Fall 2012

Colorado State University
School of Biomedical Engineering

Special points of interest:

- **SBME celebrates five years of research, education, and collaboration.**
- Regulatory Affairs Industry/Academic Consortium addresses the industry-specific educational needs of the bioscience workforce.
- Engineering II is scheduled to be open in fall 2013.

Inside this issue:

Message from the Director

Dr. Stuart Tobet, director

The fall of 2012 marks a number of significant milestones for the School of Biomedical Engineering at Colorado State University. For one, we celebrate our fifth anniversary as a degree granting program. We are gratified by how much the school has built on its strengths.

- Our faculty continue to commit themselves to excellence in teaching and research, capturing awards, publishing in the most respected journals, and forging new collaborations.
- We have expanded our partnerships with community leaders and businesses. One result is the Regulatory Affairs Industry/Academic Consortium that exemplifies SBME's commitment to creatively partner with industry to promote transformational science and technology.
- Our first anniversary as an undergraduate degree program is reason for yet another celebration. Growing opportunities for internships and experiential learning further emphasize the workforce potential of this new undergraduate dual degree.

The support of valued allies such as you is key to our mission of infusing biomedical issues and problems with engineering skills and solutions. I welcome your participation, insights, questions, and ideas. You can reach me at (970) 491-7157 or Stuart.Tobet@colostate.edu.

SBME Celebrates Five-Year Anniversary

2007

- School of Biomedical Engineering established
- PhD, MS, ME programs begin
- Sue James appointed director

2010

- Stuart Tobet, new SBME director
- Kevin Lear, new SBME associate director and director of undergraduate programs

2011

- Regulatory Affairs program launched online
- First class of dual degree freshmen arrive on campus
- CSU breaks ground on Engineering II

2012

- Allison Robin hired as business development coordinator

SBME Interdisciplinary Research and Collaboration

Looking to explore new ideas? Solve an unmet biomedical need? Want scientific validation of a new device or method? Striving to be on the leading edge of new technologies? If so, we may be able to help.

Colorado State University's School of Biomedical Engineering is building local area industry collaborations. As you read throughout the newsletter, our faculty are conducting cutting edge research and are strong sources of information in a number of areas including, medical devices and therapeutics, imaging and diagnostics, and regenerative and rehabilitative medicine. The chart below is provided to help industry professionals quickly identify research interests of SBME faculty.

We encourage you to contact us to set up an informal information exchange meeting. These gatherings initiate the exploration of cross-disciplinary research areas, identify joint or cooperative ventures, encourage resource sharing, create potential grant opportunities, and provide for the exchange of information about state-of-the-art research.

If you would like to begin a conversation with SBME to discuss a beneficial collaboration, please contact Director Stuart Tobet at stuart.tobet@colostate.edu or (970) 491-7157.

SBME Interdisciplinary Research Areas	Medical Devices and Therapeutics	Imaging and Diagnostics	Regenerative and Rehabilitative Medicine
Research Interests	Biomedical image and signal processing Cardiovascular mechanics Equine orthopedics Polymetric biomaterials	Biosensors Electrical impedance tomography Lab-on-a-chip Chemical vision	Materials for tissue engineering Biomimetic nitric oxide materials Orthopaedic biomechanics Stem cell therapy Cartilage regeneration
SBME Faculty	V. Chandrasekar (Chandra), Ph.D. Dave Dandy, Ph.D. Prasad Dasi, Ph.D. Seth Donahue, Ph.D. Dave Frisbie, Ph.D., D.V.M. Laurie Goodrich, Ph.D., D.V.M. Kevin Haussler, Ph.D., D.V.M., D.C. Charles Henry, Ph.D. Sue James, Ph.D. Chris Kawcak, Ph.D., D.V.M. Salman Khetani, Ph.D. John Kisiday, Ph.D. Kevin Lear, Ph.D. C. Wayne McIlwraith, Ph.D., D.Sc., D.V.M. Christie Pebbles, Ph.D. Ketul C. Popat, Ph.D. Christian Puttlitz, Ph.D. Ken Reardon, Ph.D. Brad Reisfeld, Ph.D. Melissa Reynolds, Ph.D. David (Qiang) Wang, Ph.D.	Chuck Anderson, Ph.D. Jim Bamburg, Ph.D. Randy Bartels, Ph.D. V. Chandrasekar (Chandra), Ph.D. Tom Chen, Ph.D. Dave Dandy, Ph.D. Scott Earley, Ph.D. Charles Henry, Ph.D. Diego Krapf, Ph.D. Kevin Lear, Ph.D. C. Wayne McIlwraith, Ph.D., D.Sc., D.V.M. Carmen Menoni, Ph.D. Jennifer Mueller, Ph.D. Ashok Prasad, Ph.D. Vakhtang Putkaradze, Ph.D. Ken Reardon, Ph.D. Stuart Tobet, Ph.D. Jozseph Vigh, Ph.D. David (Qiang) Wang, Ph.D.	Ray Browning, Ph.D. Frank Dinenno, Ph.D. Tammy Donahue, Ph.D. Seth Donahue, Ph.D. Scott Earley, Ph.D. Nicole Ehrhart, V.M.D. Nick Fisk, Ph.D. Dave Frisbie, Ph.D., D.V.M. Laurie Goodrich, Ph.D., D.V.M. Kevin Haussler, Ph.D., D.V.M., D.C. Sue James, Ph.D. Chris Kawcak, Ph.D., D.V.M. Salman Khetani, Ph.D. Matt Kipper, Ph.D. John Kisiday, Ph.D. C. Wayne McIlwraith, Ph.D., D.Sc., D.V.M. Ketul C. Popat, Ph.D. Ashok Prasad, Ph.D. Christian Puttlitz, Ph.D. Raoul Reiser, Ph.D. Melissa Reynolds, Ph.D. Stuart Tobet, Ph.D. Brian Tracy, Ph.D.

