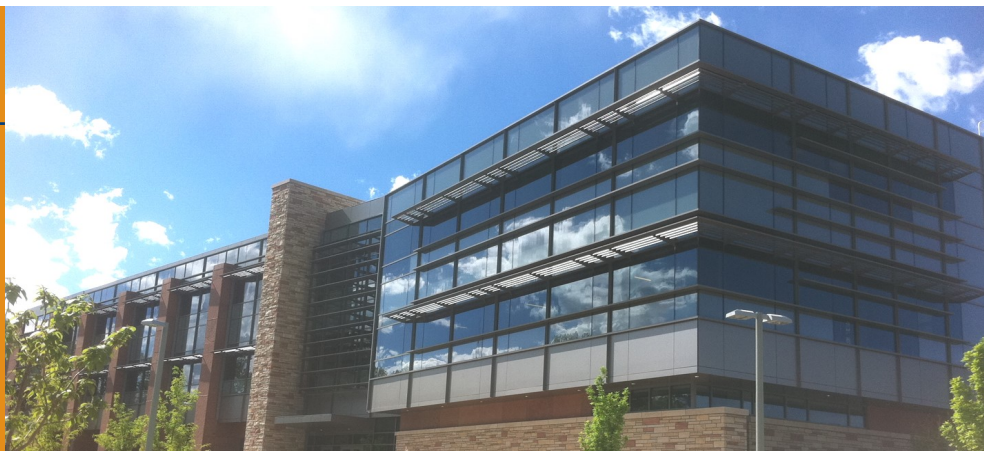


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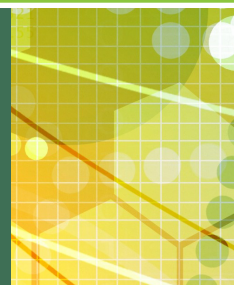


Volume 3, Issue 1

Winter 2015



Colorado State University
SCHOOL OF BIOMEDICAL ENGINEERING



visitors >>>

The Company We Keep

Each semester, the School of Biomedical Engineering invites distinguished professors from around the world to speak on biomedical engineering research and related disciplines for its weekly seminar series. The Fall 2014 speakers included:

Dr. Susanta Sarkar
Colorado School of Mines

Dr. Kristi Anseth
University of Colorado, Boulder

Dr. Dave Grainger
University of Utah

Dr. Michael Sacks
University of Texas at Austin

Dr. Jean-Baptiste Masson
Institut Pasteur, Paris, France and Janelia
Farm Research Campus

Dr. John Stone
Georgia Southern University

Message from Director *Exponential growth in biomedical engineering*

After enrolling a record number of students for the fall of 2014, our first class to complete the dual-degree biomedical engineering bachelor's program is gearing up to graduate in the spring of 2015.

Biomedical engineering is an in-demand career field that is gaining popularity among high school students looking to choose a college major. According to the most recent Bureau of Labor Statistics, employment of biomedical engineers is projected to grow 27 percent from 2012 to 2022. In the past few years, we have seen an increase in the number of BME departments and faculty at universities around the country. We have also seen schools without formal BME programs integrate BME in a number of unique ways.

However, with this influx of biomedical engineers, we must ensure that

jobs are available for new graduates. By keeping an open dialog with industry, we are able to continually provide students with the education and experiences that are highly sought in the field.



In biomedical engineering, there is significant power in combining degrees/knowledge whether it be our special dual B.S. degrees for undergraduates (BME plus a fundamental engineering discipline) or the depth of our graduate degrees (Ph.D. or Masters) combined with a strong undergraduate background. Typical jobs for biomedical engineers include government regulatory agencies, universities, medical institutions, and manufacturing companies.

I value your thoughts and welcome your questions. You can reach me directly at (970) 491-7157 or Stuart.Tobet@colostate.edu.

Graduate Programs

The School of Biomedical Engineering has had an active fall semester. With the growth of its Master of Engineering Online program, additional courses have been added, including Advanced/Additive Manufacturing Engineering, Biological Physics, and Process Control and Instrumentation, giving online students more options.

In addition to the online courses, two new residential classes are being offered this spring, Biomedical Signal Processing and Bio-Inspired Surfaces. (The titles of these courses are a great example of the breadth of the bioengineering field.)

Our Seminar Series has hosted an array of educators from around the country, in addition to CSU faculty and students. The diversity of our speakers caters to the interdisciplinary and collaborative nature of our program.

