



SCHOOL OF BIOMEDICAL ENGINEERING

COLORADO STATE UNIVERSITY



Students
introduce Direct
Socket
technology to
ROMP.

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In the news:
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Two new
members are
asked to join the
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Volume 9, Issue 2 Fall 2021

MESSAGE FROM THE DIRECTORS

Programs Helping Build Clinical and Cultural Awareness

At the Colorado State University School of Biomedical Engineering, we always seek new opportunities to enhance students' biomedical engineering skills in the context of clinical and cultural awareness. Two areas in which we are making significant impacts are growing opportunities in clinical environments and in global environments. Students have greatly valued their experiences in high tech hospital settings and low tech international challenges like the study abroad course in Ecuador. Cultural characteristics play critical roles in understanding engineering problems and in exploring new designs for medical devices and engineering solutions.

For the past four years, a select number of students have had the unique opportunity to participate in clinical simulations for high-level emergency situations at the University of Colorado Health Clinical Education and Innovation Center. Through the Clinical Immersion Program, our students also observe medical procedures such as joint replacements, bone fracture repairs, and open-heart bypass surgeries at the University of Colorado Health Medical Center of the Rockies. These clinical experiences help BME students understand the environment, needs, and constraints that must be considered for successful design of medical devices.

Thanks to a training grant from the National Institute of Biomedical Imaging and Bioengineering of the National Institutes of Health to Drs. Julie Dunn and Ellen Brennan-Pierce, this seven-week summer program offers support to seven interns and up to nine volunteers. To continue and expand this extraordinary program, we set up a [Clinical Immersion Fund Endowment](#) which will allow us to continue this hands-on experience and create similar extracurricular opportunities to supplement classroom

education well into the future.

While we can provide hands-on experiences to students in Colorado, industry is increasingly conducted globally. A number of our alumni and advisors in their industry positions have found themselves either traveling to other countries or doing significant amounts of global work remotely. The pandemic has provided significantly more experience in the world of remote work. To train BME students on global health challenges and how other countries create innovative engineering solutions, we are creating an experimental Global Classroom. This class is designed to improve students' cultural competence readiness, connect science to practice, and better prepare them for the future workforce.

International partner institutions in India, Brazil, and Rwanda will provide unique perspectives in biomedical engineering needs and how to solve them in different environments. A recent study completed by our undergraduate advisors indicates that 70 percent of our students are interested in taking this course. In some cases, may lead to them considering potential options for conducting some of their studies abroad.

If you have an idea for how we can provide more cross-cultural (medical or global) opportunities, please reach out to us via email at Stuart.Tobet@colostate.edu and Ketul.Popat@colostate.edu.

Dr. Stuart Tobet
Director, SBME

Dr. Ketul Popat
Director, Undergraduate Programs

CONGRATULATIONS TO THE CLASS OF 2021!

Bachelor of Science in Biomedical Engineering and Mechanical Engineering

Michelle Bailey
Logan Blakeslee
Diana Boll
Sarah Burke
Dominic Castillo
Brandon Cook
Christina Croal
Joanna Dunne
Erin Estrada
Logan Farrand
Kimberli Fernandez
Jack Fleischmann
Jordan Fox
Kalley Harriss
Emily Hoffmann
Chad Kennedy
Brooke Landoch
Katrina Lems
Adam McAuliffe
Tara Mensch
Meghan Morrill
Avi Nataf
Elise Ng
Gabriel Perez
Sydney Sherrick
Brandon Tighe
Grace VanOrman
Harvinder Singh Virk

Bachelor of Science in Biomedical Engineering and Electrical Engineering

Katie Brown
Sainandan Gowdar
Nate Haswell
Ethan Lash
Alfredo Macha
Janaye Matthews

Faith Otieno
Kaitie Wood

Bachelor of Science in Biomedical Engineering and Chemical and Biological Engineering

