Inside this Issue

Welcome from the Chair
Dr. Rick Rabbitt

New Faculty
Dr. Orly Alter

Faculty Spotlight
Dr. Bradley Greger

Postdoc Corner
Dr. Fernando Fernandez

Student Highlights
Undergraduates
Matthew M. Jacobsen
Katherine J. Sciuto

Graduates
Corinne Adams
Jacob Hinkle

Alumni
Melissa Hanson
Randy Platt

Translational Research
Industry Advisory Board

Upcoming Meetings
6th Annual Mountain West Biomedical Engineering Conference

Visit us online — www.bioen.utah.edu

Welcome from the Chair

I’m delighted to report that Utah Bioengineering had another stellar year and continues to accelerate at an incredible pace. In nearly equal proportions, our bachelor of science alumni are entering industry, medical/professional school, and graduate school. Three Utah Biomedical Engineering Undergraduates received prestigious Graduate Research Fellowships from the National Science Foundation last year. Two students received a Whitaker Foundation International Fellowships, and two graduate students were honored with best paper awards at national and international meetings. Our students continue to excel in entrepreneurial activities through involvement with technology commercialization and the Lassonde New Venture Development Center, winning national competitions such as the Carnegie Mellon McGinnis Venture Competition. Utah undergraduate biomedical engineers have dominated the State-wide Technology Titans competition recognizing their innovative ideas. The Department is fortunate to attract some of the sharpest students in the world and over the past 5 years awarded 195 B.S., 58 M.S., and 49 Ph.D. degrees.

Research productivity has been simply amazing. Each faculty member is responsible for over $645,000/yr in sponsored research expenditures, 5 peer reviewed publications in the primary literature, 4 invited/keynote presentations, and 2 invention disclosures in 2009 alone. In addition, several faculty members were honored with prestigious awards including Dr. Normann who was honored as “Docstor Horiis Causa” form Miguel Hernandez University, and Dr. Hitchcock who was selected as “University Professor”. I am very pleased that we were able to recruit Dr. A. (Chuck) Dorval and Dr. Orly Alter to Utah under the highly successful Utah Science, Technology and Research initiative. Dr. Dorval joined the Neural Engineering group and brings great strength in deep brain stimulation and related neural stimulation therapeutics. Dr. Alter joined the Scientific Computing and Imaging Institute and brings new and powerful techniques in genomic data analysis/discovery to Utah. The Department will host the Mountain West Biomedical Engineering Conference again this fall, and I hope you will join us to interact with students and faculty and to learn more about the exciting research and developments at the University of Utah.

Image of P. californica, the “sandcastle” worm, from Dr. Russel J. Stewart, courtesy of Fred Hayes. The adhesive created by the worm to build its dwelling has been researched by the Stewart lab to create a polymer adhesive that can be used in wet environments for medical purposes.
New Faculty

The Dept. of Bioengineering would like to welcome **Dr. Orly Alter**. She received her Ph.D. in Applied Physics at Stanford University in 1999. In her thesis work, she established the quantum theoretical limits to the information that can be obtained in the measurement of a single physical system.

Research in Dr. Alter’s Genomic Signal Processing Lab is motivated by recent high-throughput technologies, such as DNA microarrays, that make it possible to record the complete genomic signals that guide the progression of cellular processes. Future discovery and control in biology and medicine will come from the mathematical modeling of such data, just as Kepler discovered the laws of planetary motion by using mathematics to describe trends in astronomical data.

Dr. Alter develops generalizations of the matrix and tensor computations that underlie theoretical physics and uses them to create predictive models from large-scale molecular biological data. Her recent experimental results demonstrate for the first time that mathematical modeling of DNA microarray data can be used to correctly predict previously unknown cellular mechanisms.