Perhaps, the most exciting news this fall is the discussion about the Front Range Biomedical Engineering Conference slated to happen in the fall of 2015. The first annual event will take place in Fort Collins and include collaborators and participants from the University of Colorado, Denver, University of Colorado, Boulder, Colorado School of Mines, Colorado State University, and the University of Wyoming. It will be the first conference of this kind in Colorado and we're excited to be the host institution in its first year.

For more information regarding graduate programs, please contact Graduate Advisor Sara Neys Mattern at (970) 491-7157 Sara.Mattern@colostate.edu.



Sara Neys Mattern, advisor,
SBME Graduate Programs

New BME Senior Design Projects

Our first cohort of dual-degree biomedical engineering undergraduate students have finally reached their senior year and are gearing up to present their BME projects at Engineering Days (E-Days) on April 17, 2015.

Below is a brief description of each of the four group projects.

Group 1:
Developing an In-Line Cellular Lysis Device (with support from Terumo BCT)
Industry Advisor: Briden Stanton

Group 2:
Diffraction X-Ray Microscopy using CCD Camera
Faculty Advisor: Carmen Menoni

Group 3:
Development of an Amperometric, Microfluidic Device for Personalized Cancer Treatment Applications
Faculty Advisor: Chuck Henry

Group 4:
Development of Two Working Prototypes for Delivering Depth-Controlled Release of Argon to Cut and Coagulate Colon Tissue (with support from Covidien)
Industry Advisor: Duane Kerr

Online Programs

Starting this spring semester, SBME online students and faculty will be using a new online learning management system called Canvas. Currently, a few SBME faculty are piloting Canvas in their fall classes. "The Canvas mobile app has given me a lot more flexibility. It's very user-friendly. I'm not restricted to my computer or sitting in my office. I can use it from pretty much anywhere, and that is the best part about Canvas," says Ketul Popat, associate professor in the Department of Mechanical Engineering

and Biomedical Engineering.

Canvas is currently used in over 800 colleges, universities, and school districts in the world. It was designed to make learning online more efficient, mobile, and accessible by integrating with other social media communities that students are already using. Online students are finding it an easy transition from the previous learning system called RamCT. "Canvas is easy to learn and it fits into my life a lot better. I can use it on my mobile devices and



Shantel Rizzotto, coordinator,
SBME Online Programs

I am collaborating a lot more with other students in my class now," commented Allyson, M.E. Online student.

For more information, contact Shantel Rizzotto at rizzotto@engr.colostate.edu or (970) 491-2557.

Undergraduate Programs

In 1879, the Colorado Agricultural College admitted its inaugural class of students whose academic assignments included farm labor. Five years later, the first three students graduated with Bachelor of Science degrees. In the interim, they endured the resignation of the first president, curricular adjustments, construction inconveniences for repairs to a brand-new Old Main building, and campus crowding with a more than 10-fold increase in enrollment by 1882. But the commitment of those pioneering students paved the way for the 30,000+ who now attend Colorado State University.

First Graduating BME Class

This fall, 17 modern student pioneers began their final year in the biomedical engineering dual-degree program. When they started CSU, the BME bachelor's degree program was still on the horizon and these BME undergraduate pioneers transferred into the program officially during the 2011-2012 academic year. While Dr. Tony Frank has been a constant at the helm of CSU during their time, these students, similar to the class of 1882, have stayed with SBME through curricular uncertainties, campus construction, the move to the new Scott Bioengineering building, and enrollment increases that reflect over 300 dual bachelor's degree and an additional 100 students minoring in BME. They have shared their positive experiences with others, and persisted, mostly smiling, while we tuned up the program. And now in the final stretch, our pioneering class has formed four teams to tackle senior design projects, which are described on page 2. Two of these projects are sponsored and advised by local biomedical companies, just one of the ways

SBME and industry are collaborating. We commend and thank the first-class class of 2015, pictured below.

Summer Internships

SBME recognizes the importance of university-industry relationships in defining our educational mission and helping us fulfill it. While many future paths are open to undergraduates completing the dual-degree program—including graduate studies in engineering, life sciences, human and veterinary medicine, law, and business—the majority of our undergraduates will elect to apply their engineering skills in the private commercial sector. Those who have experienced engineering in corporate environments during their undergraduate studies are better prepared to comprehend workplace expectations and mechanisms and contribute to their new employers. Students are exposed to industry norms in a variety of ways in our program—from a design project in BIOM 101, to peer review



Kevin Lear, director, SBME Undergraduate Programs and Brett Eppich Beal, undergraduate advisor

and problem solving in BIOM 300 lab, to their senior design capstone course—but one of the most effective is through corporate immersion in full-time summer internships or even longer periods of co-op programs.

