



INDIANA UNIVERSITY-PURDUE UNIVERSITY INDIANAPOLIS

Purdue School of Engineering and Technology

723 W. Michigan Street
Indianapolis, IN 46202

Phone: 317.278.2416
Fax: 317.278.2032
E-mail: eberbari@iupui.edu

www.engr.iupui.edu/bme

BME Seminar Schedule 2006-07

Nov. 17	Evan Morris Ph.D. Associate Professor	IUPUI Biomedical Engineering
Dec. 15	Eliza Du, Ph.D. Assistant Professor	IUPUI Electrical and Computer Engineering
Jan. 19	Karen Alfrey, Ph.D. Lecturer	IUPUI Biomedical Engineering
Feb. 16	Randall Roper, Ph.D. Assistant Professor	IUPUI Biology
Mar. 16	Ken Yoshida, Ph.D. Associate Professor	IUPUI Biomedical Engineering
April 20	Jiliang Li, Ph.D. Assistant Professor	IUPUI Biology

Research Areas of BME Faculty

BIOMATERIALS

Dong Xie, Ph.D., *Associate Professor*

BIOMEDICAL INSTRUMENTATION

Edward Berbari, Ph.D.
Professor and Chairman

BIOMOLECULAR ENGINEERING

Hiroki Yokota, Ph.D., *Associate Professor*

BONE TISSUE ENGINEERING

Gabriel Chu, Ph.D., *Assistant professor*

CARDIOVASCULAR ENGINEERING

Ghassan Kassab, Ph.D., *Professor*

MECHANOBIOLOGY

Charles Turner, Ph.D., *Professor*

MOLECULAR IMAGING

Evan D. Morris, Ph.D., *Associate Professor*

NEUROENGINEERING

John Schild Ph.D., *Associate Professor*
Ken Yoshida, *Associate Professor*

Purdue School of Engineering and
Technology
723 W. Michigan Street
Indianapolis, IN 46202

INDIANA UNIVERSITY-PURDUE UNIVERSITY INDIANAPOLIS



NONPROFIT ORG.
U.S. POSTAGE
PAID
Indianapolis
Permit No.

In this issue:

- Message from the Chair
- Faculty Spotlights:
Dong Xie, Ph.D.
Karen Alfrey, Ph.D.
- Undergraduate Research
Project Summer 2006
- Graduate Profile
- BME Club Introduction

IUPUI

INDIANA UNIVERSITY—PURDUE UNIVERSITY INDIANAPOLIS

Purdue School of Engineering and Technology
723 W. Michigan Street
Indianapolis, IN 46202
www.engr.iupui.edu/bme

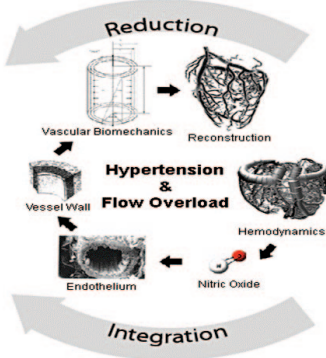
IUPUI - Purdue School of Engineering & Technology

THE BME NETWORK

Newsletter of the Department of Biomedical Engineering

Cardiovascular Biomechanics Lab

Our current research interests encompass the biomechanics of the cardiovascular system in health and diseases such as hypertension, flow-overload and heart failure.



We are interested in the structure-function relationship in the cardiovascular system and in particular, the coronary circulation under physiological and pathophysiological states. Our approach includes both experimental and computational studies.

We utilize the experimental reductionism approach to dissect the coronary vascular system into its molecular, cellular and tissue components (e.g., nitric oxide, endothelium, micro-structural components of the vessel wall, blood vessel wall, etc. as shown in figure). The computational integrative approach is then used to synthesize the entire coronary vascular circuit to understand the whole. ■



BME Guidant Foundation Endowed Chair Named

Dr. Ghassan Kassab (*pictured, left*) came to IUPUI in August 2006 from the University of California, Irvine. He assumes the position of the Thomas J. Linnemeier Guidant Chair and Professor of Biomedical Engineering. He also holds positions of Professor of Surgery, and Cellular and Integrative Physiology.

Dr. Kassab received a B.S. in Chemical Engineering, an M.S. in Engineering Sciences, and a Ph.D. in Bioengineering (Summa Cum Laude) from the University of California, San Diego.

Dr. Kassab was the recipient of the National Institute of Health Young Investigator and American Heart Association Established Investigator awards. He is a fellow of the American Institute for Medical and Biological Engineering and the American Physiological Society (Cardiovascular Section).