Jorge Arriaga
Alyssa Caldwell-McGee
Patrick Charlton
Joshua Cook
Katie Davis
Sarah Easton
Benjamin Farkas
Katie Gaughan
Greta Gohring
Steven Hsu
Dezmond Jeans
Rachel Keating
Cerine Khoo
Mallory Knudsen
Hannah Mabry
Megan Maier
Stuart McKnight
Camille Milo
Logan Munson
Sean O'Connell
Dillon Roach
Jacob Stewart
Tracey Wick
Sandra Witta
Trevor Woodruff
Lexia Wyse

Master of Engineering - Biomedical Engineering Specialization

Andrew Bristol
Logan Cannon
Will Clawson
Bailey Coker

Alyiah Hilton
Will McCormick
Hasan Salem
Mark Stimach

Master of Engineering Online - Biomedical Engineering Specialization

Ammani Al-Yousifi
Christi Fiske
Kelly Hutchins
Brooke Marvel
Deep Pal
Jessica Trostel
Marlene Waterman

Master of Science, Bioengineering

Brad Brightbill

Doctor of Philosophy, Bioengineering

Kristen Van Eaton
Sidhartha Jain
Jessi Vlcek
Tara Wigmosta
Jake Wolynski



2021/22 SCHOLARSHIP WINNERS

Joan C. King Memorial Scholarship



Leslie DeLay is a fifth-year Honors undergraduate student majoring in Biomedical Engineering and Mechanical Engineering. She hopes to pursue a career in the medical device field. One of Leslie's goals is to help provide access to mobility to underprivileged communities. Throughout her undergraduate degree, Leslie was an active member of the Chi Omega sorority, where she was nominated Model Initiate and served as vice president. As a sophomore, Leslie participated in a short-term study abroad program in which she and a group of CSU students teamed up with the non-profit Range of Motion Project to design custom-fit prosthetics for underserved Ecuadorian patients.

Brandon Lowry is a proud first-generation, nontraditional transfer student working toward a Bachelor of Science in biomedical science. Brandon is a passionate advocate for social justice and an ally to his fellow LGBTQIA+ community members at CSU. Having served as an ASCSU Senator for the Pride Resource Center over the last year, Brandon is excited to continue his work in student government as the 2021-2022 ASCSU Director of Academics. He will continue his education by pursuing a Ph.D. in biomedical sciences at CSU, with a career goal of eventually teaching anatomy in medical school programs.

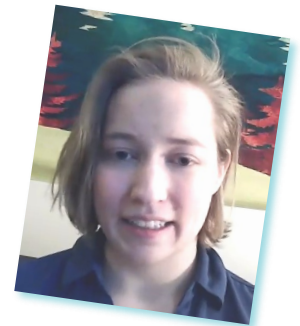


SBME Scholarship for Leadership and Innovation



Michelle Hefner (BME+CBE) has served as the president for the Society of Hispanic Professional Engineers (SHPE) since 2019. She also serves as an Engineering Student Ambassador. Michelle makes a big impact helping other students as an organic chemistry peer tutor and a Calculus II learning assistant.

Amy Kiesling (BME+CBE) has served on the executive board of the Biomedical Engineering Society student chapter since her first year at CSU and has continued to take on roles with increased responsibility. She is currently the BMES chapter president and has taken on the challenge of conducting unique virtual events during the COVID crisis. One memorable event was a virtual outreach experience for middle school students.