We are highly motivated to connect our students to such engineering job experiences. This past summer, three-quarters of our class of 2015 and nearly half of our class of 2016 had internships at companies or in university research labs. Internship employers included Allosource, Baxter, Medical Modeling, Medical Werks, and Rockwell Automation. The internship of one of our soon-to-be-graduates, Nicole Puissant, at Terumo BCT (see story on page 5) resulted not only in an ongoing consulting opportunity on campus, but also a senior design project, and strong hopes for future hire. By far, the largest summer employer of our students was Covidien, which provided positions for four of our dual-degree and two BME minor students. SBME thanks all of these employers for giving students the opportunity to experience “real world” engineering. If your company would like to connect with our talented and hard-working SBME students, please contact Terry.Comerford@colostate.edu to let us know about your internship openings so we can share them with the students.

If you would like further information about our undergraduate programs, projects, or partnerships, please contact Brett Eppich Beal, senior undergraduate adviser at Brett.Beal@colostate.edu or (970) 491-7077.



College of Engineering Outstanding Administrative Professional Award



Brett Eppich Beal, undergraduate advisor for the School of Biomedical Engineering, received the 2014 College of Engineering Outstanding Administrative Professional Award. The award acknowledges Beal's work ethic, positive attitude and dedication to helping others develop, be that students, fellow staff, or others she encounters in life. In addition, she is always eager to take on more than her share of work to accomplish a task.

CSU Researchers and Local Area Physicians Unite

By Jeff Dodge

Patients will see direct benefits from a new agreement connecting physicians with university researchers in northern Colorado.

Joint research at Colorado State University, Poudre Valley Hospital and the Medical Center of the Rockies already has spawned development of several medical improvements, including a new arterial stent that helps prevent blood clotting and a hernia patch that fights infection.

Now, as part of a newly signed memorandum of understanding, the organizations have agreed to combine resources and personnel to bring CSU research to patients faster and more efficiently. The entities will collaborate in several areas, including clinical trials, funding opportunities, technology transfer, employee education/training and marketing.

“We’re translating academic research into real-world solutions,” said Melissa Reynolds, an associate professor of chemistry at CSU who is collaborating with local physicians on products that promote healing. “We get to have discussions about what the actual needs are at the clinical level. And that’s a value that can’t be replaced by anything else.”

Dr. Gary Luckasen, medical director of research at the Medical Center of the Rockies in Loveland and a CSU alumnus, added that the agreement promotes new partnerships between CSU and the two hospitals’ parent organization, University of Colorado Health.

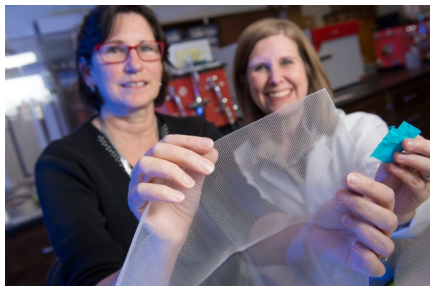
Luckasen said that the organizations need each other: The hospitals rely on

the research that is done at CSU, whether it be with animals or in a chemistry lab, and CSU requires access to the doctors and human patients who will use the products and treatments that emerge from the research.

More funding opportunities

Reynolds said the agreement improves the entities’ chances of landing research grants, since funding agencies look more favorably on existing collaborations than proposals for creating new partnerships from scratch. Having to draw new agreements and non-disclosure arrangements for each collaborative project creates delays, she said, so the partnership also streamlines and speeds the process for launching and funding new initiatives.

“It really breaks down a lot of barriers to interdisciplinary and translational research,” Reynolds said. “When you bring this group together, you break down the obstacles and merge



Dunn, left, and Reynolds show the mesh material used to prevent infection and promote healing.

the academics with the clinical side. It benefits students, too, because they’ll have access to the end users of what their research is focused on.”

She added that too often research ends at the academic level because there is no connection to real-world applications and manufacturing. The new agreement allows CSU faculty to work alongside doctors and understand their needs while developing realistic solutions that will be cost-effective in the marketplace.

