



## SCHOOL OF BIOMEDICAL ENGINEERING COLORADO STATE UNIVERSITY



New SBME Alumni Leadership Council debuts its committees and new members.

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Hands-on BME Clinical Immersion Project pivots to a virtual format amid pandemic.

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SBME researchers, students, and advisory board members in the news.

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Volume 8, Issue 2 Fall 2020

## MESSAGE FROM DIRECTOR

### Unexpected Benefits Emerge from the Pandemic

Last semester, in my director's message, I mentioned the sudden interruption of university functions due to the COVID-19 pandemic that prompted an emergency switch to all remote function. All these months later, we find ourselves thankful for the unexpected benefits, including thought-provoking conversations, that have emerged from this unique experience.

As we headed into summer, our third cohort of students were planning to attend the SBME Clinical Immersion Program, seven weeks of full-time clinical exposure to clinical care at the Medical Center of the Rockies and University of Colorado Health Clinical Education and Innovation Center. Many thanks to Drs. Julie Dunn and Ellen Brennan-Pierce, the program was converted to a remote format. One of the participating students, Sydney Sherrick (BME+MECH), commented, "Even through COVID and having to turn an in-person internship into a fully online experience, I loved every session that was prepared for us and gained an immense amount of knowledge and insight from this program." The newly generated resources include video of medical professionals interacting with medical devices which can be extended to many more students than would have been possible with only a face-to-face program. This genie is not going back in the bottle. Given the increase in other coursework delivered online, there may be many new opportunities for educational innovation.

Also this past summer, there was a virtual engineering conference, "Experiences of Black STEM in the Ivory: A Call to Disruptive Action" with many biomedical engineers in attendance. One session was particularly eye opening—A Discussion with the Deans—as it exposed important issues influencing our field. You can find the videos of the sessions here: <https://www.moles.washington.edu/news-events/special-event-experiences-of-black-stem-in-the-ivory/>. The world, its issues, and the people in it have never been solely black or

white, but political arguments have a way of polarizing what otherwise should be a spectrum. CSU actively addresses many of these issues with education, open discussions, and specific policy changes affecting the university as well as the Walter Scott, Jr. College of Engineering.

Beyond the policy side of racial injustice, benefits for biomedical engineering design were also uncovered. BME-IDEA is a meeting run by VentureWell that engages professors who teach design in biomedical engineering programs to address common needs in education and innovation. In their seminar series held earlier this fall, one topic that generated a lot of interest was "Diversity in Biomedical Engineering Design." The lead speaker for the discussion was Londa Schiebinger, The John L. Hinds Professor of History of Science and Director of Gendered Innovations in Science, Health & Medicine, Engineering, and Environment at Stanford University (engineering examples: <https://genderedinnovations.stanford.edu/case-studies-engineering.html>). One example that arose in the discussion is that some devices care about skin color, such as pulse oximeters, which are critical when treating a respiratory disease like COVID-19. This is something that should make every one of us consider whether the work we are doing can be applied to all subgroups of our populations. If we want to design for the many, we cannot stop with the few. For equity in inclusive design we must forge a path.

Let's uncover more benefits by working with one another! I can be reached at [Stuart.Tobet@colostate.edu](mailto:Stuart.Tobet@colostate.edu).

