Student Groups Energize the BME Experience

Students are the lifeblood of any department, and we are proud to support two BME student groups.

Our Graduate Women in Biomedical Engineering (“GWBME”) group started in 2010 with the purpose of providing a space specifically for graduate women in BME to support and network with each other, in a field that is still predominantly male. Initial events consisted of monthly coffee hours for graduate women to meet and breakfasts to welcome female recruits to the graduate program. The scope of the group has grown significantly since then and now includes outreach, professional development, and team building events.

Several times a year the group volunteers to encourage children to enter STEM fields, such as hosting a booth at the UMN Math and Science Family Fun Day. Additionally, the group holds several professional development events including lunches with female professors and industry leaders, career workshops, local company tours, and an annual career panel.

Finally, the group encourages camaraderie by organizing outings like Twins games, Movies in the Park, and snow tubing. In recognition of its activities and impact, GWBME was just awarded the UMN Outstanding Graduate/Professional Student Group of the Year.

Our BMES Student Chapter (“BMES”) seeks to provide BME students with resources to achieve their career goals throughout their time as undergraduates or graduates at the University of Minnesota. Additionally, the chapter provides opportunities to give back to the community. BMES holds monthly gatherings where local medical technology professionals present about their path to success and career advice, and local medtech companies provide information sessions about their internship or employment opportunities. This year, BMES is organizing the inaugural UMN BME Career Fair, where local medtech companies and graduate schools will come and network with any students interested in a medtech career. The fair will take

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Dr. Dianne Rekow

Dianne graduated with a PhD in Biomedical Engineering in 1988, advised by Prof. Art Erdman, now Director of the Medical Devices Center. Dianne’s doctoral research investigated feasibility of automated production of dental restorations, laying the groundwork for a number of now commercial dental CAD/CAM systems. Her PhD was preceded by a BS in physics-math and in mechanical engineering (1966 and 1970, resp.), 11 years in industry, and a MSME (1982). While pursuing the PhD, she simultaneously earned a dental degree and orthodontic specialty. Upon completing this second-round of training, she remained in academia, moving through ever-increasingly challenging and rewarding positions, culminating in becoming Dean of King’s College London Dental Institute in 2012, the largest dental school in Europe. She has been elected to the presidency of both the American and International Associations for Dental Research, Faculty of Dental Surgery of the Royal College of Surgeons of England, and Guy’s and St. Thomas’ NHS Foundation Trust Board of Governors as well as earning status as a Fellow of the Academy of Dental Material and of the Greater New York Academy of Prosthodontics. Dianne was just awarded the University’s highest recognition to alumni, the prestigious Outstanding Achievement Award.

How did a PhD in BME influence your career path?

It would have been impossible for me to have such a rich a career path without the PhD degree. It enabled an exciting, rewarding though somewhat unpredicted career path of academic exploration with two distinct research arms. My early efforts in CAD/CAM applied to one-of-a-kind parts, dental crowns in my case, morphed into understanding damage initiation and propagation in layered brittle ceramics with particular focus on all-ceramic dental crowns. The other research arm focused on elucidating tissue response to material and architecture of 3D scaffolds across length scales. The rigor and mentoring essential in PhD training created the unique environment needed to enhance my knowledge base while demanding systematic exploration of my own ideas. Together, these formed an important platform for knowing how to critically examine findings, learning new techniques and the joy of exploring the unknown and sharing findings.

What major opportunities do you see for BME graduates to contribute to dentistry in the next decade?

Opportunities are limitless! A few of the things we need are new ways of understanding the mechanical properties of tissues of the head and neck in health and disease which can inform clinical treatments, innovative approaches to restoring tissue lost to pathology or disease with natural tissues; devices that can detect systemic disease from saliva, eliminating the need for blood or urine sampling; imaging of tissue changes with pathology or healing so clinicians know when to treat or not; mathematical models that accurately predict clinical results thereby eliminating or minimizing the need for animal testing; understanding mechanisms of drug actions and possibilities of gene delivery, especially with the advent of personalized medicine; and a host of others innovations not yet imagined.

What advice would you give to BME students aspiring to joint DDS/PhD and MD/PhD programs?

Don’t give up! Learn as much as you can. Ask as many questions as you can. Keep asking ‘why not?’. Whether you choose to pursue clinical practice, a research career in industry or academia, or combine the two is unimportant. The beauty of the combined training is that you have many choices in which career path you elect – and, if you were to follow my example, may change rather dramatically along the way. The integration of a clinical degree with a strong BME PhD is immensely rewarding, making all the late nights studying, projects, frustrations with patient compliance, projects, and exams worthwhile. There is no question that in the future the rich multi-disciplinary grounding of the BME combined with clinical training will become increasingly important. Those with this dual training will be the leaders in our fast changing, increasingly integrated engineering and biology future.

Student groups, cont.

GWBME officers celebrate their award with group adviser Prof. Brenda Ogle.
Graduate Study Scholarship to continue cardiovascular tissue engineering research in Stuttgart and Tübingen for the 2015-16 academic year.

What are some highlights of your research experiences?
I have had two very meaningful and influential research experiences while at UMN. The first was the cardiovascular tissue engineering research with Professor Tranquillo. With his help, I was able to collaborate and spend a summer conducting cardiovascular tissue engineering research at Fraunhofer IGB in Stuttgart, Germany. Also, through this research I was introduced to various cardiologists at the UMN and shadowing them paved the way for my aspirations to become a physician-scientist. I was also awarded a fellowship from the American Heart Association to pursue a research project regarding cardiopulmonary resuscitation during my junior and senior years. This was a very intriguing experience because I was able to see the direct translation between problems witnessed clinically and research that is conducted to mitigate them.

Why did you opt to apply for the Fulbright scholarship?
I was quite keen to apply for the Fulbright and DAAD scholarships because I craved to learn more about cardiovascular tissue engineering research… and also the German culture! I am very eager to learn more about the research side of academia as this aligns well with my future aspirations to become a practicing physician who conducts research.

What is your advice for our current BME majors?
I would definitely tell current BME majors to remain open-minded regarding your future interests, don’t limit yourself, and go with your gut. If you have a good feeling about something you should pursue it and don’t put your own limits on what you can achieve.
Professor Zhi Yang

Electric pulses are the language of the nervous system. Allowing pinpoint intervention and the ability to effectively control the nerve signaling, makes tiny bioelectronics an excellent solution for therapeutic interventions.

With the vision to electrically treat diseases, Prof. Zhi Yang’s lab has developed a new technology called Neuronix, a fully integrated, miniaturized device that supports neural stimulation, sensing, and processing function. This innovative system architecture addresses key challenges that the current bioelectronic implants fail to address, featuring ultra-high precision (17bit), low-power (15μW), low-noise (2μV), and tiny size: 1/10th the size of a grain of rice yet achieving a higher channel count (up to 48 channels).

Neuronix is also devised to provide simultaneous stimulation and sensing, a feature envisioned by the community for decades. This will enable precise, closed-loop neuromodulation for treating diseases, a technology Prof. Yang is pursuing in collaboration with his colleagues. He envisions that with Neuronix, clinicians will be able to inject bioelectronics covered with a biomaterial exactly to the target. This innovative, interdisciplinary technology will bridge the gap between engineers and clinicians, and promises a day not far off when doctors will administer drug-like electronics that revolutionizes healthcare.