Dr. Julie Dunn, medical director of trauma research and education at the Medical Center of the Rockies, started collaborating with Reynolds after the two met in August 2012. They were at a

gathering organized by CSU Professor Stuart Tobet, director of the School of Biomedical Engineering, to discuss unmet medical needs and ways that CSU researchers might help meet those needs. It was also at that meeting where Dunn met Jennifer Mueller, a professor of mathematics and biomedical engineering at CSU. Together, they are now studying the effectiveness of a new non-invasive method of monitoring lung function in real time using electrical impulses measured on the skin, without the need for radiation and dye. They are conducting a study on the technology, called electrical impedance tomography, in the intensive care unit at MCR.

The agreement

The agreement will give the hospitals and CSU access to each other’s clinical trials, and hospital physicians will be able to act as co-investigators for sponsored research at the university.

The initial areas targeted for research are cancer, cardiovascular disease, infectious disease, diabetes and metabolic disease, neuroscience, sports medicine, and women’s health issues.

The agreement also calls for improving and increasing funding and peer-reviewed publications by sharing “complementary knowledge, skill sets, laboratories, equipment and other applicable resources” as well as providing joint seminar/lecture opportunities or even an annual research symposium.

“CSU has a longstanding commitment — crossing many disciplines and academic colleges — to transformational research that advances our understanding of human health and well-being,” said CSU President Tony Frank. “This agreement builds on that strength, laying the groundwork for important advances in treatment and patient care.”

BME Class Notes



Anthony Schwartz ('13 Ph.D. Bioengineering) works as a scientist for the National Cancer Institute and provides investment analysis/advice for publicly traded biopharmaceutical companies through his work at Zach's Investment Research. Schwartz spends his free time helping startup biotech companies. He can be reached at anthony.schwartz.phd@gmail.com.

Derek Haight ('12 M.S. Bioengineering) works as a researcher in the Sports Research at NIKE in Portland, OR. In his new position, he works with very elite athletes to gain insights into what makes them excel. The information he collects is then used to improve future footwear and equipment.

Your former classmates are eager to hear from you! Keep them informed of your career accomplishments and personal achievements through the Class Notes section. Share your new job, promotion, award, patent, further education, volunteer work, marriage, birth, or any accomplishment. If you are open to others connecting with you, please provide your email address and ask that it be published along with your news. In addition, we encourage alumni to send along a high-resolution photo of at least 300 dpi when submitting your accomplishments. Please send the images to Allison.Robin@colostate.edu.

Puissant's Terumo BCT Internship

Nicole Puissant will graduate in May 2015 with a dual-degree—B.S. in Biomedical Engineering and a B.S. in Chemical and Biological Engineering. Last summer, she had an internship with Terumo BCT in Lakewood, CO, where she was part of the Spectra Optia Apheresis System group and learned about blood therapeutics. She created and performed verification protocols and reports and, in fact, is still working with Terumo BCT on a project to automate protein production. A few of the best elements about the internship included seeing an actual blood donation on one of the Terumo machines and knowing that, “no matter what I was doing that day, I knew I was helping to save someone's life” says Puissant.

“We are impressed with the CSU dual-degree bioengineering majors,” stated Jeremy Kolenbrander, Senior Manager for Therapeutics Product Development at Terumo BCT. “Their skills line up very well with our medical device development and manufacturing needs.”



faculty update >>>

New Professor



Yan (Vivian) Li recently joined the School of Biomedical Engineering as an associate faculty member. Li is an assistant professor in the Department of Design and

Merchandising in the College of Health and Human Sciences. Li's research focuses on fiber innovations via nanotechnology for advanced textile applications, particularly for medical textiles and apparel. She is committed to collaborating with researchers in related fields such as biomedical engineering, materials science and engineering, chemistry, and physics, as there is a constant need to upgrade the functions and performance of textiles and apparel for the improvement of protection and living conditions. With the growing medical need for sensing and communication features, Li is focused on developing novel multifunctional medical textile materials.



Meet the New Undergraduate Advisor

Becca Kronenbitter is a new part-time undergraduate academic advisor with the SBME and is also currently pursuing a M.Ed. in counseling and career development at CSU. Becca has a background in student and career services and has a passion for offering students support as they navigate their college experiences and develop intellectually, personally, and professionally.

