News

IEM-Affiliated Medical Devices Center Named for Earl Bakken
The IEM-affiliated Earl E. Bakken Medical Devices Center (MDC) has been named for the Medtronic founder who is known as the father of Minnesota’s Medical Device Industry. Established in 2008, the MDC is among the leading academic centers, globally, for the development of medical devices. It functions in the same spirit of collaboration between engineering and medicine that Mr. Bakken had with legendary University of Minnesota surgeon Dr. C. Walton Lillehei, and receives strong support from the medical device industry’s leading companies. “The Medical Devices Center wouldn’t be possible without the foundation Earl Bakken built in Minnesota,” says the MDC’s Director Dr. Arthur G. Erdman, Professor of Mechanical Engineering and IEM Medical Devices Theme Co-Chair. “Having his name officially associated with our center is an honor, and we are committed to continuing to live up to his charge, to create new technologies to improve health.” - UMN Renames Two Centers to Honor Earl E. Bakken

IEM-Affiliated Centers Play Key Roles in Utilizing Virtual Reality & 3D Printing to Prepare for Successful Surgery to Separate Conjoined Twins
The IEM-Affiliated Earl E. Bakken Medical Devices Center, Visible Heart Lab, and 3D Printing Core all played key roles in the preparation for a very challenging, but successful surgery to separate twin sisters conjoined at their hearts and livers. These capabilities were required due to the unique aspects of the twins’ anatomy and high risks of the procedure. The twins’ condition prior to surgery was “extraordinarily shocking,” according to IEM Member Dr. Daniel A. Saltzman, Professor of Pediatric Surgery, who performed the operation with his team at the University’s Masonic Children’s hospital. Dr. Saltzman informed the parents that, as a result of the procedure, they “could lose one or both twins.”

The members of Dr. Saltzman’s team planned key aspects of the surgery by utilizing the Medical Devices Center’s 3D Virtual Prototyping system to visualize both virtual and printed models of the twins’ hearts; these were generated from CT and MR images by Alex Mattson, a Biomedical Engineering Ph.D. Candidate within the Visible Heart Lab, and Bethany Tourek, a Mechanical Engineering Ph.D. Candidate within the Medical Devices Center. Mattson also helped Pediatric Cardiologist Dr. Matthew Ambrose utilize both the Medical Devices Center’s 3D Virtual Prototyping system and the Visible Heart Lab’s 3D Visualization System, which the physician used to perform a virtual walk-through of the twins’ anatomy. Dr. Anthony Azakie, Chief of Pediatric Cardiac Surgery, who separated and repaired the twins’ hearts, asked Mattson to scrub in on the case based on his knowledge of the anatomy. The Visible Heart Lab’s component of the IEM 3D Printing Core was also utilized to print numerous detailed 3D models, some of which were hand painted by Mattson to show relative degrees of blood oxygenation with these conjoined heart anatomies.

What the surgical team members learned by using these tools helped them to better-understand the twins’ anatomy and led to a change in the surgical plan, in what ultimately resulted in a successful outcome. And, according to the Washington Post, this may have been the first time that virtual reality has been used to prepare for surgery to separate twins conjoined at their hearts. “It felt like I was working in the future,” says Dr. Saltzman. “It was extraordinarily exhilarating.” - KARE 11: Conjoined Twins Separated with Help of 3D Technology | Washington Post: How Doctors Used Virtual Reality to Save the Lives of Conjoined Twin Sisters

John Bischof & Colleagues Develop Advanced Cryopreservation Tool that Utilizes Lasers & Gold Nanoparticles
Dr. John C. Bischof, IEM Associate Director for Development, and Professor of Mechanical and Biomedical Engineering, and his colleagues, have developed an advanced tool that utilizes lasers and gold nanoparticles for the cryopreservation of tissue. The research, entitled “Gold Nanorod Induced Warming of Embryos from the Cryogenic State Enhances Viability,” was published in the journal ACS Nano. “Lasers have the exciting ability to act like a ‘light switch’ that can turn biological activity on and off within
gold nanoparticle laden biomaterials," says Dr. Bischof, who was the senior author of the study. “In this case, by careful engineering and deployment of gold nanoparticles within a cryogenically stored and biological inactive embryo, we can use a laser pulse to quickly warm the embryo back to ambient temperatures and switch biological activity, and therefore life, back on.”