Faculty Spotlight

**Dr. Bradley Greger**

Research in the Greger lab focuses on understanding how information is encoded in neural structures and ways to apply this understanding to the treatment of human pathology. Recent work in the lab has focused on using grids of micro-electrodes (micro-ecog grids) to record electrical activity from the surface of the brain in human patients. By using these very-small closely-spaced grids of electrodes, it is possible to access large amounts of information being processed by the brain from a relatively small area of the cerebral cortex. The neural data recorded by the micro-ecog grids is then analyzed to determine what a patient is doing or saying. The direction of arm movements and which of ten words a patient is speaking can currently be decoded from the neural signals. The results of these experiments are being used to guide the implementation of neural prostheses for severely paralyzed or ‘locked-in’ patients.

*Image*—microelectrodes in a clear silicon array rest on the brain surface.

Postdoc Corner

**Dr. Fernando Fernandez** joined Dr. John White’s lab in 2007 with a Canadian Institutes for Health Research postdoctoral fellowship. At that time the lab was based in Boston, but within six months he learned that John was planning to move his lab to Utah. Although making a decision to move with a lab can be challenging, Fernando described that this was an easy decision for him. Upon becoming a Postdoctoral fellow, starting in a new lab was not easy because he wanted to make sure that he had the same success he had as a graduate student and that he could still produce results but in a different setting. The real challenges faced as a postdoc, he explained, are coming up with new ideas, getting the experiments working and publishing. His research has been hypothesis driven which is perhaps not necessarily commonplace within Bioengineering Departments. A typical day for Fernando, in the USTAR professor’s lab, is varied as he explains that it depends on whether he is conducting research or having a day on the computer reading and writing. When experiments are planned the current techniques involve using *in vitro* brain slices that have been carefully dissected and then applied to neurophysiological and electrical testing, all of which must be done within a day. Fernando plans to continue his research interests in an academic professorial position, which is a goal he had when he started his postdoctoral career. With multiple first author papers in hand, including the most recent one published in the *Journal of Neurosciences* (2010), he has started applying for his next career position, and we wish him the best of luck.
Matthew M. Jacobsen, BME Senior
Matt has been working toward his degree in BME and Political Science since 2004. He took a two-year leave of absence to serve a LDS mission in Baltimore, MD (Spanish speaking). Soon after his return, he became involved in research with Dr. Masaaki Yoshigi at the Huntsman Cancer Institute. “We looked at the development of the embryonic heart from a proteomic perspective. Our goal was to find proteins expressed differentially through the development of the young heart using 2D differential gel electrophoresis. Using this technique, we successfully identified differentially expressed proteins in the embryonic heart that can be further studied to identify the roles the proteins play in the development of the heart.” Other activities that Matt participates in are: Students of Biomedical Engineering, Tau Beta Pi and the Undergraduate Student Advisory Committee for Bioengineering. He is also the editor of The Hinckley Journal of Politics. Upon graduating this coming spring, his immediate future plans involve embarking upon a Ph.D. Eventually, he wants to be involved in research and development in the biomedical industry, “to gain the perspective and expertise from the sector to be able to help in improving and reforming the interface that exists between government regulations and medical device design.”

Katherine J. Sciuto, BME Junior
Katie Sciuto is from Alaska but made her way to Utah when she was training to be on the U.S. Ski Team, which she made in 2007. She place 5th in Nationals in aerial jumps in 2007. She discovered biomedical engineering in 2008 and has been working toward her BS since that time. Katie is currently working with Dr. Steve Poelzing studying the effects of voltage sensitive dyes (used for optical mapping) on cardiac electrophysiology. She is also currently serving as the Department of Bioengineering’s Undergraduate Advisory Committee Co-Chair. She also works as a stunt woman and participates in the Utah chapter of the Screen Actors Guild. Upon completion of her degree, she plans to pursue a PhD in bioengineering.

