

## Letter from the Chair



Dear Biomedical Engineering Alumni and Friends:

I am excited to send our Autumn newsletter and share our recent progress! First, we have received final approval to start an undergraduate degree program in Biomedical Engineering. We have recruited a small class of pioneering students who are starting in the major

this quarter with the very first undergraduate courses to be offered in the Winter (2009) quarter. These 2<sup>nd</sup> year students that comprise the class of 2011 have finished a core of science, math, and engineering science courses as they enter our program. Our biomedical engineering curriculum is designed to integrate engineering and life science courses with distinctive "domain courses" in the Junior year, and a design course, focused on projects to aid the disabled, in the Senior year. More details about our new program are in the newsletter, and on-line at <http://www.bme.ohio-state.edu>.

Second, we were able to recruit an outstanding new faculty member, **Samir N. Ghadiali** who joined us in September as an Associate Professor. (I've known Samir and his wife from their time as students in Biomedical Engineering at Tulane University, prior to my arrival at OSU in 2006.) Samir's research work brings multiscale techniques -- experiments and numerical simulations -- to examine fundamental questions from mechanotransduction at the cell level to applications of lung injury and eustachian tube dysfunction. His work is currently funded by NIH, NSF, and the American Heart Association. Not only does Samir bring added depth to our research and collaborations in Health Sciences, he had previously developed and taught a course in Quantitative Physiology. A modification of what he has taught before will be a key element of the new undergraduate curriculum.

I hope that you will want to help fuel our continued successes -- there are many ways that you can assist. 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

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

named professorship, a named scholarship, or laboratories and facilities. More modest gifts help with our operations and events. 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 newsletter, we continue to introduce our faculty members, introduce our undergraduate major, and list some recent faculty and student achievements.

I am always happy to meet our alumni and friends. Please stop by if convenient to get a firsthand look at our progress. Thank you, in advance, for your continuing support of our efforts.

Richard T. Hart, Ph.D.

Edgar C. Hendrickson Professor and Department Chair  
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## STEM Leadership Summer Camp



The Department of Biomedical Engineering hosted workshops for the STEM Leadership Summer Camp targeting underrepresented high school student groups interested in Engineering. The students pictured above have the opportunity to try the Dynamic Multimodal Imaging of Biological Tissue in Dr. Ronald Xu's lab.

## MEET THE FACULTY

**B. Rita Alevriadou, Ph.D.**  
Associate Professor

**Q: How did you get to OSU?** In 2003, I joined OSU as an Associate Professor of BME and Internal Medicine (Cardiology). On November 1st, I will have been here 5 years!

**Q: Where did you receive your degrees?** I graduated with a Diploma in Chemical Engineering from the Aristotle University of Thessaloniki, Greece in 1986. I started graduate studies at Rice University, Houston under a Fellowship award. At Rice, I carried out my research within the Bioengineering and Biosciences Institute and received a PhD in Chemical Engineering in 1992.

The same year, I joined the Molecular and Experimental Medicine Department, Scripps Research Institute, La Jolla, CA, as a post-doctoral fellow. From 1993-2003, I was an Assistant Professor of BME at the Johns Hopkins University School of Medicine, Baltimore, MD.

**Q: What influenced you to become a biomedical engineer?**

Like many engineers, my math skills contributed to my choice of a major. I was also interested in medicine, and when I was choosing a major for undergraduate study, BME was not an option, so I decided to pursue chemical engineering instead. For graduate school, I chose to concentrate in Bioengineering because I thought it would be interesting and worthwhile to use my engineering knowledge to advance human health.

**Q: Describe your proudest professional moment!**

The times when I was awarded grants from federal agencies and private foundations, which provided me with the financial means to operate my lab were some of the proudest moments in my career. Presentations from members of my group to national/international meetings, such as the Biomedical Engineering Society, also made me proud and gave me the happiness of being recognized as a valuable member of my professional society.