Dr. Stuart Tobet  
Director  
School of Biomedical Engineering

## CONGRATULATIONS TO THE CLASS OF 2020!

### **Bachelor of Science in Biomedical Engineering and Mechanical Engineering**

Jasmin L. Akers  
Lauren T. Berens  
Emily A. Bergum  
Chandler J. Birrell  
Joseph A. Clouse  
Daniel J. Corbett  
Sarah K. DeBoer  
Teryn C. Degenhart  
Doribella A. Demiranda  
Evan G. Dummer  
Annie G. Elefante  
Megan E. English  
Claire J. Fenton  
Joshua A. Floyde  
Dylan M. Giardina  
Stephen S. Haag  
Olivia L. Hahn  
Andrew J. Hegemann  
Matthew D. Helmreich  
Ryan C. Henry  
Emma E. Hurley  
Kirsten S. Kauk  
David V. Kimmey  
Danielle G. Kubicek  
Corey A. Lauck  
Zachary R. Leighton  
Sean R. McClure  
William F. McCormick  
Nicholas A. Mitchell  
Lyndsey E. Nold  
Mikayla Novak  
Jacob Null  
Nicholas R. Peters  
Michael J. Poland  
Mauri L. Richards  
Samuel P. Ritter  
Jordan J. Schlitzer  
Kieran A. Simske  
Erin J. Solis  
Jacob W. Stockebrand  
Jeremy Tabke  
Juliette A. Talarico  
Cole M. Watkins  
Julia B. Whitworth

### **Bachelor of Science in Biomedical Engineering and Electrical Engineering**

Jacob Alfieri  
Isaac J. Griess  
Sarah A. Maclean  
Alden J. Tennison

### **Bachelor of Science in Biomedical Engineering and Chemical and Biological Engineering**

Katherine A. Conger  
Elias Espin  
Zachary J. Haigh  
Skyler J. Hochmuth  
Marina K. Larson  
Anugrah B. Mathew  
Torin G. Moore  
Stephanie A. Pascua  
Analia N. Quirk  
Justin R. Southerland  
Jake T. Stewart  
Cameron D. Taylor  
Hayden J. Yarbrough

### **Master of Engineering - Biomedical Engineering Specialization**

Brad Brightbill  
Andrew Bristol  
Zori Oberle  
Patricia Stasiowski  
Thomas Troup  
Akanksha Venumula

### **Master of Engineering Online - Biomedical Engineering Specialization**

Kasey Bacher  
Nick Chalmers  
Melinda Coleman  
Renee Deal  
Samantha Drake  
Dan Enos  
Justin Felix  
Julie Harrison  
Brandon Hentges  
Kayla Lawrence  
Cade Moody  
Jeremy Palgen  
Kyle Scalts  
Napalia Shamasa  
Heidi Stair  
Taylor Gregory-Sweet  
Jason Wallis

### **Master of Science, Bioengineering**

Ryan Arey  
Terrance Bishop  
Alec Richardson

### **Doctor of Philosophy, Bioengineering**

Keagan Collins  
Joshua Mannheimer  
Yanyi Zang



## FALL UPDATE: BME ALUMNI LEADERSHIP COUNCIL



In November 2019, SBME Industry Advisory Board member **Stephanie Salazar** (B.S. Mechanical Engineering, '11) began discussions with a handful of alumni regarding the creation of a biomedical engineering alumni group. Within a few weeks, the BME Alumni Leadership Council (ALC) was formed. The inaugural members include:

**Hannah Mikelson** (BME+MECH, '18)  
Quality Engineer, Medtronic

**Evan Siebenmorgen** (BME+MECH, '16)  
Clinical Sales Associate, Intuitive

**Ash Mathew** (BME+EE, '18)  
Software Engineer, Barry-Wehmler Design Group

**Jillian Sirkis** (M.S. Bioengineering, '17)  
Human Factors Engineer, General Atomics Aeronautical Systems

**Terrance Bishop** (M.S. Bioengineering, '20 and BME+CBE, '17)  
Recent graduate of the Master of Science in bioengineering program

**Morgan Leatherland** (BME+MECH, '17)  
Former System Integration Engineer, Flow Systems Inc.

**Lane Taylor** (BME+MECH, '15)  
Software Engineer, Medtronic



Over the past year, the Council has established bylaws, identified clear goals and objectives, and has solicited new members. From applications received over the summer, three new members were selected: **Kate Knights** (BME+CBE, '16), Bioprocess Engineer II, Novartis Gene Therapies; **Sam Allsup** (BME+MECH, '18), Industrial Sales Engineer, Phoenix Contact; and **Zach Kugler** (BME+EE, '18), Electrical Engineer, Zynex Medical.

