



SCHOOL OF BIOMEDICAL ENGINEERING

COLORADO STATE UNIVERSITY



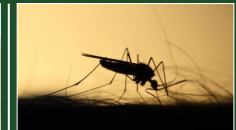
Biomedical
industry and
healthcare in
Portugal.

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Remarkable
achievement of
SBME alumnus
Brandon Tighe.

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Tracking disease-
carrying
mosquitoes with
DNA barcodes.

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MESSAGE FROM THE DIRECTOR

The One Constant in Universities is Change

With Spring 2023 coming to a close and the Fall 2023 semester on the horizon, there are a few changes that have come to fruition for [CSU's School of Biomedical Engineering \(SBME\)](#), including saying goodbye to one of our long-time advisors (Deb Misuraca), welcoming a new Undergraduate Advisor to the SBME team (Chase Jackson), welcoming our new Program Development, Communications, and Department Administrator to the SBME team (Marianne LaCount).

The SBME Executive Oversight Board has also added three new members including the new [CSU Dean of the Graduate School \(Dr. Colleen Webb\)](#), the [University VP for Research \(interim Dr. Christa Johnson\)](#), and the incoming [Dean of the Walter Scott College of Engineering \(Dr. Allen Robinson\)](#) who will be joining us in October.

The new Dean of the [Walter Scott College of Engineering](#) is coming to us from [Carnegie Mellon University](#) by way of Kigali, Rwanda where he has been the director, Associate Dean for International Programs in Africa for the College of Engineering, Director of the EPA-funded Center for Air, Climate, and Energy Solutions, and Professor in the Departments of Mechanical Engineering and Engineering and Public Policy.

With this newsletter, we also offer a belated welcome to [CSU President, Amy Parsons](#), who started this spring.

Every fall we get to welcome new [undergraduate](#) and [graduate](#) students to the CSU School of Biomedical Engineering. We are always excited by the tremendous potential that comes with this annual influx and revitalization. When we combine the annual influx with new staff in SBME, we believe the new possibilities that will emerge at our table, will greatly expand future [educational opportunities for students](#).

A quick scan of biomedical engineering news in the world around us will show you stories on “unlocking secrets of the heart”, “new microscopy imaging technique”, and “engineers develop new wearable sensor technology”. Here at CSU SBME, our faculty are addressing all these relevant industry topics and more. Our faculty welcome our students to participate in these studies and the interactions inspire more-bigger-better, forward thinking outcomes.

Through education, research training, and life mentoring we continually go beyond the classroom and into the real world. Our alumni tell us about their industry assignments in far flung regions across the globe and we continue to work a global perspective into our research, teaching, and outreach.

Our faculty collaborate around the world and our students participate in co-curricular excursions for our [study-abroad program](#) to Ecuador for prosthetic experience in partnership with the [Range of Motion Project \(ROMP\)](#), to Portugal for pharmaceutical experience and to a global classroom to interact with instructors from multiple countries.

Change is all around us, from the change in seasons and a beginning of a new school year to the influx of talented trainees and birth of new important projects. Change is necessary in engineering to foster and bring in new technological advances. We treasure the past, and we look forward to exciting tomorrows.

Dr. Stuart Tobet
Director, SBME

Enhancing the Student Experience Through Short-Term Study Abroad

By Deb Misuraca



Study abroad participants posing at the Lisbon Main Square in downtown Lisbon.

Ecuador co-leaders, Dr. Ellen Brennan-Pierce (SBME faculty) and SBME academic advisor, Deb Misuraca, led 14 CSU students to Lisbon, Portugal in January 2023 for the inaugural *Biomedical Industry and Healthcare* short-term program.

During the study abroad experience, students learned about the differences between the US and Portuguese/EU healthcare systems, specific biotech research, and innovations in Portugal, as well as Portuguese culture.

Sierra Curdts, a graduating BME+CBE student said one of the biggest takeaways for her was a new open-mindedness towards seeking jobs outside of the U.S.