**Q: Any memories of the department chair with whom you've worked most closely?**

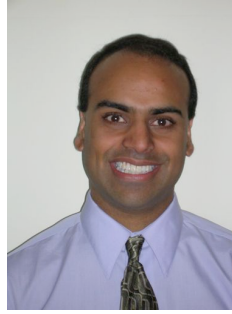
I still remember how nervous I was when Rich (Hart) came to interview for the Chair's position. Since I was a member of the Search Committee and wanted to make the best impression and convince him to join, I was trying to sound smart and help him form a positive impression of OSU. I continued talking as I was driving, with Rich in the passenger seat, from the Medical School to Bevis Hall, and suddenly I realized I had made a wrong turn and was going on 315 North, leaving the campus behind us! It took me a while, but I finally brought him to Bevis safe and sound.

**Q: A little about your personal background?**

Any time I have is spent with my three daughters; my oldest one is 9 and I have 4-year-old twins. I try to cultivate in them the love of reading and learning. I also enjoy swimming and traveling.

**Q: Tell us about your research.**

My research interests are in the areas of vascular biology/bioengineering, vascular endothelial cell mechanotransduction/mechanosignaling/mechanoregulation (cell signaling due to mechanical forces), oxidative stress, antioxidants, molecular mechanisms of blood cell adhesion, thrombosis, and inflammation. My lab employs molecular and engineering methodologies to enhance our understanding of how physical stimuli (such as fluid flow, stretch, oxygen tension) regulate the function and survival of vascular cells in health and disease, especially in atherosclerosis and cardiac ischemia/reperfusion.

**Samir N. Ghadiali, Ph.D.**  
Associate Professor

**Q: How did you get to OSU?** I arrived at OSU in September 2008 and my first impression is that there is a very collegial atmosphere on campus and excellent opportunities for collaboration.

**Q: Where did you receive your degrees?** I received my B.S. in Chemical Engineering from Cornell University and M.S. and Ph.D. in Biomedical Engineering from Tulane University. After holding a Research Assistant Professorship at Children's Hospital of Pittsburgh, I was the Frank Hook Assistant Professor of Bioengineering at Lehigh University.

**Q: What influenced you to become a biomedical engineer?** I have always been fascinated with the complexity of the human body and have always wanted to know exactly how different organs work. At Cornell, I had the opportunity to take a Biomedical Engineering elective with Dan Hammer and quickly realized that the problem solving skills I learned as an engineer could be used to understand how the human body works and to develop new therapies. I've been hooked on BME ever since.

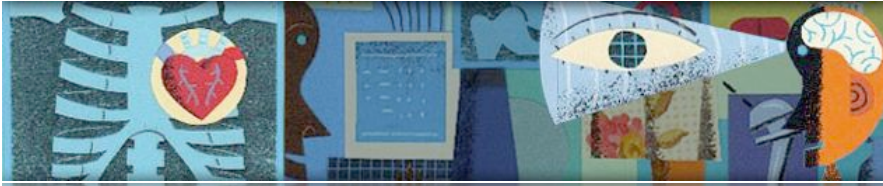
**Q: Describe your proudest professional moment!** Mine was the graduation of my first two PhD students. Both took on very complex projects and received awards for their research. It was very satisfying for me to be part of their development as scientists who have made their own important marks on the field.

**Q: What do you hope to bring to the department?** My goal is to develop a biomedical engineering research program which has a significant impact on both basic science and clinical medicine. I also hope to provide graduate students with translational research opportunities and a multi-scale understanding of human physiology. Finally, I look forward to contributing to the undergraduate program and providing undergraduate students with research opportunities.

**Q: Any memories of the department chair with whom you've worked most closely?** I took my first course in Finite Elements with Dr. Hart during my time at Tulane. At the time, I was disappointed with the "B" I got in this course but when I recently reminded Dr. Hart of this, I was pleasantly informed that this was actually a decent grade for his course!

**Q: A little about your personal background?** I met my wife during my time at Tulane and she is currently a medical product development manager at Battelle. I have one 4-year-old daughter and she is very happy to be in Ohio as we are both huge Ohio State football fans! I enjoy outdoor activities, especially cycling and am a big "classic rock" fan.

