



Department of Biomedical Engineering

*... to promote learning and discovery
that integrates engineering and life sciences
for the advancement of human health...*

Letter from the Chair



Dear Biomedical Engineering Alumni and Friends:

I'm thrilled to present the first newsletter from the new DEPARTMENT of Biomedical Engineering at The Ohio State University!

As many of you already know, Professor Herman Weed founded the Biomedical Engineering Center at OSU in 1971 and served as the first Director, until 1988. During that time, the Center was housed in the Department of Electrical Engineering, and focused on signal processing applications and instrumentation. In 1988, the Center emerged from being housed in a department to become a freestanding Center in the College of Engineering, with J. Fredrick Cornhill as the Director. Working with talented faculty, bright students, and dedicated staff members, his and subsequent leadership from Morton Friedman, Mauro Ferrari, and Andreas von Recum developed additional research foci and related graduate courses in biomedical engineering. The Center's operations became increasingly like that of a department, and finally, under the leadership of Professor von Recum, the Center was granted Departmental status in late 2005, and Professor von Recum became the department's first Chair. He also became the first Emeritus Professor in Biomedical Engineering, retiring from the Chair position in June 2006.

I have been warmly welcomed as the new Chair, arriving here in July 2006 after 23 years on the faculty of the Department of Biomedical Engineering at Tulane University, and nine years as the Department Chair. Immediately after arriving in Columbus, I began work with the faculty on strategic planning for the new department, first with a thorough Strength-Weakness-Opportunity-Threat analysis, classification of current research themes (based on recently published manuscripts), and development of Mission, Vision, and Objective statements. The plans set the stage for work on a proposal for a new undergraduate major that has, as its central theme, the *integration* of engineering and life sciences.

The proposal was completed in October, and is currently in the review and revise cycle that will take it over the next 12-24 months from the College of Engineering to the university Senate to the Board of Trustees and finally to the Board of Regents for final review and approval. In subsequent newsletters, I'll keep you informed of the progress, and provide more information about our educational research plans and accomplishments.

As we grow into our new role as a Department -- with the new ability to hire and grant tenure to faculty, and with an expanded educational mission to complement our research mission -- we will depend on help from our alumni and friends. There are many ways that you can help to fuel our successes. Most obvious is financial support that can be specifically targeted to the department. Gifts can help us achieve our strategic goals, and could include opportunities to endow a named professorship, a named scholarship, or laboratories and facilities. More modest gifts help with our operations and events for support of student activities. In addition to financial support, I am hoping that the network of alumni and friends will be able to help our students find internship and employment opportunities.

In this first newsletter, we are introducing three of the new faculty members (with more to be profiled in subsequent newsletters), honoring the Center's founder, describing one aspect of the innovative, collaborative research in the department, and listing some recent student achievements. Additional information is available on our recently revamped website: <http://www.bme.ohio-state.edu/>

I am meeting many new people on campus, and would especially like to meet our alumni and friends. Please stop by if convenient to get a first hand look at our progress. Thank you, in advance, for your continuing support of our efforts.

Richard T. Hart, Ph.D.
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MEET THE FACULTY



**Ronald Xu,
Ph.D.
Assistant
Professor**

I have been an assistant professor with the Department of Biomedical Engineering at The Ohio State University since Oc-

tober 2004. My lab is currently working on biomedical imaging and spectroscopy. We are developing multi-modal detection systems for real time, in vivo, non-invasive monitoring of metabolic dynamics of biological tissue. Major clinical applications include cancer detection and therapy, ischemic heart diseases, brain functional study and ocular imaging.

I earned my MS in precision machinery and instrumentation from the University of Science and Technology of China in 1992. I attended State University of New York at Stony Brook for MS education in mechanical engineering and earned my Ph.D. in mechanical engineering from Massachusetts Institute of Technology. I followed this with postdoctoral training in biomimetic robotics at Stanford University.

Before joining OSU I was invited to be a founding member of a medical device company in Silicon Valley. I was with the company for five years and am still serving as Director of Technology Development. During my five years with the company we published five patents, for pre-commercial engineering prototypes, and two major animal studies that eventually let to final FDA 510K approval of one commercial product. This experience has given me the complete cycle of medical device development and commercialization. At OSU, I am working on biomedical imaging and spectroscopy techniques to provide for real-time, non-invasive monitoring of the metabolic dynamics of biological tissues. My goal is to bring to BME my industrial experience and my understanding of clinical translational research.



