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Designing Undergraduate Success

Karen Alfrey earned a BS in Electrical Engineering from Cornell University and MS and PhD in Electrical Engineering from Rice University with a research focus in mathematical and computational modeling of neural systems. She is a Clinical Associate Professor in Biomedical Engineering, a role that focuses on teaching and campus service. She describes her current teaching duties as “the math-y classes in the junior year of the BME curriculum” – Biomedical Computing (BME 33400), Biosystems and Signals (BME 33100), and Probability, Statistics, and Applications in BME (BME 32200), as well as the career-oriented BME Seminar course (BME 40200). She also serves as the Director of the Undergraduate Program and Associate Chair of the department, with responsibilities that include not only teaching but also overseeing undergraduate advising, assessing program effectiveness, and facilitating improvements to the BME program. At the campus level, she also regularly takes on leadership roles on committees and projects related to assessing and improving the educational experience at IUPUI. Currently she is working on the Foundations of Excellence: Transfer Experience project, a multi-year initiative to analyze and improve the admissions process, transition to campus, and academic success of IUPUI transfer students.

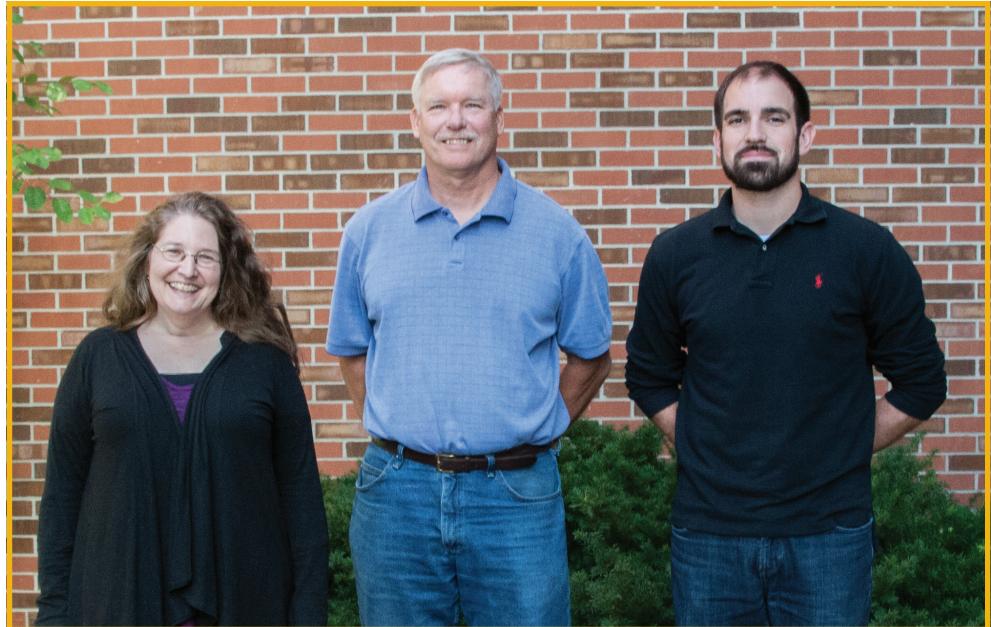
This September saw the culmination of six years’ worth of BME assessment efforts as the department underwent its ABET reaccreditation visit. Although the results will not be finalized until the engineering commission convenes next summer to vote on all

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THE BME NETWORK

Newsletter of the Department of Biomedical Engineering



L to R: Alfrey, Combs, Higbee

the programs visited in the 2016-17 academic year, everyone involved in the visit felt that it went very smoothly overall. “Unlike a lot of faculty members, I actually get pretty excited about assessment,” Alfrey says. “It’s basically a form of quality assurance for our educational programs, and it inspires a lot of my creative activities in the classroom: first, to develop reasonable ways to observe and quantify whether students demonstrate the skills and knowledge we think they should be gaining from a given assignment, class, or sequence of classes; and then, if we find that students haven’t yet attained those outcomes to the level we’d like to see in our graduates, to come up with new teaching innovations and student activities to help them practice and master those skills. I know my classes have a reputation for being ‘hard’, but I think students come out the other side appreciating that the purpose of those hard assignments is to help

them develop the skills they’ll need as engineers – whether that be interpreting a long text description to identify a problem to be solved; making decisions about the best problem-solving approach in the face of ambiguous or even contradictory data; or even just learning the organizational and time-management skills for keeping up with multiple projects at once. I definitely aim to make my courses challenging, but it’s the kind of challenge that leads to growth.” During the ABET preparations and visit, Dr. Alfrey was especially thrilled at the feedback from employers affirming that IUPUI BME graduates are indeed very effective in the workplace; in fact, several employers have stated that when they want to hire a BME, they prefer to hire from the IUPUI program – a real testament to the quality of the program and its graduates.