“Seeking jobs outside of the U.S. always felt overwhelming before now, and while it still would require research, I now feel that I have contacts to start the process if I decide to go down that path.”

Students also enjoyed the many cultural aspects of being in a historic European city including touring of the Jerónimos Monastery, the National Tile Museum, and sampling the delicious traditional Portuguese pastry Pastel de Belém.

After a successful first offering, the experimental course will become a permanent course and applications are now open for Winter Break 2024.

[This trip] allowed me to expand my awareness and appreciation of other cultures in addition to facilitating my academic and professional growth, with the added benefit of spending time with peers and faculty to create life-long relationships.

—Kyle Barth, Study Abroad Participant

In 2018, SBME offered its first short-term study abroad program *Prosthetic Innovation in Ecuador*. Partnering with the non-profit healthcare organization [Range of Motion Project](#) (ROMP), this study abroad took place in Quito, Ecuador and focused on prosthetic design and fabrication, function, and delivery to difficult-to-reach populations and has been a Summer-favorite program.

Feedback from the 2018 Ecuador experience showed us that engineering students are looking for a model of studying abroad that is academic, impactful, and time conscientious.



Sierra Curdts (BME+CBE) looks at a tumor on a liver via virtual reality at the Advanced Simulation Center at the University of Lisbon's Faculty of Medicine.

Farewell to Academic Advisor, Deb Misuraca

By Deb Misuraca

How lucky I am to have something that makes saying goodbye so hard."

—A.A. Milne

Sadly, after eight years working as an undergraduate advisor in the School of Biomedical Engineering at CSU, it is time to say goodbye. As I think back on my tenure in the SBME, I am so proud of the accomplishments and momentum I see happening within.

What do our students need?

That is the question we are constantly asking ourselves. From two short-term study abroad programs — *Prosthetic Innovation in Ecuador and Biomedical Engineering and Healthcare in Portugal*, two certificates — the *Quality of Science Certificate* partnering with *Pathways for Patient Health* and the *BME Global Engineering Certificate* to the Clinical Immersion Summer program created by Dr. Ellen Brennan-Pierce and Dr. Julie Dunn, the School strives to create an academic, experiential, and I think most importantly, holistic experience for students.



Academic Advisor, Deb Misuraca




CSU student, Jian Cohen uses prosthetic arms to pick up a piece of bread during an E-Day.

This past year was especially impactful as I watched our Biomedical Engineering Society officers and members put in an enormous amount of effort to help fellow [CSU student Jian Cohen](#), who was born without arms. Engineering students came together to design devices to make life a little easier for the favorite 20-year-old student. They demonstrated just one aspect of what makes our engineering students exceptional, taking inspiration to make the world a better place.

A special thanks to Dr. Kevin Lear for giving me the opportunity to seek out my career interests, to Drs. Ketul Popat and Stu Tobet for their support and guidance, to Brett Beal - you are my hero! To Sara Mattern for all the conversations, and to Dr. Ellen-Brennan Pierce, my partner in study abroad, and to all our undergraduate students...you amaze me! Keep doing what you're doing, because the world is a better place because of you.


A huge thank you from the entire SBME team for helping our school thrive. You will be greatly missed!

A photograph of Amy Parsons, a woman with blonde hair, wearing a dark blazer over a green top. She is standing at a wooden podium with a microphone, speaking to an audience. The background is a bright, modern interior space with large windows.

AMY PARSONS NAMED 16th PRESIDENT OF COLORADO STATE UNIVERSITY FEBRUARY 1, 2023

Amy Parsons, who has 16 years of higher education leadership experience, as well as seven years of private sector experience, led some of the most comprehensive projects in CSU history during her executive leadership roles at the university. She leaves her current role as founding CEO of global e-commerce company Mozzafiato, LLC.

As vice president of operations at CSU, she helped navigate through the fiscal challenges of the recession, supported the first comprehensive salary equity survey to uncover and remedy gender-based inequities, and oversaw a historic physical transformation that included construction and renovation of state-of-the-art classroom buildings, parking structures, research facilities and an on-campus stadium. As executive vice chancellor of the CSU System, she led System-wide initiatives, including creation of the CSU Spur campus at the National Western Center in Denver.