Corinne Adams (University of Denver, BSME, 2008)
Corinne will be starting her third year this fall in Dr. Jeff Weiss’s lab. Her area of study is in orthopedic research that is conducted primarily in the Mechanical Engineering Building. She uses experimental and computational approaches to study mechanical properties of hip movement in normal activities. One of the techniques used for her research is a text scan grid of pressure transducers. She explains that there is no such thing as a typical day. For her research generating a model and analyzing it can takes at least 2 days, with a few additional days to clean up and then a week or more to do the data analysis. She works with Ashley Kapron and Mike Harris who also have research interests in different aspects of hip movements and has regular meetings with Dr. Weiss and Dr. Anderson. When there is a story ready to tell, she submits an abstract to attend meetings with groups such as the Orthopedic Research Society or the ASME. Corinne plans to complete and publish her current work carried out in the first couple of years of her PhD. In the following years, she plans to continue research work and publish at least two more peer reviewed papers before submitting her thesis. She is undecided at this stage as to her plans after obtaining her PhD.

Jacob Hinkle (Miami University, BS Mathematics and Physics, 2006)
Jacob’s area of research deals with focusing on shape analysis of anatomical structures and medical images. He recently used raw data from an imaging device (CT, PET, or MRI) to estimate motion of organs during image reconstruction. In addition to research, he has done some teaching and grading for a couple of classes. He enjoys teaching—"It's satisfying to relay information to a group of students and get feedback that they understand something they didn't before. I'm also a firm believer you don't know unless you can explain it.” Of balancing his social/personal life with that of research Jacob said, "I don't find this part too difficult really. I like to go out and have a good time, and I try to leave my work at work. That's not always possible though, and sometimes there's a research problem that nags me until I just go figure it out.” Although he would usually rather be at work solving engineering problems, he recognizes how useful conferences can be to build relationships among his colleagues and find collaborators. He feels that along with publishing journal articles, conferences are a great way to get the word out about your work, and he enjoys in-person communication with other scientists. He plans to apply for post-doc positions after graduation, and he eventually sees himself working in academia.
Melissa Hanson graduated cum laude in the spring of 2009. While she was at the University of Utah, she worked for 3.5 years with Dr. Patrick Kiser to develop a pH sensitive hydrogel that would act as a physical barrier to HIV in the vaginal lumen and would be loaded with anti-HIV anti-retro viral drug. She also participated in 2 REU’s, one at University of Washington and one at Rice University. Because she had a strong research portfolio and academic record, she chose to apply for the NSF Graduate Fellowship and was awarded it in spring of 2009. She is now working on her PhD at MIT. Her research is with Dr. Darrel Irvine. Together, they are developing micro-particle based HIV vaccines. She is specifically identifying the necessary adjuvants to create a sufficient immune response. She says, “I am grateful for the mentoring I received while at the University of Utah. It prepared me for my graduate career.”

Randall J. Platt, BS, 2010
Randall Platt graduate with honors spring 2010. Although he did not begin his undergraduate career in biomedical engineering, he was attracted to the “diversity of education” that BME offers because it “prepares students to understand new research areas and technologies and see the interconnections across disciplines.” While here, he worked with Dr. Baldomero Olivera (Department of Biology) researching a unique family of venomous cone snails whose venom can be used as treatment for chronic pain, epilepsy, Alzheimer’s, Parkinson’s disease, and drug dependence. His senior year, Randy was awarded the Whitaker Foundation Fellowship, and will be using this opportunity to work with Dr. Molly Stevens (MSE, Imperial College, London) to optimize synthetic, tissue engineered scaffolds for bone replacement surgery. Upon completion if his fellowship, Randy plans to obtain research in international laboratories followed by entry into a grad program. He would eventually like to be a full professor working in academia.

Translational Research Highlights

COMING SOON! Watch for this section in our next issue!

The Industrial Advisory Board (IAB) is excited this year to announce it is increasing membership from twelve to eighteen members. The Industrial Advisory Board (IAB) is comprised of executives from the life science industry in Utah. The board advises the department in curriculum development, student training, community outreach, collaborative opportunities and information transfer. We look forward to having the opportunities provided by this group for periodic meetings with various leading biomedical companies in Utah.

Upcoming Conferences

6th Annual Mountain West Biomedical Engineering Conference, Canyons Resort at Park City, Utah, September 10-11, 2010

http://www.bioen.utah.edu/conference/canyons2010/

Giving

If you would like to contribute to the department, you can do so by visiting this website:

http://togetherwereach.net/