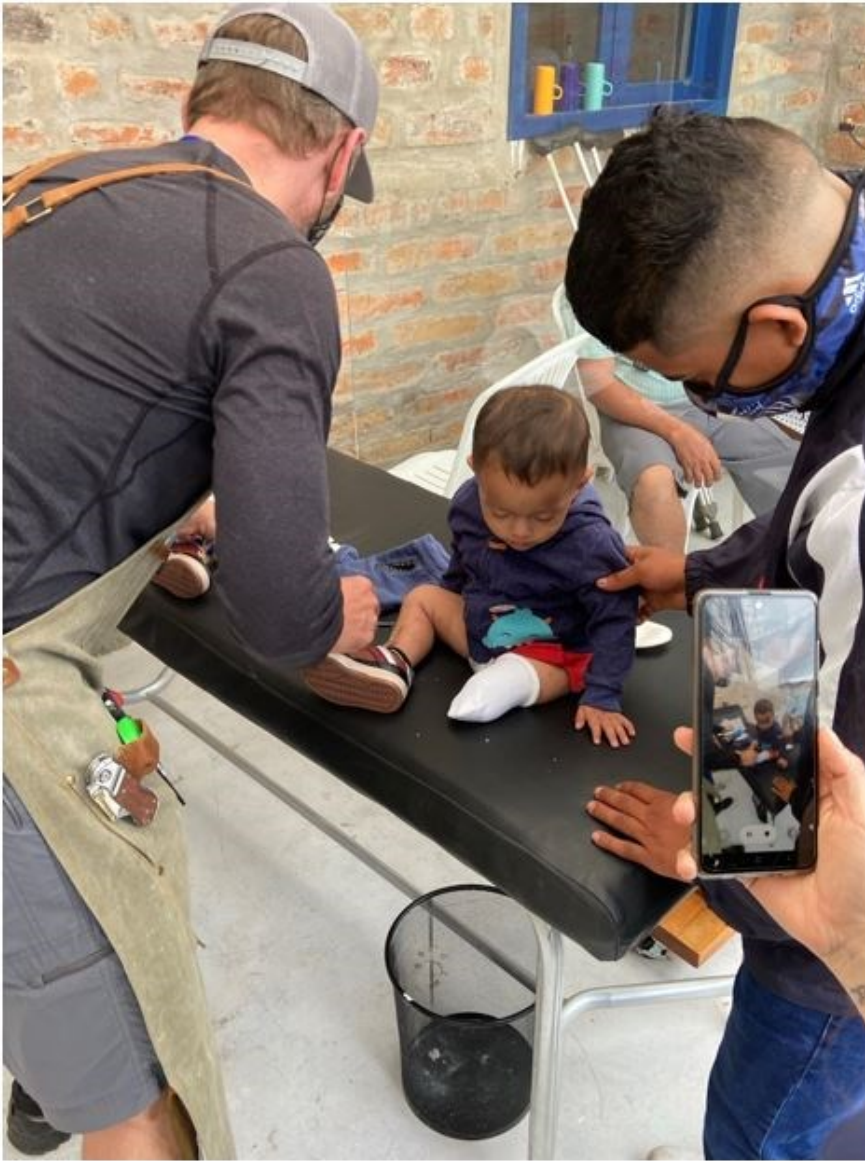
Dorothy and Dennis Bruner Biomedical Engineering Scholarship



Jaiden Oropallo is this year's Dorothy and Dennis Bruner Biomedical Engineering Scholarship recipient. This annual \$2,500 scholarship was created to support any undergraduate or graduate student pursuing a degree in biomedical engineering or bioengineering. Oropallo is currently pursuing a Ph.D. in Bioengineering. He has a background in vascular tissue engineering and received his Bachelor of Science in biomedical engineering with a minor in chemistry from the Florida Institute of Technology. He works with Dr. Christian Puttlitz in the Orthopaedic Bioengineering Research Laboratory.

BME Students Bring New Innovation to Ecuador

By Michael Benedict



In the second half of 2021, many of us have breathed a sigh of relief as *some* things return to normal: get-togethers with friends, family plans for the holidays, restaurants re-opening and more. Around SBME, things are opening back up too: faculty and staff have returned to their offices, and students are back in classrooms. Another important aspect of SBME has returned as well: BIOM 350 — Prosthetics in Ecuador.

This study-abroad course takes BME students on a trip to Quito, Ecuador, where they practice their biomedical engineering skills in a real-world environment. As [explained by CSU Education Abroad](#), students “learn about prosthetic design and fabrication, function, and delivery to difficult-to-reach populations. In partnership with the Range of Motion Project (ROMP), a non-profit for-impact healthcare organization, participants design and test prosthetic technology in a low-resource setting alongside ROMP personnel and clinicians.” Such an experience would be valuable to engineering students no matter where it took place, but the location is another perk of the experience — students “work in clinics and dev-labs at the

14-month-old Joshua was one of 16 clients who was fitted with a prosthetic.