A photograph of Brandon Tighe, a man with a beard and tattoos, wearing a light blue button-down shirt and dark pants. He is sitting outdoors on a stone ledge, looking towards the camera. The background shows green trees and a blue sky with clouds.

OUTSTANDING GRAD: BRANDON TIGHE

The School of Biomedical Engineering is proud to highlight alumnus Brandon Tighe. In May 2021, Tighe received his bachelor's degrees in biomedical engineering and mechanical engineering. In December 2022, Tighe earned a CSU master's in mechanical engineering and was selected as an outstanding grad. Tighe's circuitous path to earning three degrees from the Walter Scott, Jr. College of Engineering began amidst challenges and missteps, including homelessness and a two-year stint in prison. But today, he's about to start his dream job as a research and design engineer at a Northern Colorado electric vehicle manufacturer.

Full story: <http://bit.ly/3XHbD1u>

Industry News Highlights

by Marianne LaCount

Each semester we like to look back on and highlight important news within the biomedical engineering industry and accomplishments achieved by our faculty, peers, and students; to educate current and future students; and keep those interested in the success of CSU's School of Biomedical Engineering up to date. Here are a few quick highlights from the Fall 2022 semester:

Graduate Seminar Summary: Dr. Chelsea Magin, CU Denver

By *Mussamma Akhtar*

Dr. Chelsea Magin's talk focused on Biomaterial Engineering Strategies for Studying Sex Differences in Pulmonary Arterial Hypertension. She discussed her lab's research on evaluating sex, age, and microenvironmental stiffness in fibroblast activation. The lab aims to create 3D dynamic models that mimic illness situations more accurately. Pulmonary hypertension, a chronic lung condition, primarily affects women and has a low survival rate. Dr. Magin wants to understand the underlying reasons for this sex difference and explore tailored therapies.

Using hydrogels, the lab investigates fibroblast activation in response to different conditions. Female fibroblasts were more active in standard culture, but less active in a soft state and more activated in a rigid state, similar to males, when exposed to corresponding male and female serums. Introduction of serum from elderly individuals increased activation in both male and female cells. These findings highlight the impact of sex, age, and microenvironmental stiffness on fibroblast activation. Additionally, the lab has developed 3D dynamic models using 3D-printed hydrogels, which have shown to sustain cell viability and demonstrate increased fibroblast activation with enhanced stiffness.



Dr. Chelsea Magin, Assistant Professor at CU and Bioengineer Researcher

To Track Disease-Carrying Mosquitoes, Researchers Tag Them With DNA Barcodes

By *Anne Manning*

Researchers at Colorado State University have developed an innovative technique for tracking disease-spreading mosquitoes. The team, known as the "Dark Crystal" collaboration, created edible particles made of DNA and proteins that mosquito larvae consume. These particles consist of microscopic protein crystals assembled from a bacteria-derived protein. By inserting fluorescent dyes or synthetic DNA into the crystals, the researchers established a unique "barcode" system for tracking mosquitoes. This approach offers advantages over traditional methods, allowing researchers to trace the origin, movement, and final location of mosquitoes.

Future research aims to explore different barcodes consumed by larvae each week and expand experiments to tropical environments. Several questions remain, including the persistence of DNA snippets in mosquito guts and methods to enhance barcode performance. The interdisciplinary collaboration between the CSU researchers has been highly productive, and they are enthusiastic about advancing the potential of DNA protein crystals for mosquito tagging and disease surveillance applications. [Visit our website to read the full article.](#)



The researchers collecting mosquitos for analysis at a field site in Fort Collins

Industry News Highlights Continued

by Marianne LaCount

How Can You Tell If a Fracture is Healing? CSU Biomechanical Device Could Provide Answers!