Graduate BME Studies Update

Today, the School of Biomedical Engineering has more than 55 students enrolled in its four graduate degree programs: Ph.D., Master of Science, Master of Engineering, and Master of Engineering Online. Our students are supported by more than 60 faculty members across 13 different departments in four colleges on campus. We provide collaborative and transdisciplinary education, research, and experiences for our trainees.

Since its inception, SBME has graduated 22 M.E., seven M.S., and seven Ph.D. students. Our graduates have gone on to post-doc positions at prestigious universities and advanced their careers at top bioscience companies.

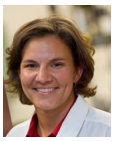
Current Ph.D. student, Michelle Mellenthin, was awarded a Whitaker Fellowship and is spending the academic year in Brazil. Emily Stump ('07 B.S. Microbiology, '10 M.S., Bioengineering), validation scientist at Commissioning Agents, Inc., was nationally recognized in the International Society for Pharmaceutical Engineering ISPEAK newsletter for her extensive service work. Stump has been an active member of ISPE since 2006, when she founded the CSU Student Chapter. She currently serves on four ISPE committees. Barb Smith ('12 Ph.D. Bioengineering), has started postdoctoral research under the supervision of Dr. George Whitesides in the Department of Chemistry at Harvard University.

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

Sara Neys, advisor, SBME Graduate Programs

SBME New Core Faculty Members

Seth Donahue joined the College of Veterinary Medicine and the Department of Mechanical Engineering as associate professor. Formerly a professor at Michigan Technological University, Donahue taught human biomechanics and cell and tissue mechanics. His research interests include osteoporosis drugs and drug delivery, drug-loaded biomaterials systems for accelerating bone defect healing for limb salvage and quantification of serum hormones and biomolecules in hibernating black bears.



Tammy Donahue joined the School of Biomedical Engineering as a core faculty member. For the last 20 years, Donahue has studied in the orthopaedic biomechanics area with specific focus on soft tissue mechanics, namely meniscus, tendon/ligament and muscle. She received her Ph.D. from University of California at Davis.

Scott Earley is an associate professor for the Department of Biomedical Sciences at Colorado State. Scott has developed a world-renowned research program in vascular physiology at CSU. His research is consistently published in the top physiology and clinical journals. Earley received his Ph.D. from the University of New Mexico School of Medicine.

Nick Fisk comes to us from the Department of Chemical and Biological Engineering at CSU. His research interests cover protein interactions, synthetic biology, and biosensors. Fisk's laboratory is currently developing sensors for active tuberculosis infection supported by a seed grant from the Bill and Melinda Gates Foundation. Fisk received his Ph.D. from the University of Wisconsin.

Salman Khetani joined CSU in fall 2011 as an assistant professor in the Department of Mechanical Engineering. His research interests include creating engineered tissue models of human physiology and disease for *in vitro* research. He has successfully merged semiconductor-based microfabrication tools with tissue engineering to create a highly stable model of the human liver in a miniaturized format for drug screening. He received his Ph.D. from the University of California at San Diego.