Originally from New Hampshire, Becca graduated with a B.A. in sociology from the University of Colorado Boulder. Becca discovered her passion for student services in higher education working in Admissions and Career Services at Cornell University. Becca is excited to have joined the SBME team and enjoys working with colleagues to create an empowering support system for students as they adapt to college and explore their interests. She can be reached at becca.kronenbitter@colostate.edu.

SBME Faculty Research & Awards



Melissa Reynolds Wins NSF Grant to Further Biomaterials Research



Melissa Reynolds, assistant professor in the Department of Chemistry and Biomedical Engineering at Colorado State, received a prestigious five-year, \$500,000 CAREER grant from the National Science Foundation to embed chemical catalysts into medical devices that interact with blood to create nitric oxide—a molecule produced by the human body to block infections, prevent dangerous clotting and promote healthy cell growth.

The CAREER grant will enable Reynolds and her research team to learn how and why the crystal chemical catalysts work and how to make longer-lasting crystals. The current water soluble prototypes dissolve over time. “We want to make the crystals last as long as the catheter or stent is in the body, and in some cases that can be years,” says Reynolds. “With this grant, we’ll be looking at different materials so these crystals last longer.”

Currently, patients implanted with devices must ingest anti-coagulants for the rest of their lives to ensure their bodies do not reject the objects. However, if a patient is wounded, “they bleed out because the body can’t rely on the blood to clot and slow the bleeding,” says Reynolds. “We want to develop materials that do that inside the body so they don’t have to stay on anti-coagulants.”

Sue James Receives CSU Ventures Award for Innovative Excellence



This year’s CSU Ventures 2014 Award for Innovative Excellence was presented to Susan James, department head for Mechanical Engineering and professor for Biomedical Engineering. This award is presented to a researcher whose innovations have been transferred to industry and are exhibiting strong potential for commercial use. James’ research has led to the development of a bio-inspired material known as BioPoly™. Currently, this material is available in Europe for orthopedic applications such as total joint replacements and the knee resurfacing implant. The benefits of this material include minimally invasive surgery, less trauma to patients, and expedited recovery time. Once FDA approval is received, the resurfacing implant will be available in the United States.

Carmen Menoni Receives Two Prestigious Honors



In 2014, Carmen Menoni, professor in the Department of Electrical and Computer Engineering and Biomedical Engineering, received CSU’s University Distinguished Professor award for her outstanding scholarship and achievement in semiconductor physics, optical materials science, and engineering and nanoscale imaging. Internationally recognized, she has led the use of bright beams of extreme ultraviolet laser light that are used to demonstrate novel, nanoscale table-top microscopies. Professors receiving this title hold the distinction for the duration of their association with the university.

Menoni has also held several leadership positions within the Institute of Electrical and Electronics Engineer (IEEE). This year, IEEE selected Menoni to serve as a Distinguished Lecturer for the upcoming academic year. As an IEEE Distinguished Lecturer, Menoni will travel the world to share her expertise on the subject of extreme photonics, an area that encompasses the generation and utilization of bright pulses of laser light with wavelengths 10-50 times shorter than blue light. She will also discuss opportunities for new microscopes, nano-probes, and material modification tools that can achieve nano-scale spatial resolution in materials science and biology.

New Director of Equine Clinical Services Announced



Recently promoted to Director of Equine Clinical Services at the James L. Voss Veterinary Teaching Hospital, Chris Kawcak, a professor in the Department of Equine Science and Biomedical Engineering, focuses on teaching, research, outreach and clinical services related to horses.

Kawcak is one of a team of researchers working to find ways to prevent and treat catastrophic injuries in equine athletes. He utilizes three-dimensional imaging techniques, MRI and CT to diagnose early joint disease and microscopic joint injuries. Working with researchers in biomedical engineering, Kawcak has developed biomechanical models to assess risk factors for equine athletes. These models may also improve diagnosis and treatment for people with arthritis and joint injuries.

SBME Student Accomplishments

BME Graduate Students Teach at Northrop Grumman Summer Camp

This past summer, SBME graduate students, Michelle Mellenthin and Laura Place, worked with engineers from Northrop Grumman to build excitement among Denver metro high school students for in-demand career fields. The summer camp, which took place at Grandview High School on July 21-24, focused on hands-on learning opportunities in STEM disciplines. New to this year's camp was a focus on biomedical engineering. Both Mellenthin and Place instructed students on biomechanics, biomedical imaging, biomaterials, biomedical devices and diagnostics. "The two CSU biomedical engineering students who taught the class were exceptional," says Michael de Miranda, professor of engineering education at Colorado State University. This summer camp is offered annually as part of Colorado State's STEM partnership with the Northrop Grumman Corporation.

