News Stories

IEM Helps to Organize, Sponsor & Staff Several Medical Technology Events that Impacted More than 1,800 Participants During the Week of April 15th

As part of its core functions, the Institute for Engineering in Medicine (IEM) played key roles in the organization, sponsoring and staffing of the following medical technology events in the third week of April, which engaged and impacted more than 1,800 participants, including medical technology professionals, physicians, faculty scientists, nonprofits and government agency representatives:

1. **18th Annual Design of Medical Devices Conference (DMD)**
2. IEM Bioscience and Technology Symposium, which served as a component of DMD: Engineering the Genome, Cancer Bioengineering, Alzheimer’s Disease & Aging.
3. IEM & DMD Career Event
4. **7th Annual Neuromodulation Symposium**
5. Organ Preservation Center (BRI) Retreat and Reception, both of which IEM organized, staffed and hosted as part of its role of fostering the evolution of new research centers; this one being a collaboration between IEM, Harvard Medical School, Massachusetts General Hospital, the Organ Preservation Alliance and industry partners.
6. **2019 Manufacturing Needs for Biofabrication of Engineered Tissues and Organs**
7. IEM Working Group Grant Happy Hour for IEM Seed Grant awardees, which IEM organized, staffed, hosted and sponsored to help awardees learn from one another and establish a supportive and cohesive network of fellow investigators.

Kalpna Gupta Leads Research on the Impact of Chronic Opioid Therapy on Pain & Survival in Sickle Cell Disease

IEM Member Dr. Kalpna Gupta, Professor of Medicine, led a team of researchers that studied the impact of chronic opioid therapy on pain and survival in sickle cell disease. “Our findings show that opioids cause hyperalgesia, which means they do cause pain, and that is why there is an increased requirement of morphine as the time goes by,” says Dr. Gupta. The researchers also found that, while morphine reduced survival in control mice, it did not reduce survival in sickle cell disease mice. “There was a distinct difference in survival with morphine treatment between control mice expressing normal human hemoglobin and sickle mice expressing human sickle hemoglobin,” says Dr. Gupta. This finding is especially significant because it shows a genuine need for opioid therapy in patients with sickle cell disease. The research, entitled “Effect of chronic opioid therapy on pain and survival in a humanized mouse model of sickle cell disease,” was published in Blood Advances. This study can have an impact on patients genuinely requiring opioids for pain, because opioidphobia, created by rising awareness about the opioid crisis, can lead to a bias in treating sickle pain with opioids. [University of Minnesota Researchers Study Effect of Chronic Opioid Therapy on Pain and Survival in Sickle Cell Disease](#)
Essa Yacoub & Kamil Ugurbil Utilize CMRR’s Powerful 7 Tesla System to Better Understand the Brain’s Processing of Sound
In research performed with colleagues from Maastricht University in the Netherlands, IEM Members Dr. Essa Yacoub and Dr. Kamil Ugurbil, each Professors of Radiology-CMRR, have utilized the Center for Magnetic Resonance Research’s (CMRR) 7 Tesla magnet to gain a better understanding of how the brain processes sound. The powerful magnet made it possible to noninvasively compare the brain’s responsiveness to a range of natural sounds, including human speech and music sounds, between different cortical layers. Using computational models, they then showed that a transformation in sound processing takes place in specific layers of the brain. After this transformation, neuronal populations become responsive to specific combinations of sound aspects. The research, entitled “Processing complexity increases in superficial layers of human primary auditory cortex,” was published in the Nature journal Scientific Reports.

Scientific Reports Article

Timothy Ebner & Suhasa Kodandaramaiah Lead Research Team that Develops Transparent Device Allowing for Real-Time Viewing of Mouse Brains
IEM Members Dr. Timothy J. Ebner, Professor and Head of the Department of Neuroscience, and Dr. Suhasa B. Kodandaramaiah, Professor of Mechanical Engineering, are leaders of a team of researchers that has developed a 3D-printed device named the “See-Shell,” which is a transparent replacement for part of a mouse’s skull that allows for real-time viewing of its brain. “What we are trying to do is to see if we can visualize and interact with large parts of the mouse brain surface, called the cerebral cortex, over long periods of time. This will give us new information about how the brain works,” says Dr. Kodandaramaiah. Dr. Ebner says that, while these types of studies can’t be performed in humans, “they are extremely important in our understanding of how the brain functions normally and in disorders, with the long term goal of improving treatments for people who experience brain injuries or diseases.” Leila Ghanbari, a 4th year PhD student in mechanical engineering, was the lead author of the paper published in the journal Nature Communications.