Fundación Hermano Miguel in Quito and have a weekend excursion to the Ecuadorian countryside.” Sadly, the trip was cancelled in 2020 due to the COVID-19 pandemic. Thankfully, it returned in 2021.

Studying ideas in classrooms is one thing, and testing those ideas in labs is another — doing actual, hands-on work with clients in dire need of help takes education to a whole new level. Kalaina Stroyan, a third-year BME+MECH student, explains the difference: “I have struggled in the past [with] how far removed my work was from that human impact. [In Ecuador] I was working directly with patients, creating prosthetics for them, and getting to connect and share stories and experience. That connection is what has drawn me to this field the most and made me realize this is the direction I now want to be heading in.” The experience also impacted the career path of Katie Evans, a fourth-year BME+MECH student: “this definitely made me realize that I love... building prosthetics. I enjoyed learning from the resident prosthetists about how they build these devices, which fits closely with the R&D process of the prosthetic industry.”

Of course the COVID-19 pandemic is ongoing, and its effects were certainly felt in Ecuador: In the past, about 20 students have made the trip — this year, as a precaution, it was scaled back to 14. Masks were a constant, and much of the work was undertaken outdoors. The course's Program Leaders always include an SBME professor and an SBME staff member — this year, those roles were filled by Dr. Kevin Lear, a professor in BME and Electrical and Computer Engineering, and Brett Eppich Beal, SBME's senior academic advisor. As Beal explains, the COVID-19 risks were navigated successfully: "for me, as a program coordinator, it was amazing that our travel was flawless: no one got sick... and we all tested covid negative for the trip home." In the end, managing the risks and making the trip was absolutely worth it, for reasons Beal makes clear: "ROMP organized 16 clients to attend the clinic; all received below-knee prosthetics; and all 16 walked by the end of the week. Yes. 16 people walked. It was amazing."



CSU biomedical engineering students with ROMP staff and prosthetic recipients.

Despite all the challenges, a new innovation was even introduced this year: the new-to-ROMP "Direct Socket" technology. As Dr. Lear explains, the traditional ROMP prosthetic process is "time-consuming [and] requires large equipment, handling of very hot plastic, and multiple plaster molding steps." The new technology, on the other hand, "directly forms a socket around the patient's residual limb without requiring any plaster molding or handling of hot plastic." A great additional perk is the time saved by this new process — according to Dr. Lear, "While the traditional plaster casting process typically takes multiple days to produce a prosthetic socket, the direct-socket system can be completed in a couple of hours."

Experiencing the rich culture, cuisine, and beauty of Quito is something students always greatly enjoy. But perhaps the greatest aspect of the trip is the very tangible effect their work has on the lives of the clients. Dr. Lear says that witnessing "students' compassion and skills applied to bettering the patients' lives left indelible memories in mind and heart." The feeling was the same among the students themselves — according to Evans, "The most impactful part, the thing that I will remember 20 years from now, was the very first time that every patient was able to stand up and take their first steps. The joy that you see in each of their faces." Stroyan echoes those sentiments: "I remember that the dad of Joshua, the 14-month-old boy who got his first prosthetic, told us thank you for letting him see his son's first steps, and every time I think about that moment it reminds me why I love this field and why all the hard work is worth it."

It's a poignant reminder of the powerful impact biomedical engineering can have on human lives. SBME is grateful to continue offering the Prosthetics in Ecuador course, even during these trying times — for the great educational benefits it has for our students, and for the changes it makes in the lives of those in need.

SBME NEWS BRIEFS

New research center paves way for CSU's leadership in cannabinoid science

By Anne Manning

Melissa Reynolds, a professor in the Department of Chemistry and the School of Biomedical Engineering as well as the director of the new Panacea Life Sciences Cannabinoid Research Center, says that cannabinoids are a fascinating, relatively untapped area of analytical and materials chemistry. CSU possesses a wide variety of expertise to lead in cannabinoid research, Reynolds said.

"People will say, 'Well, this particular cannabinoid is good for – blank,'" Reynolds said. "Do we have any data for that? Is that data reliable? There's a good understanding out there that it's not – that the scientific evidence for the claim is pretty hit or miss. So, we're trying now to develop various studies to answer key questions about key cannabinoids, to really look at their potency and their efficacy for various applications."

