News Stories

Bob Tranquillo and Colleagues Awarded T32 NIH Grant for Training Biomedical Engineering Graduate Students to Become Future Cardiovascular Medical Device Innovators

IEM Member Dr. Robert T. Tranquillo, Department Head and Professor of Biomedical Engineering and also Professor of Chemical Engineering & Materials Science, and his colleagues, including IEM Member Dr. Victor H. Barocas, Professor of Biomedical Engineering, have been awarded an NIH T32 grant to train predoctoral biomedical engineering students to become more effective at innovating cardiovascular medical devices in their future careers. The training will have a multidisciplinary focus that will include exposure to clinical environments, coursework in anatomy and physiology, interaction with clinicians, and professional development. “This training program will provide an exceptional opportunity for BME graduate students who seek a career in cardiovascular engineering, whether it be in academia, the medtech industry, government labs and agencies, or consulting,” says Dr. Tranquillo. “The University of Minnesota is indisputably the ideal location for this training program, confirmed by NHLBI.”

IEM Members Create Novel 3D Bio-Printed In Vitro Model for Studying Metastatic Cancer Cells

A team of researchers led by IEM Member Dr. Angela Panoskaltsis-Mortari, Vice Chair for Research and Professor, Department of Pediatrics and Department of Medicine, has created the first 3D bio-printed in vitro model for the isolation and study of specific metastatic cancer cells. The research, which was published in the journal *Advanced Materials*, showed that the model’s 3D structure was more effective at mimicking in vivo environments than 2D models. “This model is more consistent with what the body is like,” says Dr. Panoskaltsis-Mortari, “and, therefore, studying the effects of drugs with human cells at this level makes the results more meaningful and predictive of what will happen in the body.” IEM Member Dr. Michael C. McAlpine, Benjamin Mayhugh Associate Professor of Mechanical Engineering, who is a co-corresponding author of the paper, says that the team’s 3D printing technology, which is custom-built, “allows us to precisely place clusters of cells and chemical depots in a 3D environment.” The research was funded, in part, by an IEM seed grant.

University Researchers 3D Bio-Print a Model that Could Improve Anticancer Drugs and Treatments >
3D Bioprinted In Vitro Metastatic Models via Reconstruction of Tumor Microenvironments >
IEM Members Explore the Application of Nanotechnology to Destroy Cancerous Tumors, Enable Organ Preservation, and Tag Cells for RFID

IEM Members Dr. Bethanie J. Stadler and Dr. Rhonda R. Franklin, both Professors of Electrical and Computer Engineering, and Dr. Erik B. Finger, Assistant Professor of Surgery, discussed with the Minnesota Daily how they are working with IEM Director Dr. John C. Bischof, Professor of Mechanical Engineering, to label diseased or cancerous cells and explore the use of nanotechnology-based heat therapies to ablate cancerous tumors and to make it possible to re-warm organs that are frozen for preservation.

Dr. Stadler, whose nanomaterials are used to study thermal properties in the biological systems and applications of Drs. Bischof and Finger, explains that this type of cell identification can easily be done in clinical settings because “it’s cheap and accessible.” For cell identification, the researchers are seeking to use nanoparticles for radio frequency identification (RFID) tags to label the cells. Dr. Franklin, whose group has been developing detection methods to identify these nanomaterials, says that “what was really fascinating is we were working on the potential concept of the tag itself, the fact that a nanostructure could be used potentially to create the tag.” Once the team has successfully achieved that tagging capability, they will have identifiable nanoheaters. In cancer applications, “you can use heat therapy to treat a tumor, to direct a nanoparticle to get near or inside a cell or inside cancer cells,” says Dr. Finger, “then apply radio frequency, magnetic fields, [and] you can heat-kill ... tumor cells and spare the rest of the cells around it.” In organ preservation applications, Dr. Finger says that “Each of those little [nanoparticles] generates heat, so it heats homogeneously and quickly, so it’s not like an ice cube in a microwave where you’re melting the outside while the center is still frozen.”

Michael Smanski Awarded McKnight Land-Grant Professorship

IEM Member Dr. Michael J. Smanski, Assistant Professor of Biochemistry, Molecular Biology, and Biophysics, has been awarded the 2019-2021 McKnight Land-Grant Professorship for his research, entitled “Re-programming living systems for applications in medicine, agriculture, and the environment.” The Smanski group works on diverse projects that share a common theme of leveraging technologies in DNA synthesis/assembly (i.e. writing and composing genetic information) to reprogram living systems. Recently, they have successfully engineered bacteria to produce a potent neuroprotective drug and mammalian cells to produce therapeutic proteins. In parallel, they have invented and demonstrated a new approach for creating effective and safe bio-pesticides that will control populations of insect pests, disease vectors, and invasive species. The goal of the McKnight Land-Grant Professorship Program is to advance the careers of new assistant professors at a crucial point in their professional lives. The designation of “McKnight Land-Grant Professor” is held by recipients for a two-year period.