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Message from the Chair



Edward J. Berbari

Chancellor's Professor
and Chair of Biomedical
Engineering

Match the interest with the faculty member!

Dr. Lin	Acorn collection
Dr. Berbari	Fermenting things
Dr. Alfrey	Ham Radio enthusiast
Dr. Wallace	Camping/ Dutch Oven cooking
Dr. Yoshida	Works out late night at gym
Dr. Yokota	Photography
Dr. Schild	Hand Bells

Every six years the BME department undergoes our comprehensive evaluation for our continued accreditation from ABET, the organization which accredits all engineering and technology programs in the US. The visit is one step in this yearlong accreditation process and ours was this past September. While we will not know the outcome until next year, we were very pleased with our visit and the accompanying feedback from our program evaluator. Of note during the visit was the role which our non-tenure track played in both the preparation of our self-study report as well as critical visits with the program evaluator. Our undergraduate students rely significantly on the contributions of Bill Combs, Clinical Associate Professor, Dr. Karen Alfrey Ph.D., Associate Chair, Clinical Associate Professor and Director of Undergraduate Programs, along with Dr. Steven Higbee Ph.D., Clinical Assistant Professor and Coordinator for Undergraduate Research. All three of these highly valued faculty members are highlighted in this issue of our annual newsletter. Karen and Bill have been with our undergraduate program since its earliest days and Steve joined us over three years ago.

In other faculty news, both Drs. Chien-Chi Lin and Joseph Wallace were promoted to Associate Professor with tenure. Dr. Julie Ji was recently appointed as the Director of the Graduate Program. Research awards in the department were over \$1.6 million in the last fiscal year and were primarily from NIH.

Undergraduate Student Awards: Seven of our BSBME students received various awards as members of the 17th Annual IUPUI Top 100 Outstanding Students, recognizing them for scholastic achievement, extracurricular activities on campus, to civic and community service. They are William Elkhattab (also in the Top 10), Timothy Emmel, Brian Frondorf, Jeffery Joll, Kyle McElyea, Landan Mintch, and Lillie Wolter. We also had three Bepko Scholarship award winners. Sultan Almunif received the Charles H. Turner Outstanding Academic Achievement Award for Senior Year, Brian Frondorf for Junior Year, and Brittany Frecker for Sophomore Year. Matthew Arkenberg received the Biomedical Engineering Outstanding Service Award, along with the Outstanding Engineering Dual Degree Biomedical Engineering (Butler/IUPUI) Student Award. Tyler Hudgens received the Exemplary Internship/Research Award.

Graduate Student Awards: Alycia Berman, a current BME Ph.D. student, received a 2016 National Science Foundation Graduate Research Fellowship, a very significant accomplishment. Well done Alycia!

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William Combs currently teaches the IUPUI two semester capstone Design course for the Department of Biomedical Engineering. He has managed approximately 60 student design projects, collaborating with sponsors from industry and the IU School of Medicine. Bill also teaches the Freshman Introduction to Engineering course and topics in cardiovascular device design. Bill has extensive experience in industry, focused on cardiovascular devices in both large companies such as Medtronic and small start-ups. Bill's Medtronic Research and Development career spanned a 29-year time period, focusing on researching and implementing new therapies for treatment of cardiac arrhythmias, the development of new diagnostics testing methods and devices to aide electrophysiologic testing, along with the development of automatic therapies for bradyarrhythmias and tachyarrhythmias commonly implemented in implanted pacemakers and defibrillators. Bill served as director of the Pacing and Monitoring Research group for almost 10 years. While in the Research Group, he specifically lead Medtronic's research investigations in the use of bioimpedance measurements between electrodes and chronically-implanted devices for the purposes of measuring minute ventilation, intracardiac contractility, transplanted organ status and edema in the heart failure patient. Bill also directed algorithm development and systems design for Medtronic implanted pacemakers and defibrillators. Bill's work in industry has resulted in over 40 issued and pending patents. He has a keen interest in identifying health care solutions for resource-limited geographies and the application of bioethics to the Medical Device industry. Bill's extensive industry experience and keen interest in Engineering Education uniquely positions him to teach and mentor the BME Senior Design capstone course.