Having a central resource that allows researchers across campus to access cutting-edge equipment and create synergies will be essential to bolstering CSU's reputation as a leader in cannabinoid research and biology, according to Reynolds.

Full story: <https://natsci.source.colostate.edu/new-research-center-paves-way-for-csus-leadership-in-cannabinoid-science/>

Looking to get your Ph.D. in Bioengineering?



The School of Biomedical Engineering is waiving its application fee for Ph.D. applicants.

Our Ph.D. in Bioengineering offers a versatile focus on improving health, fighting disease, and aiding persons with disabilities. With interdisciplinary faculty, our graduate programs combine strengths in veterinary medicine, engineering, and the sciences.

If you are interested in applying for admission to the Ph.D. Bioengineering program and wish to begin in Fall 2022, you must submit your application no later than January 15, 2022.

If you plan on applying to multiple schools, applying to a graduate school with no application fee is a great way to save money.

Learn more about the Ph.D. program at <https://www.engr.colostate.edu/sbme/graduate-programs/>

To apply, visit <https://gradadmissions.colostate.edu/apply/>

BME alumnus serves as president of the Colorado Professional Chapter of SHPE



Luis Fernando Monterrosa graduated from CSU in 2020 with a Bachelor of Science in biomedical engineering and mechanical engineering. He now serves as the 2021-2022 President of the Colorado Professional Chapter of the Society of Hispanic Professional Engineers (SHPE).

After graduating from CSU, he joined Medtronic where he worked as a test engineer. Now, he is participating in a leadership program with the Korn Ferry Foundation.

Monterrosa was heavily involved with SHPE as a student. According to SHPE Colorado, "He is involved with SHPE because he believes in the vision of empowering Hispanics and Latinos to become the next leaders of the STEM fields and provide the next generation with role models they can relate to and be inspired by."

SHPE began in 1974 with a cohort of fellow Hispanic engineers. Now, SHPE serves more than 13,000 members and runs hundreds of student and professional chapters in colleges and universities.

Learn more about SHPE at <http://www.shpe.org>

Getting to the heart of the matter, with COVID-19 patients

By Anne Manning

COVID-19 is a respiratory illness that can lead to lung failure, requiring some patients to be sedated and placed on mechanical ventilation.

Helping extremely ill patients like this is the motivation behind a new study led by Jennifer Mueller, a professor in the Department of Mathematics and the School of Biomedical Engineering, and a Professor Laureate in the College of Natural Sciences. Mueller specializes in a noninvasive pulmonary imaging technology called Electrical Impedance Tomography, and her goal is to help patients receive more targeted care and have better chances of recovery.

As part of the study, Mueller is also partnering with the chair of the SBME Industry Advisory Board, Dr. Julie Dunn, who serves as the medical director at the UHealth Medical Center of the Rockies. There, Dunn will lead imaging of patients suspected of having a pulmonary embolism, or a blood clot in the lung, in order to validate EIT for computing ventilation perfusion ratios. These are measures of how well both air and blood are reaching the lungs.

Full Story: <https://natsci.source.colostate.edu/getting-to-the-heart-of-the-matter-with-covid-19-patients/>

NEW SBME ADVISORY BOARD MEMBERS



Gregory Florant

Dr. Florant's research interests are centered on the mechanisms that animals use to adapt to different situations. At a young age, he became interested in falconry and began raising and taking care of birds. Additionally, Florant attempted to learn as much as possible about these animals and

strove to increase his knowledge through reading. As a young man, Florant worked at a local animal hospital and then at the Palo Alto Junior Museum & Zoo. The latter job had an especially strong influence on him and helped to nurture his scientific interests. His childhood fascination with the natural world led him to wonder how animals respond, survive, reproduce, and evolve in changing environments—Florant would eventually dedicate his life's work to answering these formative questions as a biology professor at Colorado State.