**Jun Liu,
Ph.D.
Assistant
Professor**

I have been an assistant professor in the Department of Biomedical Engineering since 2005. My re-

search focuses on biomedical ultrasound with applications to disease detection and diagnosis. I am combining high resolution ultrasound imaging with bionanotechnology to develop disease-specific molecular imaging agents. I also apply mathematical and biomechanical models to analyze ultrasonic signals for non-invasive characterization of tissue properties.

Biomedical Engineering is by nature multidisciplinary. This presents a challenge for both research and education. BME research projects and courses often involve a wide span of knowledge and skills. The challenge is to ensure depth while embracing the breadth of this discipline. I believe this challenge brings great opportunities for meaningful integration and innovation in research and education.

Before joining the faculty, I was a graduate student in BME at Ohio State. My experiences give me unique perspectives of what might be helpful for students here. I hope to further enhance the learning experiences of students in both classroom teaching and one-on-one mentoring.

While growing up in China, I made up my mind to be an engineer while still in elementary school, when my teacher asked me to write an essay of "what you want to be when you grow up?" My mother was an engineer, and she was a role model for me. My parents and my sisters still live in China. My husband is a biostatistician, and I found it extremely helpful to consult him for research planning and data analysis. I have a 7 year old daughter. She enjoys a wide variety of activities: playing violin, swimming, and gymnastics. My hobby is reading, mostly non-fiction.



**Yi Zhao,
Ph.D.
Assistant
Professor**

I have been an assistant professor in the Department of Biomedical Engineering since Fall 2006. My re-

search interests are in Micro-Electro-Mechanical Systems (MEMS) and nanotechnologies for biomedical applications. I design and develop devices and systems sized from a few centimeters down to tens of nanometers using semiconductor based fabrication methods. Because the small feature size is comparable to many biologic entities (e.g. cells and tissue patches) these devices can be used to address biomedical problems that cannot be answered by conventional scale systems. In particular, I am interested in detection of biomechanical and bioelectrical signals at the small scales, and actuation of the biologic entities by external stimulation.

Before joining the BME faculty, I received my BS and MS, both in mechanical engineering from Tsinghua University in Beijing, China, and PhD in manufacturing Engineering from Boston University. I hope my experience will help the multidisciplinary research in BME from the engineering perspective, by applying micro/nano technologies to the established fields of the department. I would also like to initiate new research directions to address biomedical questions by innovative use of micro/nano engineering principles.

With the rapid development of biomedical micro/nano technologies, there is an increasing need for researchers from engineering disciplines, biologic science and clinical research to collaborate in an interactive manner. The mutual respect and understanding of these researchers is critically important for the continuous success of the merging area. This can be greatly facilitated by BME due to its close relationship with both, bridging engineering and biomedical/clinical research.

HONORING OHIO STATE'S BIOMEDICAL ENGINEERING PIONEER

Professor Emeritus Herman R. Weed was presented with a silver tray honoring his lifelong contributions to biomedical engineering at the departments inaugural celebration by William A. "Bud" Baeslack III, Dean of the College of Engineering.

Professor Weed joined family members, former students and colleagues as well as current faculty and students to commemorate the event.

Professor Weed came to Ohio State in 1946 and was an instructor while he received his master's degree in electrical engineering. He developed industrial electronics and automatic controls programs for the College of Engineering. With each new development in his field, he saw potential for even greater progress.

"I began to think about the fact that automatic controls needed to go through medicine, because the medical world was beginning to get a lot of equipment and new technology," he explains. In 1971, he took advantage of funding from the National Science Foundation to de-



velop a biomedical engineering program at Ohio State, where over the years he advised approximately 80 master's and 30 doctoral degree students.

Professor Weed's career achievements include being named a National Fellow of the American Institute of Medical and Biological Engineering and Outstanding Biomedical Engineering of the Year in 1987 by the American Society for Engineering Education. Professor Weed retired from Ohio State in 1996, having served 50 years.

"My wish for the biomedical engineering program was that it would be an operation where, instead of electrical engineering, mechanical engineering, medicine, surgery, and other departments being separate as they worked on research, they would be a group operation."

"It's the thing we hoped for even from the very beginning—that it would eventually be a department," says Professor Weed. "Even before it was a department, it was still doing fantastic things." We look forward to continuing the legacy of excellence that he began!