SBME Faculty Research and Awards

MATT KIPPER AND NICOLE EHRHART DEVELOP COATING FOR BONE IMPLANTS

The Muscoskeletal Transplant Foundation has awarded Matt Kipper, associate professor of chemical and biological engineering and biomedical engineering, a three-year, $300,000 grant to further develop and test a nanostructured material used to coat large, dead pieces of bone on bone allografts.

Dr. Nicole Ehrhart, professor in surgical oncology and a specialist in cancer surgery at Colorado State's Animal Cancer Center, will work with Kipper to test the healing of coated bones versus noncoated bones. According to Kipper, noncoated implants (bones) have a "high incidence of failure, related to healing where that implant was put in."

Controlling the structure of the coating at the molecular scale is the key to success and has been proven on other types of surfaces. If they can demonstrate that they can safely stabilize the proteins they want and cause stem cells to grow, this research will benefit both humans and animals at risk for losing a limb due to massive bone trauma or bone cancer.

SUSAN JAMES AND BIOPOLY LLC CREATE JOINT IMPLANT MATERIAL FOR HUMANS

After 17 years of development, Susan James, now department head of Mechanical Engineering at Colorado State and formerly founding director of CSU's School of Biomedical Engineering, can proudly say that her invention of a longer-lasting joint implant material is now being used in humans. "This success will enhance our reputation to show that what begins as fundamental research eventually reaches the clinic."

This implant material designed to allow active adults to seek joint repair at an earlier age and thus reduce their pain sooner, was developed in conjunction with BioPoly LLC, an orthopedic implant company based in Fort Wayne, Indiana. According to BioPoly officials, "The BioPoly RS Partial Resurfacing Knee Implant is the first knee device made from a proprietary biomaterial specifically created for favorable interaction with joint tissues."

The CSU-related patents were licensed to BioPoly by CSU Ventures, the technology transfer office for the university.

MELISSA REYNOLDS BIO-BANDAIDS PROMOTE WOUND HEALING

Foreign-body reactions are common among synthetic materials such as sutures, surgical patches, and bone screws used to promote healing.

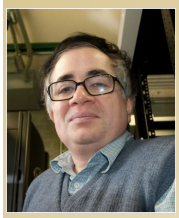
However, Melissa Reynolds, assistant professor in the Department of Chemistry and Biomedical Engineering at Colorado State, has developed a class of biodegradable materials that mimic the body's own healing process, therefore eliminating systemic side effects.

The materials used are natural and synthetic polymer backbones functionalized with nitric oxide (NO), a naturally occurring signaling agent. The materials have been tested and were shown not to cause adverse effects. Various amounts of NO can be loaded onto the biodegradable, non-toxic polymers, allowing for therapeutic action and tunable storage which serves to mimic the natural processes that occur within the body to maintain homeostasis.

The advantages of these polymers, including their biocompatibility and ability to prevent and treat localized infection, make them practical for clinical use.

ASHOK PRASAD RECEIVES NSF CAREER AWARD TO MODEL HOW CELLS RESPOND TO TOPOGRAPHY

Ashok Prasad, assistant professor of chemical and biological engineering and biomedical engineering, has been awarded a $400,000, five-year National Science Foundation CAREER grant to study how stem cells respond to the geometry and topography of their environment.



Prasad will use mathematical and computational modeling to understand how these physical cues can direct mesenchymal stem cell differentiation into different cell types. He will develop models that improve understanding of how these cells renew themselves, particularly their role in bone formation. "Mechanical signals that cells receive from their environment are increasingly being recognized as extremely important for human health," Prasad said. His research forms part of the attempt to make quantitative predictive models for biological phenomena that could uncover the engineering principles behind life.

According to NSF, the Early CAREER Award is the "most prestigious awards in support of junior faculty who exemplify the role of teaching-scholars through outstanding research."

Engineering II Facility Progress

In April 2011, Colorado State broke ground on Engineering II, a 122,000 square foot interdisciplinary research and academic facility that will bring faculty and students together in teams focused on energy, health, and the environment. The building is needed to accommodate the College of Engineering's growing student enrollment and expanding research activities.

Core faculty from the School of Biomedical Engineering will lead many of the numerous research pods within Engineering II, including biomechanics, high -speed biomedical microscopies, photonic biosensors, and lab-on-a-chip systems.