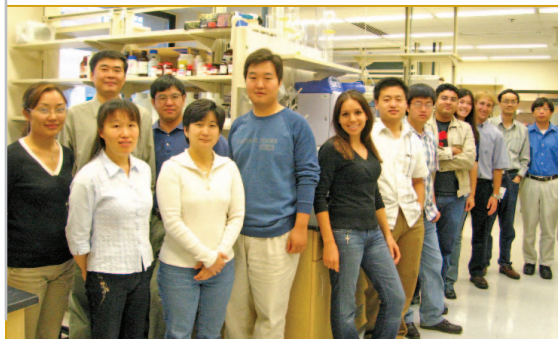
Since 1990, Dr. Kassab has served as Assistant Researcher in the Department of Bioengineering, and Associate Researcher in Bioengineering at UCSD.

From 2001 until present he served as Associate Professor in the Department of Biomedical Engineering; Professor in the Department of Biomedical Engineering, Professor in the Department of Medicine (Cardiology), and Professor in the Department of Mechanical and Aeronautical Engineering at the University of California, Irvine.

While at UCI, Dr. Kassab developed two undergraduate majors: Biomedical Engineering and Biomedical Engineering—Premedical.

Dr. Kassab currently serves on the International Advisory Board for the Center of Excellence in Visceral Biomechanics and Pain at Aalborg University, Denmark. He is also on the editorial board of the American Journal of Physiology and associate editor for Mechanics and Chemistry Biosystems.

Dr. Kassab is married to Ghada Kalsha and they have two sons, Gabriel, 18 months, and newborn, Gianni. ■



Cardiovascular Biomechanics members

Message from the Chair



Edward J. Berbari
Professor, Chair
Biomedical Engineering

Biomedical Engineering is the newest department at IUPUI. It was formed concurrent with the acceptance of our charter undergraduate's class in the fall of 2004. This commitment to a new department and new undergraduate degree is part of IUPUI's commitment to the statewide initiatives in the life sciences. This newsletter serves as an introduction to our relatively new department, its students and faculty, and our unique blend of resources for biomedical engineering research and education.

Biomedical engineers are at the forefront of many leading technological innovations which are improving the diagnosis and treatment of human diseases. It is our goal to provide our students with an exceptionally strong and challenging academic program to fulfill a broad range of our students' career goals. These may include jobs in the medical device and related industries, preparation for admissions to medical or dental school, or continued work at the graduate level in advanced biomedical engineering research.

IUPUI is the only campus in Indiana where a School of Engineering co-resides with a major medical school, the IU School of Medicine. This provides unique research opportunities and collaborations for both our faculty and students. This proximity enables the department to place major emphasis on clinically driven research, primarily (but not limited to) the areas of orthopedics, cardiovascular sciences, neurosciences, and imaging. Within these major research areas, our faculty have expertise in a wide range of biomedical engineering areas including biomechanics, biomaterials, tissue engineering, biomolecular engineering, bioinstrumentation, and biophysical modeling.

As you read our first newsletter, we hope you will enjoy meeting some of our faculty and students, and that we have communicated to you the level of enthusiasm and excitement we have as we establish our new department. Comments and feedback are always welcome, and I encourage direct contact if you have questions about faculty or student opportunities in biomedical engineering at IUPUI. ■

FACULTY SPOTLIGHT

Dong Xie | Ph.D. | Associate Professor



Dr. Xie works primarily in the area of advanced polymeric biomaterials. One major goal in this emerging field is to develop novel polymers and their composites for dental and orthopedic applications, which include hard tissue and soft tissue restorations.

The second main goal in this field is to develop novel biodegradable polymer and composites systems for tissue engineering, which includes design and formulation of deliverable, in situ polymerizable and resorbable polymers as tissue scaffolds for soft and hard tissue regenerations.

The third area of his research is to engineer tissue compatible polymers to pancreatic islets to completely diminish all the detrimental immune and complement mediated reactions that may occur during islet allo- or xenotransplantations and to prevent loss of islet mass, which will dramatically impact millions of patients in need of pancreatic islet transplantation. ■

Karen Alfrey | Ph.D. | Lecturer



Dr. Alfrey's areas of interests are computational biology; neuronal modeling; biological control systems; and undergraduate teaching.