Jaime Modiano Discusses the Caveats of Announcing Promising Results for Early Stage Medical Treatments with Popular Science

IEM Member Dr. Jaime F. Modiano, Perlman Professor of Oncology and Comparative Medicine in the College of Veterinary Medicine, discussed with Popular Science the risks associated with publicizing success in the early stage development of medical treatments, such as pharmaceuticals. One risk for researchers is that, as soon as their research is published, it becomes publicly available information that would be available to competitors and could make future patent protection more difficult. “They have to protect themselves in order to make their research a go in the real world rather than a paper in the academic world,” says Dr. Modiano. Another risk is of raising expectations of success too early, especially before testing it in animals. “If your drug doesn’t work in your animal model, you need to go back to the drawing board,” says
Dr. Modiano. "But if it works the way you expected, your idea has legs. It gives you a reason to move forward, a reason to believe that it could work in humans." Even when a drug works in mice, only a small percentage of these show success in humans, which Dr. Modiano says that is sometimes due to limitations in funding the research. The full Popular Science article can be found at the following link.

Most Health 'Cures' You Hear About in the News Aren’t Ready for Humans >

IEM Biotechnology Symposium to Debut at 2019 Design of Medical Devices Conference
The Design of Medical Devices Conference (DMD) has been very successful in highlighting recent advances in medical devices. The approach to medicine today includes not just devices and the drugs, but also biologics, including live cells and viruses, and combinations of all of the above. The Biotechnology Symposium, which will be a sub-program in the DMD Conference, will highlight emerging areas of science and technology development at the interface of biology with engineering to deliver improved healthcare. The full day symposium, to be held on Wednesday, April 17th, at McNamara Alumni Center, will be comprised of three sessions that engage with scientific and thought leaders at the University of Minnesota, the Mayo Clinic and local biotech industry. IEM aims to develop a pre-eminent annual meeting for cutting-edge medical science and technology, that embraces the full spectrum of biomedical applications and technological approaches to include molecular, genetic, and cell-based therapeutic strategies. Session topics include:

- Genome Engineering, Chaired by IEM Executive Committee Member Dr. David A. Largaespada, Professor in the Departments of Pediatrics, and Genetics, Cell Biology and Development
- Cancer Bioengineering, Chaired by Dr. Paolo Provenzano, Associate Professor, Department of Biomedical Engineering;
- Alzheimer’s Disease and Aging, Chaired by Dr. Jonathan Sachs, Professor, Department of Biomedical Engineering.

“We look forward to highlighting exciting new opportunities for applying engineering in medicine that fully leverage rapid advances in cellular and molecular biology to develop new therapeutic strategies,” says Dr. David J. Odde, Medtronic Endowed Associate Director for Strategy and Innovation, Institute for Engineering in Medicine.

2019 DMD Program >
DMD Registration >

Announcements

Registration Open for 18th Annual Design of Medical Devices Conference, April 15, 16-18, 2019 at Graduate Minneapolis and McNamara Alumni Center Minneapolis, MN

Registration is open for the 18th Annual Design of Medical Devices Conference, the world’s largest medical device conference, April 15, 16-18, 2019 at Graduate Minneapolis & McNamara Alumni Center, located on the University of Minnesota Twin Cities Campus. The conference will include a wide variety of sessions, which can be viewed in the Scientific Program. Links to key aspects of the conference as follows:

5.10k Run/Walk
A Heart to Learn
IEM & DMD Career Event
Innovation Workshop
Lab & Center Tours
Mfg Needs for BioFab
Pediatric Device Breakthrough
Registration Open for the 7th Minnesota Neuromodulation Symposium, April 18 & 19, 2019

Registration is open for the 7th Minnesota Neuromodulation Symposium organized by the Institute for Engineering in Medicine (IEM) and MnDRIVE Brain Conditions. Neuromodulation is a rapidly-growing field, encompassing a wide spectrum of implantable and non-invasive technology-based approaches for the treatment of neurological and psychiatric disorders. Advancing the field of neuromodulation represents challenges in:

- Developing engineering methodologies
- Understanding mechanisms of neuromodulation at cellular and system levels
- Clinical translation to treat patients
- Shaping the regulatory process for emerging technologies and approaches

This symposium is aimed at bringing together scientists, engineers, clinicians, industrial practitioners, and entrepreneurs to discuss challenges and opportunities in neuromodulation. The symposium will consist of plenary presentations by leaders in academia, industry and government, and poster presentations to exchange ideas in this exciting field. The Symposium will be held immediately following the Design of Medical Devices Conference.

Registration Open for Preservation of Cellular Therapies Short Course, May 21-22, 2019

The IEM Biopreservation Core Resource (BioCoR) presents an upcoming preservation short course on May 21-22: Preservation of Cellular Therapies. Currently 1.2 million patients are receiving treatment from regenerative medicine products produced by 171 companies with a capital value of ~$4.7 billion. Most molecules, cells and tissues are collected at a given time and location for use at a later time. Therefore, our ability to stabilize key biological properties (e.g. viability, biomarking capability) during transportation and long-term storage is a critical technology. The preservation of cellular therapies is the central focus of this professional short course. Learn about fundamentals of preservation, protocol development, design of a storage facility, regulatory issues associated with preservation of cell therapies, clinical issues and more. Course website here! If you have questions, contact us at biocor-pct@umn.edu

Register Here!