Engineering II is expected to hold a Leadership in Energy and Environmental Design (LEED) Gold Certificate, in accordance with the green building rating system developed by the U.S. Green Building Council, regarding sustainable construction.

The building will be open to students and faculty in Fall 2013.

Tour the Building

Tours are offered at 3:30 p.m. on the second Tuesday and fourth Friday of each month. Tours begin at the Haselden Barton Malow management trailer located on the southwest corner of Meridian Avenue and West Plum Street. For more information, contact Jesse Parker at (970) 491-3885.

Naming Opportunities

To receive information about available naming opportunities, please contact the College of Engineering Development Office at (970) 491-3358 or supportengineering@colostate.edu.

Student Success Center

Lecture Hall

Regulatory Affairs Program Growth

In response to the medical device and pharmaceutical industry's request to infuse quality and regulatory training into the curriculum, the School of Biomedical Engineering at Colorado State University formed the Regulatory Affairs Industry/Academic Consortium in October 2010. This collaborative group of pharmaceutical, biotechnology, medical device companies, professional societies, bioscience associations, and academic and governmental institutions are dedicated to addressing the industry-specific educational needs of Colorado's bioscience workforce, therefore enhancing education and economic development opportunities in the State.

Faculty and Consortium members participate in the development and delivery of the Regulatory Affairs Interdisciplinary Studies Program. This flexible, accelerated, four-course, online program provides a comprehensive understanding of the central elements of regulatory affairs and quality as it applies to the development, manufacturing, and commercialization of pharmaceutical and medical device, in-vitro diagnostics, and human tissue products.

The first course of this program was launched in January 2011, and since that time 104 students have participated. The School is now working to move the curriculum into an online graduate certificate that can be taken in its entirety or as electives toward other graduate programs.

For more information about the Regulatory Affairs program contact Deanna Scott, director of interdisciplinary regulatory affairs program, (970) 402-5330 or Deanna.Scott@colostate.edu.

Deanna Scott, director, Interdisciplinary Regulatory Affairs Program

Regulatory Affairs Industry/Academic Consortium Members

Medical Center of the Rockies, Poudre Valley Health System

Medtronic

Polsinelli Shughart PC

Colorado BioScience Association

REGLERA Simplifying Regulatory Law and Guidance

Collaborative Responsive NextGen Outsourcing

regulus pharmaceutical consulting, inc

CPC Clinical Research

AlloSource Doing More With Life

Baxa

USDA Wildlife Services NWRC National Wildlife Research Center

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FIND US ON:

SBME Events Calendar fall 2012 and spring 2013

OCTOBER 2012

SBME Seminar: "Towards Metabolic Engineering of Medicinal Plant for Pharmaceutical Production" presented by Dr. Christie Peebles, CSU
Oct. 22 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

The Performing Art of Science Presentation
Speaker: Nancy Houfek, Harvard University
Oct. 29 / Hilton Fort Collins / 9—11:00 a.m.
ricro.colostate.edu/events.htm

SBME Seminar: "Communicating your Science" presented by Nancy Houfek, Harvard University
Oct. 29 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

NOVEMBER 2012

SBME Seminar: "A Physiologic-Based Pharmacokinetic Model for Virtual Drug Dosing in Cats" presented by Renee Lake, SBME Ph.D. student
Nov. 5 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

SBME Seminar: "Fracture Healing in Haversian Bone under Conditions of Simulated Microgravity" presented by Ben Gadomski, SBME Ph.D. student
Nov. 12 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

SBME Seminar: Dr. Yu Li Wang, Carnegie Mellon
Nov. 26 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

Front Range Neuroscience Group Annual Meeting
Nov. 28 / Hilton Fort Collins / 10:00 a.m.—6:30 p.m.
FRNG.colostate.edu

DECEMBER 2012

SBME Seminar: "Activation of TRPM4 Channels in Contractile Smooth Muscle Cell by Mechanical Stretch" presented by Dr. Scott Earley, CSU
Dec. 3 / CSU Behavioral Sciences Bldg., RM 103 / 12—12:50 p.m.

APRIL 2013

CSU Research Colloquium
Cardiovascular Research at CSU: Molecules, Models, and Mankind
April 4 & April 5 / Hilton Fort Collins
vpr.colostate.edu/pages/research_colloquium.asp

Engineering Days
April 19 / CSU Lory Student Center ballrooms
9:00 a.m.—3:00 p.m.