The Council is a collective of alumni who strive to positively impact the SBME program by supporting biomedical engineering students, providing feedback to the SBME, creating and fostering an inclusive alumni community, and increasing the prominence of the SBME programs.

The Council consists of three committees:

- Alumni Connection; Terrance Bishop, Chair
- Student Connection; Ash Mathew, Chair
- Industry Partnership; Lane Taylor, Chair

These committees act upon the vision of the ALC and establish events and programs to benefit alumni, students, and to strengthen connections between CSU SBME and industry. These committees have begun planning a multitude of programs and tools such as student mentorship programs, alumni networking nights, improved industry contact list, alumni advice forums, and many others.

Stay connected! If you are a CSU biomedical engineering or bioengineering alum, please consider joining the ALC LinkedIn group at <https://www.linkedin.com/groups/12456820/>.

More information can be found on the SBME website: <https://www.engr.colostate.edu/sbme/alumni-leadership-council/>.





## PROGRAM DIRECTORS SEEK INNOVATIVE SOLUTIONS

By Michael Benedict

Whether it's making progress toward public health breakthroughs, or answering difficult questions about education in an era of remote learning, SBME faculty members are always working tirelessly toward innovative solutions. Dr. Ellen Brennan-Pierce – Associate Faculty in SBME and the instructor for SBME Senior Design – was recently first author on an exciting new paper in the Teaching Tips Special Issue of *Biomedical Engineering Education*, a prestigious interdisciplinary journal.

The paper, titled “Clinical Immersion for Biomedical Engineers: Pivoting to a Virtual Format,” begins by describing a need that was identified several years ago: for BME students to gain real-world experience in clinical settings. CSU and the University of Colorado Health Medical Center of the Rockies (UCH-MCR) collaborated to address this need with a full-time summer immersion program. Participating students “attended patient rounds, observed surgical procedures... and interacted with product/device representatives.” They would then debrief these experiences in meetings with Dr. Brennan-Pierce and the other program directors. (You can read more about it here: <https://www.engr.colostate.edu/sbme/2019/10/27/2019-clinical-immersion-program-experience/>.)

The program was a huge success, and had become very popular with students – it was gearing up for its third offering when COVID-19 hit. As other in-person programs, internships, and classes across the country were being cancelled, Dr. Brennan-Pierce and the other program directors sought an innovative solution instead: just as the article's title says, they “pivoted” to a virtual, online format.

This virtual Clinical Immersion Program was held during the summer of 2020. As the article explains, it primarily consisted of online meetings with clinicians and medical device sales representatives, followed by meetings with the program directors to debrief and discuss these experiences. Content that was covered included videos of medical procedures, device demonstrations, question-and-answer sessions, and more. There were even some advantages to the new online format: it ensured that every participant always had a good view of procedures, it allowed more students to participate than during a normal summer, and it allowed students from outside the SBME major to participate as well.

In the end, and in spite of some of its clear limitations, the new virtual format was a great success – its strengths included the live video tours, the video footage of procedures, and the lively discussions that followed each virtual event. The article explains that the students “strongly voiced their appreciation for the programming.” The “pivot” for this program is a classic example of SBME's inventiveness and resourcefulness, as Dr. Brennan-Pierce and her colleagues managed to turn a difficult set of circumstances into a successful learning experience.

Susan Stanton (a physician assistant at the UCH-MCR) and Dr. Julie Dunn (the Medical Director of Trauma Research & Education at the UCH-MCR, and the chair of SBME's Advisory Board), were co-authors on the paper. You can read the full paper here: <https://link.springer.com/article/10.1007/s43683-020-00032-x>.

