Dear alumni and friends,

You probably know how important design courses are to BME undergraduates. As former students, you yourself may have worked on a project that had a real impact on a person’s life. The six sequential biomedical engineering design courses have the potential to significantly improve the quality of life for the disabled and the elderly in the local community. The experience that both patients and students receive is priceless.

Last year, a team of BME seniors dedicated themselves to helping a surgeon with T12 paraplegia by taking an entrepreneurial approach. They conducted their own fund-raising campaign and gathered support from companies who donated many of the necessary parts for their design: a motorized base with four mecanum wheels (to move in any direction) and an ergonomic stability mechanism to hold the client in the standing position, allowing him to perform surgeries once again. Even after the design course has ended, the team continues to perfect its design to enable this physician to return to his passion, orthopedic surgery.

This fall, a team of sophomores and juniors is designing a device to assist a 65-year-old woman who has suffered from Parkinson’s disease over the last 15 years. She would love to again be able to enjoy cooking in her kitchen and to regain the ability to complete everyday tasks. Complications from her condition cause her to be severely hunched over while standing or sitting, but the team plans to design, develop and construct a brace that can be worn to help hold her upright while also increasing her mobility. The students’ hope is to allow the client to easily put on and take off the brace on her own, thereby reestablishing her independence.

Teams are working on 39 projects this semester. To support these projects and to help ensure their success, please consider donating to the Biomedical Engineering Design Course Fund. Go to go.wisc.edu/69oo33.

Thanks, and ON WISCONSIN! —Beth Meyerand

NEW FACULTY:
BME welcomes Kris Saha

Krishanu (Kris) Saha joined the department as an assistant professor in fall 2012, following a postdoctoral fellowship at the Whitehead Institute for Biomedical Research at MIT. Saha is broadly interested in how and why different types of human cells are generated in the laboratory. He investigates human stem cells and emerging engineering methods in materials science and synthetic biology to make smarter therapeutics, model human disease and advance personalized medicine.

“What appeals to me about Wisconsin is that I have utmost freedom to pursue questions across disciplines with top-notch colleagues and resources, while also having a strong connection to teaching core principles of engineering,” says Saha.

Biomedical engineering undergrads can expect to spend a large chunk of their education working on products that solve real-world medical problems. From admission to the department all the way through to graduation, they take a series of design courses that help them apply a suite of skills and knowledge necessary for devising solutions to challenges that come up daily in the world of medicine. Often, they draw on some fairly disparate—and seemingly unrelated—fields.

For example, why would they need to know how the precision of gyroscopes of a Segway might be affected by the regulations governing a hospital operating room? What could quality woodworking have to do with a device that offers comfortable in-home patient care for a child with cerebral palsy? “Most of the time, engineering isn’t a straight line,” says Senior Lecturer Mitch Tyler. “You have to learn to draw from different places and different sources in order to synthesize something new and relevant to the problem you’re dealing with.”

Tyler says textbooks and problem sets can only offer a finite number of opportunities for students to test their problem-solving skills. In contrast, BME design courses get students out of their comfort zone and enable them to become more interdisciplinary, more resourceful and more well-rounded as engineers.

In addition, real-world design challenges offer students a chance to experience the human, business and practical constraints that just aren’t present in “on-paper” homework.

See examples of 2011-2012 student design projects on the back side.
**RESEARCH AWARDS**

- **Professor David Beebe**—$2.5 million from the Bill and Melinda Gates Foundation via its Grand Challenges in Global Health initiative to streamline methods for preparing patient samples for point-of-care diagnostics in developing countries.

- **Associate Professor Naomi Chesler**—$600,000 Course, Curriculum, Learning and Instruction grant via the National Science Foundation to develop and test a new internship simulation for engineering undergraduates.

- **Associate Professor of Pediatrics Marlowe W. Eldridge** (also BME) and **Associate Professor Naomi Chesler**—$3.27 million grant via the National Institutes of Health to study the relationship between bronchopulmonary dysplasia, a condition in low-birth-weight infants, and right heart failure in adulthood.

- **Assistant Professor Pam Kreeger**—$720,000 via the American Cancer Society to investigate how the communication between macrophages and cancer cells affects the progression of ovarian cancer.

- **Associate Professor William Murphy** as part of team lead by stem cell pioneer Dr. James Thomson—$2.2 million via National Institutes of Health to derive and assemble the distinct cell types found in the human cerebral cortex.

- **Associate Professor Justin Williams, LOCI Director** Kevin Elceir, Electrical and Computer Engineering Professor Barry Van Veen—$2 million via a Defense Advanced Research Projects Agency award to improve reliability of neural interfaces for robotic prosthetics.

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**BETTER HEALTH BY DESIGN (continued)**

*For a full version of this story: go.wisc.edu/w6zs80*

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**Standing Paraplegic Omni-Directional Transport**

Undergraduates Michael Konrath, James Madsen, Justin Cacciatore, Bret Olson and Blake Marzella developed a robotic platform to allow Dr. Garrett Cuppels, an orthopedic surgeon who lost the use of his legs in a 2010 accident, to return to the operating room to perform standing surgeries once again. Numerous media outlets ranging from WKOW in Madison to the Wausau Daily Herald profiled the team, but despite the excitement for their project, the students never lost sight of the gravity of their task. “This is someone’s livelihood, and it’s going to be used in a place where, if something goes wrong, it can not only hurt him, it could hurt other people,” says Konrath. “Everything we do has to be checked against calculations to craft a really accurate design—it’s a real product.”

**Hydrodissection Fluid Barrier**

Undergraduates Patrick Cassidy, Sean Heyrman, Alexander Johnson and Anthony Sprangers created a fluid barrier for ablation procedures that changes into a gel state at body temperature, requiring less fluid and potentially making the ablation procedure safe for patients for whom it would otherwise not be a viable option. The concept, which started as a design project, earned them second place in the Collegiate Inventors Competition in 2011. Now the students have patented their project as a potential product which could be sold alongside ablation equipment.

**CidalSeal**

Kelsey Hoegh, Taylor Powers, Laura Platner, Tanner Marshall and Daniel Tighe developed a foam cuff to help prevent infection at the site where a drain tube is placed after a breast mastectomy. In addition to taking home a 2012 Tong Design Award for the project, the team of BME seniors presented their work at the Wisconsin state capitol for a public science outreach event.

**Infant Respiratory Monitor**

Sudden Infant Death Syndrome is responsible for thousands of deaths each year in developing countries. Undergraduates Christopher Besaw, Benjamin Smith, Donald Weier and Stephen Young developed a reliable, low-cost detection system that alerts nearby adults when a child stops breathing, giving them a chance to wake or resuscitate the infant. The device—a concept taken up by several BME design teams over the past few years—received an honorable mention during the 2012 Tong Design Awards.

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**A changing table hidden in plain sight**

John and Melanie Patterson—a pair of ’98 UW-Madison grads now raising a family in Oregon, Wisconsin—asked BME students if they could design a changing table for their 8-year-old son Marc. Their son has cerebral palsy and requires diapering, but as he has grown, lifting him up to change him has become increasingly difficult. While most currently available products that would suit the Pattersons’ needs also looked very clinical, undergraduates Ben Smith, Lisle Blackbourn, Brett Napinwoki and Michael Kapitz took to heart the family’s desire for something that looked like it belonged in a home. By placing a pneumatic scissor-lift inside two interlocking wooden boxes, the team created a handcrafted changing table that doubles as a padded storage bench. Watch a video about the changing table project at: go.wisc.edu/7v4rpk.

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