**Q: Tell us about your research.** My lab utilizes techniques from the biological, mathematical, and engineering sciences to identify the molecular, cellular, and tissue mechanical mechanisms responsible for various respiratory disorders. Due to the complexity of the respiratory system, it is difficult to identify pathological mechanisms using one technique. For example, my lab has used micro-fluidic cell culture models of the pulmonary system to investigate how various biophysical factors (e.g. membrane mechanics and cytoskeletal structure) influence cell injury, barrier disruption, and inflammatory signaling. Some of our results were difficult to interpret so we developed multi-scale, imaged-based computational models of this system and have used them to understand our counterintuitive data. These models have provided us with an efficient way to suggest new avenues of investigation and are leading to novel patient-specific therapies for respiratory disorders.



## UNDERGRADUATE PROGRAM IN BME APPROVED

We are very excited to announce that the Chancellor officially signed off on the new undergraduate program in Biomedical Engineering on October 7, 2008. The major begins this January with a small cohort of up to 25 exceptional students. Most of these students are in their second year of study at Ohio State University. The curriculum follows a standard first-year engineering sequence of mathematics, sciences (including chemistry, physics), English, and introductory engineering courses. These topics have follow-up courses during the second year, and expand to include life sciences (biology, organic chemistry) as well as engineering sciences and initial biomedical engineering courses. The new undergraduate major will embrace the multidisciplinary nature of biomedical engineering.

Life sciences and engineering sciences continue in the 3rd year, but the focus is upon biomedical engineering with biomedical measurement and techniques labs, and the "domain" courses (the six domains include: bioimaging; biotransport; biomechanics; biomaterials; molecular, cellular and tissue engineering; and biomedical micro-/nanotechnologies). Each of the six domain courses are intended to build on previous engineering and life sciences courses to truly integrate engineering and medicine content. Pedagogically similar (each domain course emphasizes creativity, technical communication, *in silico* modeling and simulation, hands-on experiments) the domain courses are pathways to advanced biomedical engineering courses and research. The domain courses are intended to integrate engineering and life sciences and to insure breadth of biomedical engineering content.

The 4th year has three distinctive features: a requirement for students to take two advanced-level BME courses as follow-ups to one or two of the domain classes (enabling focus and depth in the program); an individually designed and approved 3-course sequence of professional engineering electives (allowing for students to pursue independent research projects, honors theses, minors, or other engineering courses); and the two-quarter team design project. These design projects will be based on student engineering teams with 4-5 members who will work with a specific disabled client from the local community. For these real-world, open-ended experiences, students will determine what is needed and will work to design and construct a device to meet their client's needs, with a public show of the designs in the Spring of the Senior year. The undergraduate program will prepare students to enter the workforce, to continue on with graduate study, and also completes many of the requirements for medical school. The Ohio State University and the Department of Biomedical Engineering are delighted to be offering students the opportunity to study Biomedical Engineering as undergraduates.

### The Kettering Scholarship Fund

The Kettering Biomedical Engineering Scholarship Fund was established in 2000 to support undergraduate students studying Biomedical Engineering (BME). The Scholarship has been used since that time to support students working on the BME minor. With the advent of the new undergraduate major program in BME, the Kettering Scholarship now will be aimed directly toward assisting exceptional BME major students in their junior and senior years. Kettering Scholars rank among the strongest students at Ohio State. 2007-2009 awardees hold an average 3.61 grad point along with a mean ACT score of 30.75, ranking them in the top 27% of their class and nearly ten points above the national average. Most recent scholars include Ohio residents, **Greg Davison** of Saint Clairsville; **Bernard Jonard** of Zanesville; **Michael Keller** of Cuyahoga Falls; **Elizabeth Martin** of Hudson; **Cynthia Schwartz** of Powell; and **Carlvin Yu** of Pickerington.