Steve Higbee is the newest faculty member in the IUPUI Department of Biomedical Engineering, having joined the department in 2014 after completing his PhD in Bioengineering at Rice University (Houston, TX). Before attending Rice, he grew up in Indianapolis and received his bachelor's and master's degrees in Biomedical Engineering from Purdue University (West Lafayette, IN). As a Clinical Assistant Professor of Biomedical Engineering, Steve is highly involved in the teaching and advising of undergraduate BME students. Steve brings his expertise in biomaterials to the junior-level courses that he teaches: BME 381 (Implantable Materials and Biological Response) and BME 383 (the associated lab course). He also developed and teaches a new senior level elective: BME 495 (Advanced Biomaterials). Steve also teaches BME 241 (Biomechanics) in the spring semesters on the Butler University campus for Butler-IUPUI dual-degree students.

In addition to his teaching duties, Steve serves as the Coordinator for Undergraduate Research for the BME department. In this position, Steve works with students and faculty to improve the breadth and quality of undergraduate research experiences available to BME students. He has observed an increasing number of BME students participating in research across campus. Steve has helped grow the scope of BME undergraduate research on campus by making new connections outside of the department to the IUPUI School of Science and the IU School of Medicine. Steve also represents the School of Engineering and Technology on a campus level on issues related to undergraduate research and serves as the co-director for the Multidisciplinary Undergraduate Research Institute (MURI).

Finally, in each of the past two years Steve has taught a freshman course, ENGR 196 (Introduction to Engineering Problem Solving), to students planning on studying BME. This year, in collaboration with Biology and Freshman Engineering, Steve helped develop a Themed Learning Community (TLC) for freshman BME students. In this TLC, freshman BME students are enrolled together across multiple courses and had the opportunity to visit Roche Diagnostics to observe BMEs in industry. Through this TLC effort, Steve hopes to create enthusiasm about BME among freshmen and to encourage students to make connections that will serve them throughout their tenures as BME students.

The Class of 2016



BME Award Recipients for 2015-16

7 Top 100 Awards:

William Elkhateib, Timothy Emmel, Brian Frondorf, Jeffery Joll, Kyle McElyea, Landan Mintch, Lillie Wolter

Charles H. Turner Outstanding Achievement for Senior Year: *Sultan Almunif*

Bepko Scholarship for Outstanding Academic Achievement for Junior Year: *Brian Frondorf*

Bepko Scholarship for Outstanding Academic Achievement for Sophomore Year: *Brittany Frecker*

Biomedical Engineering Outstanding Service Award: *Matthew R. Arkenberg*

Exemplary Internship/Research Award: *Tyler Hudgens*

Medtronic Outstanding Sr. Design Team Award: *Josh Arkanoff/Matthew R. Arkenberg/Kirstie Keene*

Outstanding Engineering Dual Degree Biomedical Engineering (Butler/IUPUI) Student Award: *Matthew R. Arkenberg*



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Nov. 11	IUSD Biomedical and Applied Sciences	Gabe Chu
Nov. 17	BMEGSA	Thanksgiving Dinner
Nov. 18	BME	Julie Ji
Nov. 25		THANKSGIVING
Dec. 2	Mechanical Engineering	Jong Ryu
Dec. 9		BME 696 Presentations

Research Areas of BME Faculty

BIO MATERIALS

Steven Higbee, Ph.D., *Clinical Assistant Professor*
Chien-Chi Lin, Ph.D., *Associate Professor*
Dong Xie, Ph.D., *Associate Professor*

BIOMEDICAL INSTRUMENTATION

Edward Berbari, Ph.D., *Professor*
and Chairman

CARDIOVASCULAR ENGINEERING

Bill Combs, MSEE, *Clinical Assoc. Professor*
Julie Ji, Ph.D., *Associate Professor*

MECHANOBIOLOGY

Sungsoo Na, Ph.D., *Associate Professor*
Joseph Wallace, Ph.D., *Associate Professor*
Hiroki Yokota, Ph.D., *Professor*

NEUROENGINEERING

Karen Alfrey, Ph.D., *Associate Chair of Biomedical Engineering & Clinical Associate Professor*
John Schild, Ph.D., *Associate Professor*
Ken Yoshida, Ph.D., *Associate Professor*