RESEARCH COLLABORATION

Assistant Professor Jun Liu's collaborative work with Dr. Thomas Rosol, Dean of the College of Veterinary Medicine and Professor of Veterinary Pathology at Ohio State was featured in the June 12, 2006 issue of *Advance* magazine. The article, "The Nano Level," details Dr. Liu and Dr. Rosol's study on nano-particles for ultrasound imaging. Through laboratory experiments with mice the Drs. were able to show that nano-sized particles injected into the mice would generate detectable signals on ultrasound and enhance the images of mouse liver.

This study, which was funded by the Susan G. Komen Breast Cancer Foundation,

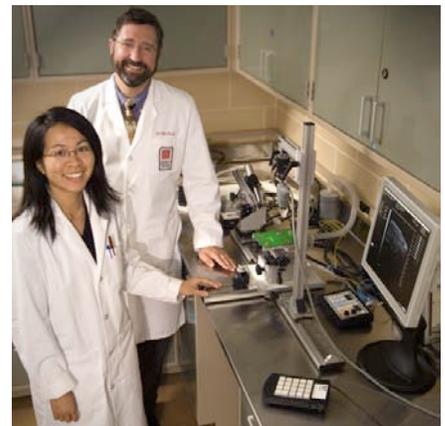
was published in *Physics in Medicine and Biology*, 51:9, May 7, 2006.

This study aims to provide evidence that nanoparticles are able to enhance ultrasound images. The long term goal is to image and profile the molecular markers on small tumors being done so by specific binding of the nanoparticles to the molecular markers on cell surfaces.

Researchers anticipate that by combining ultrasound and nanotechnology they will be able to obtain a definitive diagnosis without performing invasive procedures like biopsies.

*For more on this study please see Dr. Liu and Dr. Rosol's co-authored study in *Physics in Medicine and Biology* and for

the whole article *The Nano Level* please see *Advance* magazine Ultrasound Supplement, June 12, 2006.



BME OUTREACH



In April 2006, the Biomedical Engineering Department hosted over 50 students from Brookhaven High School for a day of lab demonstrations and hands-on experiences with biomedical research. Lab demonstrations were held in Bevis Hall and the Dorothy M. Davis Heart and Lung Research Institute. Students took part in demonstrations on polymer characterization, biomedical optics, ultrasound of the eye, micro-devices and cell interactions, genetics, fluorescence microscopy and hard-tissue implants.

The day was a great success for the students, both in terms of interactions with the presenters and their overall positive impression of science, engineering, and The Ohio State University. One Brookhaven teacher commented that this experience was definitely beneficial for the students because "many of the students don't get a chance to see what goes on at a major university." Additionally, one student wrote back and stated that "I hope the next time I go to OSU is for me to go to school here."

BME STUDENT ACHIEVEMENT AND RECOGNITION

Keith Vogt, MD/PhD student working with BME participating faculty member Robert Small, MD, was awarded 1st place in the Scientific-Pain session and Overall Best Scientific Presentation at the 2006 Midwest Anesthesia Residents Conference for his presentation: "fMRI Studies of Pain are Improved by Cardiac Noise Correction." This was quite an accomplishment with the competition being PGY 2 through 4 residents in anesthesiology. Keith also presented his work at the 14th Scientific Meeting & Exhibition of the International Society of Magnetic Resonance in Medicine (ISMRM) in Seattle Washington in May 2006.

Dianne Henry, MD/PhD candidate working with BME faculty member Cynthia Roberts, Ph.D., Alan Litsky, MD, Sc.D. received a "Prevent Blindness Ohio Young Investigator Student Fellowship" award for female scholars in vision research. One of six grant awardees from Ohio State, Case Western Reserve, and University of Cincinnati, Dianne presented her work at a November 2006 vision research scientific forum cosponsored by Ohio's Aging Eye Public Private Partnership and keynoted by Dr. Pamela B. Davis, Interim Dean of Case Western Reserve School of Medicine.

Charles I. Jones III (MS from OSU BME'05 and currently a medical student at OSU), who continues to do research in the laboratory of BME faculty member Rita Alevriadou, Ph.D., presented his recent findings entitled: "Shear stress regulates the respiration of cultured vascular endothelial cells" at the Biomedical Engineering Society (BMES) Annual Meeting (Oct 11-14, 2006; Chicago, IL). Coauthors were: Zhaosheng Han (Postdoctoral fellow in the Alevriadou lab), Guruguhan Meenakshisundaram (BME PhD candidate; rotation at the Alevriadou lab), Yeong-Renn Chen (Assistant Professor, Internal Medicine), Govindasamy Ilangovan (Assistant Professor, Internal Medicine), and B. Rita Alevriadou (Associate Professor of BME and Internal Medicine).

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