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## COLLABORATION & OUTREACH

Co-sponsored by Colleges of Engineering (BME) and Medicine (RIF and CCTR), the 1st Annual Engineering & Medicine Translational Research Symposium was held in September 2008. Challenges in the practice of cardiovascular medicine require interdisciplinary solutions that bridge medicine and engineering principles. Recent examples of this include development of mechanical ventricular support, coronary revascularization devices, arrhythmia therapies, and imaging systems. The event featured **Zorina Galis**, Ph.D., Associate Professor of Surgery, Indiana University School of Medicine, whose keynote - "Constructive Interference: Human Health Innovation at the Merging Edge of Medicine and Engineering" - provided cardiovascular practitioners and scientists an opportunity to better recognize clinical needs that may benefit from engineering solutions and new approaches to improving cardiovascular care.

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Professor **Yi Zhao** organized a June 2008 BME workshop in collaboration with the Women in Engineering office for the Engineering in Motion program, which is designed to increase research exposure and training opportunities in biomedical engineering for K-12 students. The program introduced participants, through hands-on activities, to fundamental skills that improve the likelihood of their success in engineering courses and their future careers. Over 30 high school freshmen and sophomore students from throughout the nation attended the workshop, designed to reflect the interdisciplinary nature of BME and featuring lectures and lab demos by Professors **Liu**, **Litsky**, **Ruegsegger**, **Xu**, and **Zhao**.

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On November 5<sup>th</sup>, The College of Engineering, The College of Medicine, The John Glenn School of Public Affairs, The Office of Geriatrics and Gerontology, and the Center for Clinical and Translational Science presented a symposium in honor of the 10<sup>th</sup> anniversary of **John Glenn's** shuttle flight. The symposium, "Engineering and Medicine: The Prescription for an Aging Population" featured John Glenn and panel members from the faculty of Engineering and Medicine, including Professor **Rich Hart** from BME, who spoke about the mechanics of bone adaptation.



## ACHIEVEMENT, RECOGNITION, AND NEWS

Professor **Gunjan Agarwal** in press: "Mapping of DDR1 distribution and oligomerization on the cell surface by FRET microscopy" Cosmin Mihai, M. Chotani, T. S. Elton and **G. Agarwal\*** J. Mol. Biol (in press). "Regulation of Collagen Fibrillogenesis by Cell Surface Expression Of Kinase-Dead DDR2", Angela Blissett, Derek Garbellini, Ed Calomeni, Cosmin Mihai, Terry S. Elton and **Gunjan Agarwal\*** J. Mol. Biol (in press). Best poster award was awarded to **Angela R. Blissett** (graduate student in Biophysics working with **Gunjan Agarwal**) at the Cardiovascular Imaging Symposium, June 2008, Biomedical Research Tower, OSU.

RJ Giedt, CI Jones III, VK Galbraith and **BR Alevriadou**. "Mitochondrial superoxide levels in endothelial cells exposed to changes in flow and oxygen tension" presented at the BMES Annual Meeting, October 2008 (St. Louis, MO). **Randy (Jimmy) Giedt** also presented a poster at the Biomedical Engineering Society Annual Meeting, October 2008 in St. Louis, MO.

The Injury Biomechanics Research Lab, led by **BME alumnus** and Assistant Professor of Anatomy, **John Bolte**, hosted 125 international biomechanics professionals at the 4th Annual Injury Biomechanics Symposium held in May 2008. The event featured Stephen W. Rouhana (Ford Motor Company); Kathryn Sullivan (former astronaut and chief scientist, NOAA); Nancy J. Currie (NASA); James W. Brinkley (Air Force Research Lab, Wright-Pat AFB); and Carol Chancey (U.S. Army Aeromedical Research Lab). Industry partners included Honda Research Americas, NHTSA's Vehicle Research and Test Center, Nationwide Insurance, and Columbus Children's Hospital Center for Injury Research. Program sponsorship was provided by Denton, Inc.; First Technology Safety Systems, Inc.; Nissan Technical Center North America; and Toyota.

The American Institute for Medical and Biological Engineering (AIMBE) has elected Professor **Alan Litsky** as a fellow. **Alan Litsky** also will be serving on the editorial board of *Veterinary and Comparative Orthopaedics and Traumatology* and the *Journal of Dental Biomechanics*.

Professor **Cynthia Roberts** received the Inaugural Barrequer Medal and Lecture, Brazilian Society of Refractive Surgery, Goiânia, Brazil, May 16, 2008.

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