BME Students Named International Fellows

The Office of International Programs has named Hannah Pauly and Michelle Mellenthin International Presidential Fellows for the 2014-2015 school year. The International Presidential Fellows program was designed to introduce leading graduate students and visiting scholars to ongoing pathbreaking research at CSU, to develop their leadership potential in the international sphere, and to help build bridges to other researchers across the entire CSU campus. This year there are 27 International Presidential Fellows representing 20 countries at Colorado State University.



Mellenthin

Michelle Mellenthin is currently pursuing a Ph.D. in biomedical engineering at Colorado State. After journeying to rural Guatemala with Engineers Without Borders three times as an undergraduate, Michelle's interest in accessible medical technologies became personal. The ability to put names and faces with the people who could benefit from devices that she would someday innovate fueled her passion and motivated her to further her education and skills. This desire drove her to earn a bachelor's degree in Biomedical Engineering at the Milwaukee School of Engineering in 2010. Afterward, she began working as a graduate research assistant for Dr. Jennifer Mueller at CSU, investigating a low-cost and portable medical imaging technique. Over the 2012-2013 academic year, Michelle received a Whitaker International Fellowship to work on the design of an electrical impedance tomography imaging device at the University of São Paulo in Brazil. In those eleven months, she embraced every opportunity to learn more about

Brazilian culture and helped strengthen the collaborative relationship between the two research labs. She plans to finish her doctoral degree by the end of 2015. When she is not working, Michelle enjoys hiking and biking with friends.



Pauly

Hannah Pauly is currently pursuing a Ph.D. in Biomedical Engineering at Colorado State. She is from Lexington, KY, USA and received her bachelor's degree from Vanderbilt University in Nashville, TN, where she majored in biomedical engineering. In addition to researching and studying at CSU, Hannah has spent time researching at Trinity College in Dublin, Ireland. Currently, she is working in the Orthopedic Bioengineering Research Laboratory, where her primary project focuses on tissue engineering an artificial anterior cruciate ligament replacement. Hannah has also worked on projects characterizing the mechanical properties of osteoarthritic meniscal attachment tissue, characterizing the structure of traumatically injured femurs and tibias, and assessing the mechanics of polymer hydrogels. In her spare time, Hannah enjoys reading, hiking and spending time with her friends.

3D Lab Enables Students to Create Hearing Aid Covers

With the help of Colorado State's Idea-2-Product 3D printing laboratory, Megan Aanstoos, Ph.D. bioengineering candidate, sought to find a solution to ear-piercing sounds brought about by strands of hair brushing against her hearing aid. When she approached the lab with her idea for hearing aid covers, she was introduced to staff member, Craig Egan. Egan is also deaf and therefore, immediately identified with the issues Aanstoos was out to solve. Currently pursuing a master's degree in architecture, he was able to craft design ideas with input from audiologists and their patients. Within a few months, Aanstoos and Egan had created four prototypes.

"The technology of the Idea-2-Product lab made it possible to take this idea from my brain to an actual product quickly and without the need for a very large grant or industry involvement," Aanstoos said.

The Idea-2-Product 3D printing lab is open to the public. For a fee, users can consult with I2P staff on design and development. For more information, visit <https://idea2product.net>.





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SBME Events Calendar

FEBRUARY 2015

SBME Seminar: Dr. Julie Dunn, Medical Center of the Rockies
Feb. 2 / 229 Scott Bioengineering Building / 12–12:50 p.m.

MARCH 2015

CSU BioTech Connect

Mar. 5 / Lory Student Center Grand Ballroom / 5:30–8:00 p.m.
For information, contact Lucinda Van Inwagen, (970) 491-1955

SBME Seminar: Dr. Bin He, University of Minnesota

Mar. 9 / 229 Scott Bioengineering Building / 12–12:50 p.m.

APRIL 2015

Engineering Days (E-Days)

Apr. 17 / CSU Lory Student Center

SBME Seminar: Dr. Dawn Elliott, University of Delaware

Apr. 20 / 229 Scott Bioengineering Building / 12–12:50 p.m.

giving opportunities >>>

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.

SBME Scholarship for Leadership and Innovation

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

Joan King Scholarship

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