By Anne Manning

Fracturing the tibia is a common orthopedic injury, which can be particularly distressing when the fractures fail to heal properly. Patients with tibia fractures often undergo surgical implantation of hardware to stabilize the bone. However, approximately 10% of patients experience non-union fractures, requiring additional surgery and reintroducing waiting, pain, discomfort, and financial burdens. X-rays, the standard diagnostic method for non-union fractures, are unable to capture the subtle mechanical details of early bone tissue mineralization and stiffening. What if there was a way to detect this stiffening much earlier, enabling faster medical intervention?

Nearly two decades ago, biomedical researcher Christian Puttlitz of Colorado State University began exploring the healing potential of bone through engineering and biomechanics. This led to a partnership with UC Health, where doctors and patients are currently assisting in the testing of a fracture-detection device that Puttlitz and his team have been developing for several years. Visit the [CSU website](#) to read the full article.



Dr. Christian Puttlitz

Graduate Seminar Summary: Dr. Maureen Lynch, CU Boulder

By Abhishek Bhattacharjee

Dr. Maureen Lynch, an Assistant Professor at the University of Colorado (CU), Boulder, delivered an engaging seminar talk on bone metastasis caused by breast cancer. Her research focuses on analyzing the mechanical behavior during bone metastasis to develop therapeutic targets for effectively halting cancer cell metastasis. Dr. Lynch's lab investigates the mechanical signals released by bones affected by breast cancer and utilizes *in vivo* and *in vitro* techniques to understand cancer cell behaviors within specific mechanical environments.

The lab's major focuses include studying the structure and mechanical behavior of osteocytes, the primary cells involved in bone metastasis, and examining the effects of mechanical forces on cancer cell proliferation in bones using mouse models. The ultimate goal is to develop therapeutic targets to prevent bone metastasis and cancer-induced bone fracture and damage.



Dr. Maureen Lynch

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 Fall 2022 virtual speakers included:

UNIVERSITY OF COLORADO, BOULDER

Dr. Maureen Lynch

Breast Cancer Meets Mechanical Stimuli in the Skeleton

COLORADO SCHOOL OF MINES

Dr. Anne Silverman

Musculoskeletal Modeling Approaches to Evaluate Injury Risk

UNIVERSITY OF COLORADO, COLORADO SPRINGS

Dr. Guy Hagen

Super-Resolution Microscopy

UNIVERSITY OF COLORADO, DENVER

ANSCHUTZ MEDICAL CAMPUS

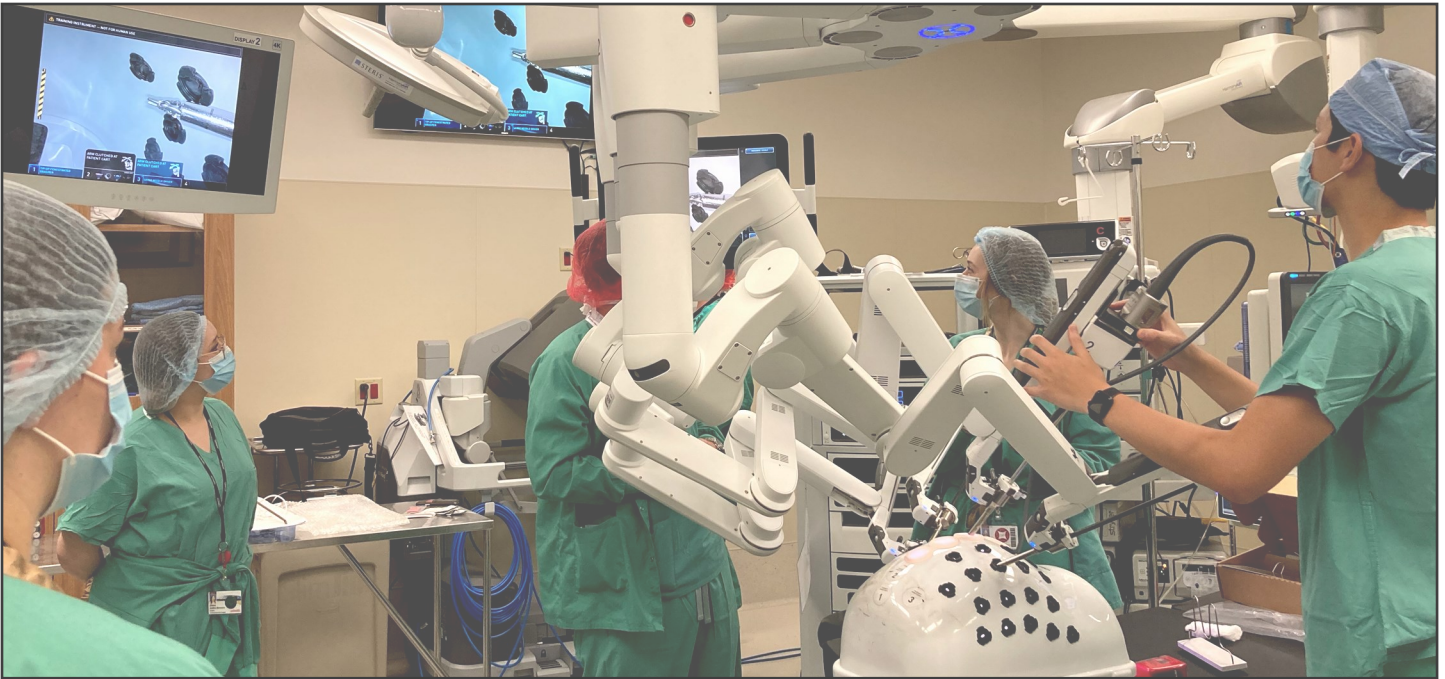
Dr. Chelsea Magin

Biomaterials Engineering Strategies for Studying Sex Differences in Pulmonary Arterial Hypertension

3D SYSTEMS

Katie Weimer

Bioethical Considerations for 3D Printed Tissues and Organs



SBME and UC Health Bring Unprecedented Value to the Workforce

The Clinical Immersion Program exposes biomedical engineering students to clinical experiences to help them understand the environment and constraints that must be considered for successful design of medical devices. Through rotations with clinicians, students observe emergent events and take part in clinical simulations that rely on medical devices and biomedical technology.

This is what we call the “hands on” experience that is incredibly important for our biomedical engineering students and their future employers. The Clinical Immersion Program prepares them for real world situations where they will have to work with medical experts to provide them with the medical devices they require for various procedures.



“This immersion program allows [students] to see how things are used, how they move in the body, the risks, and problems we encounter. They can observe what’s happening with the present designs, and it gives them a much better idea of reality as opposed to trying to create something without any access to a human body to see what it does. This makes their devices much more realistic.”

- Dr. Gary Luckasen, Cardiologist at UC Health

Investing in CSU’s Clinical Immersion Program is investing in the future of biomedical engineering, making an impact on communities around the world.

If you would like to continue supporting CSU’s School of Biomedical Engineering by donating or becoming a partner of the Clinical Immersion Program, [visit our website to get started!](#)

Biomedical Engineering students participating in the only in-person clinical immersion class in 2020

SCHOLARSHIPS FOR BIOMEDICAL ENGINEERING MAJORS



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.

Your gift will make an impact for years to come. To support future biomedical engineers, visit <https://advancing.colostate.edu/SBME>.

Biomedical Engineering Alumni Scholarship: Supports a dual-degree biomedical engineering student enrolled in the School of Biomedical Engineering.

Dennis and Dorothy Bruner Biomedical Engineering Scholarship: Supports a full-time graduate or undergraduate enrolled in the biomedical engineering program.

Joan C. King-Tobet Memorial Scholarship: Supports upper-level undergraduate students majoring in biomedical science or engineering. Must demonstrate an interest in promoting the spirit of Joan's life and gender equality in science and engineering fields and maintain an overall 3.0 GPA.

Samson Design Biotechnology Innovation Scholarship: Supports full-time graduate students majoring in biomedical engineering. Must demonstrate an interest and talent in biotechnology innovation and maintain a 3.0 GPA.



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