and research. **Congratulations to the 2020-2021 academic year award winners!**

Award for Teaching Excellence

 **Michael Taylor**
Mechanical Engineering

- » During a year of remote teaching brought on by a global pandemic, undergraduate and graduate students praised Michael Taylor for his adaptability, helpfulness, patience, and optimism. Dedicated to excellence in his department, he also led the development of a new graduate concentration, "Theoretical and Computational Mechanics."




Researcher of the Year

 **Biao "Bill" Lu**
Bioengineering

- » An M.D. and a Ph.D., Dr. Lu has extensive expertise in multiple disciplines spanning molecular and cellular biology, biochemistry, genetics, and medicine. His research program, impactful and well-aligned with Santa Clara's mission, focuses on engineering nano-carriers for drug delivery and therapy to treat cancers, hereditary diseases, and viral infections.




Adjunct Lecturer of the Year

 **Lanny Vincent**
General Engineering

- » With 40 years of industry experience in technology management and innovation consulting and a Master's Degree of Divinity, Lanny Vincent brings a wealth of experience to the classroom. He also contributes greatly to the School through compelling research, investigating the intersection of Jesuit principles with innovation and entrepreneurship.



Gerald E. Markle Award

 **Sergio Zarantonello**
Applied Mathematics

- » Sergio Zarantonello's career spans over forty years in academia and industry. Having published over thirty peer-reviewed articles in pure, applied, and computational mathematics and serving as Principal Investigator on research projects funded by the Department of Energy and the National Science Foundation, he is also dedicated to Jesuit education.