### 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 2020 speakers included:

#### UNIVERSITY OF OKLAHOMA

**Dr. Michael Detamore**

*Gradients and Chondroinductive Biomaterials in Regenerative Medicine*

#### UNIVERSITY OF COLORADO

**ANSCHUTZ MEDICAL CAMPUS**

**Dr. Jeffrey Jacot**

*Tissue Engineering for the Correction of Congenital Heart Defects*

#### COLORADO SCHOOL OF MINES

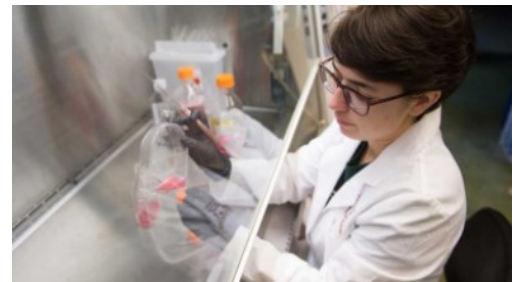
**Dr. Judith Klein-Seetharaman**

*The Synthetic Coral: An Opportunity for Collaboration between Computer Science, Biology and Materials Science and Engineering*

#### UNIVERSITY OF COLORADO BOULDER

**Dr. Wei Tan**

*Precision Design for Vascular Disease Treatment*



### New! Online Biomaterials and Tissue Engineering Graduate Certificate

Advance your career with specialized training in biomaterials and tissue engineering. Gain an in-depth understanding of biomaterials by studying the properties, processing, and economics of biomedical and biotechnology applications. Read full overview here: <https://www.online.colostate.edu/certificates/biomaterials-tissue-engineering/>.

## 2020/21 SCHOLARSHIP WINNERS

### Joan C. King Memorial Scholarship



Bavaghar

Awarded to students with an interest in biomedical sciences or engineering, this year's Joan C. King Memorial Scholarship Award was given to Helya Bavaghar and Logan Blakeslee.

First-generation student Helya Bavaghar is pursuing a Bachelor of Science in biomedical sciences. With an endless supply of energy and determination, Bavaghar keeps busy pursuing opportunities in her field which include volunteering at a hospital, working as a tutor at the CSU Academic Advancement Center, and serving as an undergraduate research assistant. "This award gave me hope and inspired me in a time when I needed it most," said Bavaghar.

In his essay, Logan Blakeslee (BME+MECH) wrote about his meaning of greatness and stated that greatness should reflect "those who are capable of identifying both their strengths and weaknesses and working tirelessly to improve those weaknesses while using their strengths to contribute positively to the lives of others and the world as a whole." Through his roles as a learning assistant tutor, and a resident assistant in Allison Hall, plus his experience studying abroad in Limerick, Ireland, he has actively sought opportunities to step outside his comfort zone and face challenges head on.



Blakeslee

### Samson Design Biotechnology Innovation Scholarship



Oropallo

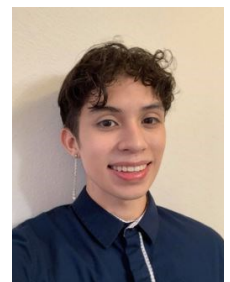
Jaiden Oropallo is this year's Samson Design Biotechnology Innovation Scholarship recipient. Oropallo completed his Bachelor of Science in biomedical engineering with a minor in chemistry from Florida Institute of Technology. There, he conducted research in the vascular tissue engineering lab and was a coxswain on the rowing team. He will be working with Dr. Christian Puttlitz in the Orthopaedic Bioengineering Research Laboratory. Oropallo stated, "It's an amazing feeling to be recognized for the work I've done during my undergrad, and I am very thankful for the scholarship, as it will allow me to support myself as I begin my graduate career."

The Samson Design Biotechnology Innovation Scholarship is an annual \$2,500 scholarship created to support a new SBME graduate student who demonstrates an interest and talent in biotechnology innovation and shows promise in innovative thinking.

### Dorothy and Dennis Bruner Biomedical Engineering Scholarship

Nyzek Rodriguez is a first-generation student and this year's Dennis & Dorothy Bruner Biomedical Engineering Scholarship recipient. Currently pursuing a Bachelor of Science in biomedical engineering and a Bachelor of Science in mechanical engineering, Nyzek embodies the intelligence, work ethic, creative spirit, dedication, and general 'spark' of a brilliant and emerging biomedical engineer.

The Dorothy and Dennis Bruner Biomedical Engineering Scholarship was created to support any undergraduate or graduate student pursuing a degree in biomedical engineering or bioengineering.