Researchers Revolutionize Vital Conservation Tool with Use of Gold Nanotechnology and Lasers
Gold Nanorod Induced Warming of Embryos from the Cryogenic State Enhances Viability

Nathaniel Helwig & Collaborators Determine Elements of Successful Smiles
IEM Member Nathaniel E. Helwig, Assistant Professor of Psychology and Statistics, collaborated with Dr. Sophia Lyford-Pike, Assistant Professor, Department of Otolaryngology, Head and Neck Surgery, and Dr. Stephen J. Guy, Assistant Professor of Computer Science and Engineering, to determine the elements of what is referred to as a "successful smile," which is the one that receives the best response. In the research, which was published in the journal PLoS One, a total of 802 participants evaluated computer-generated 3D images of human faces, and rated the smiles on those faces by their effectiveness, genuineness, pleasantness and perceived emotional intent. The results of the study show that the most optimal smiles don’t show too much of the person’s teeth or gums, are not too wide, develop symmetrically on the right or left side of the face and appear to be natural. “These findings have broad applications in a variety of areas, such as facial reanimation surgery, rehabilitation, computer graphics, and psychology,” says Dr. Helwig.

Smiling Too Widely Can be a Social Handicap

Douglas Yee Discusses Value of Program for Developing Future Cancer Researchers Among Talented Underrepresented Students
IEM Member Dr. Douglas Yee, Professor of Medicine and Pharmacology and Director of the Masonic Cancer Center, University of Minnesota, discussed the value of an internship program aimed at developing future cancer researchers, which is targeted toward promising students from underrepresented backgrounds. The program, which is funded by a Continuing Umbrella of Research Experiences (CURE) grant from the National Cancer Institute (NCI), trains the students in biomedical studies, educates them on career paths in the field, and has them complete a semester-long boot camp, after which they are paired with a faculty mentor, who provides further training on doing research in a laboratory and advises them on their future careers. “As an NCI-designated comprehensive cancer center charged with supporting excellence in research, clinical care, and education, the Masonic Cancer Center is proud to offer such a robust experience for student scientists,” says Dr. Yee. "Developing young, talented researchers, of all backgrounds, is a critical step in preparing the next generation of outstanding investigators to fight cancer in the state of Minnesota."

Masonic Cancer Center, University of Minnesota Awarded NCI CURE Grant to Mentor Future Cancer Researchers

Vipin Kumar Discusses Benefits & Risks of Big Data in Healthcare
IEM Member Dr. Vipin Kumar, Regents Professor of Computer Science and Engineering and William Norris chair in Large Scale Computing, discussed with big data news portal, Datanami, the benefits and risks of big data in healthcare. "Healthcare data about the population at large can be analyzed to create individualized treatments, an area also known as precision medicine," says Dr. Kumar. But along with those benefits are risks and moral implications of how the data will be used. “There are huge concerns about possible misuse of these kinds of information, such as discrimination in hiring or in purchasing health insurance, if this information is not handled properly,” says Dr. Kumar. “The healthcare community is on the front lines in this area, but, given the complexity of issues involved, progress in addressing these concerns is very slow."

What’s Challenging in Big Data Now: Integration and Privacy

Announcements

MnDRIVE Fellowships in Neuromodulation Graduate ● Postdoctoral ● Resident/Clinical Fellow Now accepting applications for the 2017-2018 program

Program Description: The University of Minnesota announces its 2018-19 Fellowship Program in Neuromodulation. Fellowships are funded by the Discoveries and Treatments for Brain Conditions core area of the MnDRIVE (Minnesota Discovery, Research and InnoVation Economy) Initiative.

Fellowships will be awarded to outstanding graduate (doctoral) students, postdoctoral trainees, and residents/clinical fellows pursuing research in neuromodulation. Neuromodulation is an emerging transdisciplinary field focused on treating neurological and neuropsychiatric disorders with technological interventions at the neural interface that are non-destructive, reversible, and adjustable. Neuromodulation research integrates basic science, engineering, and clinical disciplines to yield new insights into brain function and develop therapeutic innovations that include electrical, magnetic, optogenetic, and ultrasound technologies.

Applications will be accepted through January 19, 2018, for summer and fall (2018) start dates. Application materials and instructions can be accessed at: https://mndrive.umn.edu/brain/funding. Decisions will be announced mid-March, 2018.
MN-REACH/MIN-CORPS Medical Technology Commercialization Bootcamp to be Held Wednesday, August 30th from 10:00 A.M. to 4:00 P.M.

This one-day immersion into Lean Innovation principles and commercialization processes as applied to the commercialization of medical innovations is free for University of Minnesota faculty, staff, graduate students, and postdoctoral associates who want to learn more about commercializing research designed to improve human health. Its objectives are to develop a high-level understanding of Lean Innovation methods to enable commercialization and grounding in key topics that must be addressed in the MN-REACH pre-proposal.

The boot camp will also help connect innovators with resources available to support bringing an innovation to market. Individuals and teams interested in applying for MN-REACH funding are particularly encouraged to attend.

More information about and registration for the boot camp can be found here.