She earned a B.S. in Electrical Engineering from Cornell University, both her M.S. and Ph.D. in Electrical Engineering from Rice University, and her postdoctoral training was in the Biomedical Engineering Department at IUPUI, joining the faculty in 2005.

In addition to teaching and research, she serves as undergraduate advisor for BME; Chair of the BME Assessment committee; and faculty advisor to the BME Club of IUPUI.

To promote Biomedical Engineering to the next generation, she coordinated BME activities for a variety of events on campus. These include Design and Discovery Camp, an engineering camp for 9-to-12-year-olds; POWER (Preparing Outstanding Women for Engineering Roles), a workshop providing hands-on engineering experiences to high school girls; and the Intel International Science and Engineering Fair, which brought outstanding students from all over the world to Indianapolis. ■

GRADUATE PROFILE

Hwa Tsu



Hwa Tsu is a Ph.D. candidate working in Dr. John Schild's BME lab. His research incorporates computational modeling with patch-clamp electrophysiology

to further the understanding of biophysical mechanisms behind central nervous integration and control of blood pressure. One area of study involves the nucleus tactus solitarius (NTS) of the brainstem, which is where the first synaptic connections between primary baroreceptor afferent fibers and second-order neurons are located.

Using patch-clamp electrophysiology, we are able to study biophysical properties of ion channels and synaptic currents in NTS neurons from rat brainstem slices. This information will allow us to construct a biologically realistic model of the synaptic connection. This model will be used to further our understanding of complex mechanisms associated with the central integration of blood pressure. As a result, this research may lead to areas of clinical significance such as for the treatment of hypertension and other related cardiovascular diseases.

Before coming to the BME graduate program at Purdue, Hwa earned a B.S. in General Engineering with a minor in Bioengineering at the University of Illinois at Urbana-Champaign.

Hwa and Janae were married in June 2006. Janae is an Indianapolis elementary school teacher. ■



UNDERGRADUATE RESEARCH PROJECT SUMMER 2006

TCeMEP Monitoring During Procedures Performed for Spinal Deformity

Sara Brown and Corrine Wood

Our SROP and UROP funded research with Methodist Hospital in Indianapolis began in January and continued through the summer. Our research was relative to finding correlations between TCeMEP (Transcranial Electrical Motor Evoked Potentials) monitoring and outcomes (mainly motor function) post-surgery. We performed a retrospective chart review of over 500 cases performed between December 2003 and April 2006 at a single institution by twelve neurosurgeons and eight orthopedic spine surgeons. Our conclusions were TCeMEP monitoring was 100% specific and 100% sensitive in our patient populations, and no TCeMEP complications occurred.

We presented our findings at two national conferences. The CI/SROP conference at the University of Illinois at Urbana-Champaign focuses on undergraduate research experiences. We presented our findings at roundtable discussions and a poster presentation. In collaboration with members of the Neurophysiology Department at Methodist Hospital, we created two additional posters for the ASET (American Society of Electroneurodiagnostic Technologists) annual conference in Philadelphia, PA. These posters described the Cervical Non-Traumatic and Thoracolumbar Post-Traumatic patient populations for an audience of medical technology professionals.

These two experiences gave us completely different views on how research is presented at academic and professional conferences. The CIC/SROP conference focused on the academic aspect of the research. The ASET conference focused on the technical side of the research. Both gave us an opportunity to see how academic and professional conferences function. ■



Sara Brown



Corrine Wood

BME Club Introduction

The BME Club of IUPUI, founded in the Fall of 2005, offers Biomedical Engineering undergraduates and other interested students an opportunity to network, learn about the profession of BME, and participate in community outreach. Last year, guest speakers at the monthly club meetings discussed areas of ongoing BME research in both laboratory and clinical settings. Dr. Robert Stump, director of admissions of the IU Medical School, answered questions about medical school admissions and how the BME degree can provide a solid foundation of pre-medical education. On the outreach front, the BME Club participated in the National Engineers Children's Day, sponsored by IEEE, at the Indianapolis Children's Museum; participated as a group in the Susan G. Komen Breast Cancer Foundation's annual Race for the Cure; and joined Dr. Russell Eberhart's team for the American Cancer Society's Relay for Life.

As the BME program grows, and the club gains more members and more expertise, they look forward to applying their engineering skills to new outreach activities serving the medical, scientific, and educational communities. ■



Top L-R: Corrine Wood, Rachel Meyer, Jennifer Doyle, Front L-R: Carol Hargreaves, Dr. Karen Alfrey, Faculty Adviser