Florant has remained in the environmental field for many years. He cites his work on the effects of fatty acids on animal hibernation and his research on animal thermoregulation at very low temperatures as career achievements. Elected as a fellow to the American Association for the Advancement of Science, he has received two Fulbright scholarships and published articles for five decades. Though funding continues to be an obstacle for many people interested in pursuing careers in environmental science, Florant provides opportunities through various mentoring programs. He is a Ford Fellows liaison for all minorities in three Midwestern states and is also a mentor in association with the National Institutes of Health. He continues to use his knowledge and experience as a model to encourage minorities to pursue their dreams in science.

Simon Prakash

Simon Prakash is the Executive Vice President of Product at EXO, a medical device company focused on bringing a high-quality handheld ultrasound device into the hands of the many and unconstrained from the walls of the clinic or hospital. Simon leads a team of engineers developing the proprietary pMUT technology as well as the final product. The goal is to put immediate medical imaging in the hands of providers anywhere and everywhere.

Simon recently left AliveCor, a startup in Mountain View, where his purpose as CTO was to make a difference in peoples' health. There he led the development of multiple consumer-friendly, FDA-approved EKG devices with AI algorithms. By getting actionable health data into the hands of the consumer, AliveCor has improved and saved many of their consumers' lives.

Simon previously served as the Senior Director of Product Hardware Development at Google where he led the design and development of the current and future versions of Google Glass as well as defining other future products. During his tenure at Google he was responsible for product development, technology pathfinding, and started the reliability, battery, safety, and quality teams within Google X.

Simon earned his Bachelor of Science in Mechanical Engineering from Colorado State University and his Master of Business Administration from the University of Colorado. He has presented at several IEEE and ASME conferences including Wearables, IoT, component packaging, silicon architecture, thermal design, and reliability.



THE COMPANY WE KEEP

Each semester, the School of Biomedical Engineering invites distinguished guests from around the world to speak on biomedical engineering research and related disciplines for its weekly seminar series. The Spring 2021 speakers included:

UNIVERSITY OF CALIFORNIA, BERKELEY

Dr. Sanjay Kumar

Engineering Approaches Yield New Insights into Invasive Brain Tumors

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

Dr. Matthew McCullough

Improving Degradable Orthopaedic Devices Using Finite Element Analysis

THE TECHNION—ISRAEL INSTITUTE OF TECHNOLOGY

Dr. Yoav Shechtman

Next Generation Localization Microscopy—or—How and Why to Ruin a Perfectly Good Microscope

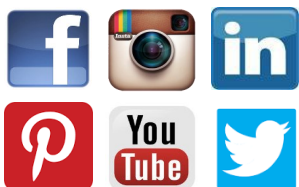


**SCHOOL OF BIOMEDICAL
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FIND US ON:



SAVE THE DATES

NOVEMBER 2021

SBME Seminar: Dr. Keyser, University of Cambridge

Nov. 8 | Virtual—MS Teams | 1:00-1:50 p.m.

<https://www.engr.colostate.edu/sbme/seminar-series/>

M.E. and M.E. Online Application Deadlines

Nov. 15 | <https://gradadmissions.colostate.edu/apply>

DECEMBER 2021

SBME Seminar: Dr. Fischenich, University of Colorado

Dec. 6 | Virtual—MS Teams | 1:00-1:50 p.m.

<https://www.engr.colostate.edu/sbme/seminar-series/>

SPRING SEMESTER 2022

JANUARY 2022

Ph.D. and M.S. Fall 2022 Application Deadline

Jan. 15 | <https://gradadmissions.colostate.edu/apply>

APRIL 2022

Engineering Days (E-Days)

Apr. 22 | Lory Student Center | All-Day

SCHOLARSHIPS

Scholarship support at all levels provides critical aid to our students. We strive to help as many students as possible with the financial obligations of their engineering education.

Donate to an SBME scholarship today and know that your gift will make an impact for years to come.

<https://advancing.colostate.edu/SBME>

Biomedical Engineering Alumni Scholarship

Dorothy and Dennis Bruner Biomedical Engineering Scholarship

Joan C. King-Tobet Memorial Scholarship

Samson Design Biotechnology Innovation Scholarship

SBME Scholarship for Leadership and Innovation