Rodriguez

## SBME RESEARCHERS, STUDENTS & ADVISORY BOARD MEMBERS IN THE NEWS



### Antiviral compounds against COVID-19 tested in secure labs at CSU

By Mary Guiden

Brian Geiss, associate professor in the Department of Microbiology, Immunology, and Pathology and the School of Biomedical Engineering, is helping CSU handle logistics, fielding inquiries from companies, and establishing contracts for testing a variety of antiviral compounds. CSU researchers are testing hundreds of existing drugs, compounds and chemicals to see if they might provide options to fight the virus that caused COVID-19.

<https://cvmb.s.source.colostate.edu/antiviral-compounds-against-covid-19-tested-in-secure-labs-at-csu/>



### Using riboflavin, UV light in specialized device reduces SARS-CoV-2 pathogens in plasma, whole blood

By Mary Guiden

UV light is proven to eliminate huge amounts of Coronavirus 2, the virus that causes COVID-19, to the point that it is no longer detected. Ray Goodrich, SBME Advisory Board member and executive director of the CSU IDRC, invented the technologies used in this study.

<https://source.colostate.edu/using-riboflavin-uv-light-in-specialized-device-reduces-sars-cov-2-pathogens-in-plasma-whole-blood/>



### New technique takes 3D imaging an octave higher

By CSU University Communications Staff

Paper co-author Randy Bartels, professor in the Department of Electrical and Computer Engineering and the School of Biomedical Engineering, stated, "A key to the experimental demonstration of this new nonlinear tomographic imaging was a custom, high-power laser, designed and built by CSU graduate student Keith Wernsing."

<https://engr.source.colostate.edu/new-technique-takes-3d-imaging-an-octave-higher/>



### CSU researchers develop at-home coronavirus test with quick results

By Dillon Thomas

SBME faculty Brian Geiss, Chuck Henry, and David Dandy teamed up with students long before COVID-19 became a pandemic to create a simple virus testing device. Now they've turned their focus to applying their device to the fight against coronavirus.

<https://denver.cbslocal.com/2020/07/21/coronavirus-test-colorado-state-university-researcher/>

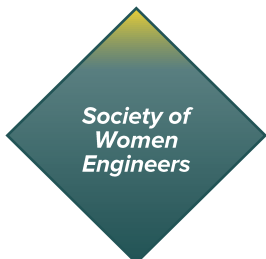


### CSU alumnus helps guide medical device company's role in COVID-19 solutions

By Emily Wilmsen

Gary Johnson ('92, B.S. Mechanical Engineering), president of the Advanced Energy Group at Applied Medical and SBME Advisory Board member, oversees a team of about 150 engineers and scientists who have designed and developed nasopharyngeal swabs in response to the COVID-19 crisis.

<https://engr.source.colostate.edu/mechanical-engineering-alumnus-helps-guide-medical-device-companys-role-in-covid-19-solutions/>



### SWE awards over \$1 million in scholarships

By Society of Women Engineers Blog

Congratulations to Olivia Pyke, CSU biomedical engineering undergraduate student who received a Society of Women Engineers Rocky Mountain Section Freshman Scholarship. This year, SWE awarded \$1,027,850 in scholarships, marking it as their highest dollar amount ever. For nearly 70 years, SWE has been providing scholarship opportunities for women in engineering and technology.

<https://altogether.swe.org/2020/09/over-1-million-in-scholarships/>



## GRADUATE SEMINAR SUMMARY:

### DR. JEFFREY JACOT, UNIVERSITY OF COLORADO

By Amanda Shick



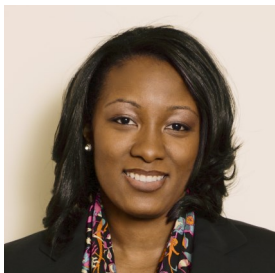
Dr. Jeffrey Jacot, associate professor of biomedical engineering at the University of Colorado Anschutz Medical Center, spoke about his research in tissue engineering relating to congenital heart defects. In the U.S. alone, approximately 10,000 infants are born each year with congenital heart defects. Current state-of-the-art materials include Dacron and fixed pericardium; both are nonfunctional tissues that are inactive biologically, and are only good for short term fixes. The use of cellular patches currently greatly increases the risk of arrhythmia and heart failure, which is why this is a significant area of research. It is usually possible to detect heart defects in a fetus using ultrasound by 13 weeks, so using amniotic fluid stem cells (AFSCs) is a possible solution to engineering native cells to fix heart defects.

Jacot and his group of researchers have successfully induced pluripotent stem cells from amniotic fluid to differentiate into functional cardiomyocytes (heart muscle cells). They then considered the mechanical properties of scaffolds to try to improve cardiomyocyte functionality and make the in-vitro results match more natural phenomena, such as cell polarization. They found that substrate stiffness affects muscle contractile force through calcium storage, and noticed there was a positive correlation between calcium storage and contractile strength.

The next problem Jacot and his team addressed was if AFSCs could be made into endothelial-like structures to make a stronger vasculature. The ideal scaffold is one that doctors can easily suture. Dr. Jacot's goal was to create a multilayered patch with decellularized heart matrix that has specific compressive and stress moduli to withstand heart contractions. They looked into single-walled carbon nanotubes, which increased beating rate and signal conduction velocity, therefore decreasing the risk of arrhythmia. A right ventricle wall replacement was conducted in adult rats, and was found to function effectively and lower arrhythmia compared to current standard heart replacement materials.

This research is still ongoing, but has very promising results that could change the efficacy of heart repairs for patients with congenital heart defects.

## NEW SBME ADVISORY BOARD MEMBERS



### KENDRA MEGGETT-CARR

Kendra Meggett-Carr is the Director of the Department of Navy's (DON) Technology Transfer (T2) Program at the Office of Naval Research. On behalf of the Secretary of the Navy and the Chief of Naval Research, she coordinates, directs, and manages the promotion and transfer of naval technology to other government organizations, commercial enterprises, and academia.

An alumna of Johns Hopkins University, Meggett-Carr earned a Master of Science in technical management. She also holds a Bachelor of Science in electrical engineering from Widener University.



### LEIGH NEUMAYER, MD

Leigh Neumayer, MD, MS, FACS, has been named the new chair of surgery at the University of Florida College of Medicine – Jacksonville. She is board-certified in surgery and surgical critical care and has published more than 150 peer-reviewed articles and co-authored a patient education book, [Meet Virginia, Biography of a Breast](#).

Neumayer earned her Bachelor of Science in mechanical engineering at CSU. Her medical degree is from Baylor College of Medicine (Houston), and she completed a general surgery residency at the University of Arizona. She holds a Master of Science in clinical research design and statistical analysis from the University of Michigan.

Read full bios here: [https://www.engr.colostate.edu/sbme/wp-content/uploads/2020/10/IAB\\_Bios\\_FA2020.pdf](https://www.engr.colostate.edu/sbme/wp-content/uploads/2020/10/IAB_Bios_FA2020.pdf)

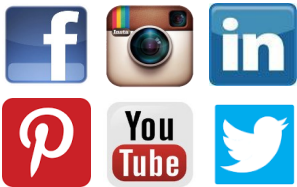


**SCHOOL OF BIOMEDICAL  
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## SAVE THE DATES

### OCTOBER 2020

#### **BMES Annual Meeting**

Oct. 14-17 | <https://bmes.org/annualmeeting>

#### **SBME Seminar: Dr. Bahney, Steadman Clinic**

Oct. 19 | Virtual—MS Teams | 1:00-1:50 p.m.

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

### NOVEMBER 2020

#### **SBME Seminar: Dr. Rullkoetter, University of Denver**

Nov. 9 | 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 2020

#### **SBME Seminar: Dr. Yun, North Carolina Agricultural and Technical State University**

Dec. 7 | Virtual—MS Teams | 1:00-1:50 p.m.

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

## 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**