Novel 3D-Printed Skull Provides a Peek into Brain

Pierre-François Van de Moortele & Bharathi Jagadeesan Discuss the Use of 3D Modeling to Better Understand Aneurysms
IEM Members Dr. Bharathi Jagadeesan, Associate Professor of Radiology, Neurology and Neurosurgery, and Dr. Pierre-François Van de Moortele, Associate Professor of Radiology CMRR, are profiled in the University of Minnesota publication Discovery for their use, with colleagues in the Departments of Neurosurgery (Andrew Grande), Aerospace Engineering (Filippo Coletti, Omid Amili) and the Center of Magnetic Resonance Research (CMRR), of 3D modeling to better understand aneurysms, which could aid physicians in deciding when to operate. The goal of the modeling system, in which the CMRR’s 7 Tesla magnet is used to scan the aneurysms of patients, is to identify high-risk aneurysms from blood flow patterns. Achieving that would be especially valuable because presently “at best, we’re providing an educated guess,” says Dr. Jagadeesan. “We want to be able to say to a patient, ‘Your aneurysm looks similar to those that have remained stable for years, so let’s stay put for now,’ or we’ll have the evidence to say, ‘The pattern of blood flow in your aneurysm is a bit concerning; perhaps we should treat it.”

Taking the Guesswork Out of Aneurysms
Alik Widge & Colleagues Seek to Discover Method to Increase Ability of Deep Brain Stimulation to Treat Mental Inflexibility

IEM Member Dr. Alik Widge, Assistant Professor of Psychiatry, and his colleagues at Massachusetts General Hospital, have discovered how to more precisely apply deep brain stimulation (DBS) to alleviate rigid, inflexible thinking. Inflexibility is a common symptom of major depressive disorder (MDD) and obsessive-compulsive disorder (OCD), among others. The research, which was led by Dr. Widge, found that flexible thinking can be measured through the results of challenging mental performance tests taken by patients and enhanced by increasing the power of low-frequency theta waves generated by the brain’s prefrontal cortex. Both can be accomplished in a clinical setting where the DBS device settings can be adjusted to optimal levels for the patient. “The increases in theta activity and in mental performance can signal us when we’ve got it right,” says Dr. Widge. “We could measure them in the operating room or in a doctor’s office using commonly available sensors.” Dr. Widge describes the findings as a significant advance for the fields of DBS and psychiatry. “We are closer than ever to bringing precision medicine to psychiatry and being able to help patients for whom nothing else has worked,” says Dr. Widge.

Stimulating Treatment for Mental Illness

Jian-Ping Wang Receives Entrepreneurial Researcher Award

IEM Member Dr. Jian-Ping Wang, Robert F. Hartmann Chair and Distinguished McKnight University Professor of Electrical and Computer Engineering, received the Entrepreneurial Researcher Award at the Inventor Recognition Event, presented by the Office of the Vice President for Research and U of M Technology Commercialization, to celebrate the recent achievements of University researchers and the breakthroughs that have resulted from their efforts. Dr. Wang’s award was based upon his research on the spin of electrons and their associated magnetism, which can allow for next-generation computing technologies that are smaller, faster and more energy-efficient than current technologies. “We are fortunate to have an academic community prolific not only in the generation of groundbreaking research outcomes, but also imbued with entrepreneurial spirit,” says Dr. Christopher J. Cramer, the University of Minnesota’s Vice President for Research. “Their innovation and creativity leads to new technologies that, when connected with capital and entrepreneurial expertise—sometimes in partnership with existing companies—can bring these discoveries from the lab to the marketplace, with real potential to improve lives in meaningful ways.”

University of Minnesota Honors Innovation and Entrepreneurship of Top Researchers

Amy Skubitz Profiled on KARE 11 for Development of Early Detection Test for Ovarian Cancer

IEM Member Dr. Amy P. Skubitz, Professor in the Department of Laboratory Medicine and Pathology, and the Department of Obstetrics, Gynecology and Women’s Health, was profiled on KARE 11 for a test she and her colleagues are developing for the early detection of ovarian cancer, a disease that kills over 16,000 U.S. women, annually, in part, due to it being diagnosed too late. Dr. Skubitz says that, in her previous research, she identified 6 blood proteins that are indicators of the presence of ovarian cancer. “When we looked at the levels of these six proteins in the blood of almost 150 women, we were able to say whether or not the women had advanced stages of serous ovarian cancer.” The research team’s current efforts are focused on detecting ovarian cancer earlier, when it can be treated more effectively, so that a woman can “come into the doctor’s office, have a blood test taken, and you could definitively tell whether she had these early stages of ovarian cancer,” says Dr. Skubitz. The researchers’ next step is to refine the test and then finish its development within the next 5 years.

U. of M. Researcher Hopes to Develop First Early Detection Test for Ovarian Cancer
MILI 3585 Navigating the Healthcare Marketplace: Economic, Social and Policy Lenses; Taught During Fall Semester
Professor Pinar Karaca-Mandic
3 Credits, Social Science Liberal Education Core

Description:
The healthcare marketplace constitutes nearly three trillion dollars in the United States and several trillion spent throughout the world. With growing demand for medical technology and the aging of the population, the scale and complexity of the healthcare supply chain is expected to dramatically increase over the next two decades. The healthcare sector is comprised of several markets for goods and services, including physician services, hospital services, insurance, pharmaceuticals and medical devices, and information technology. This course aims to provide a survey of the health sector to understand the scale, market opportunities, as well as barriers to this expanding and global industry.

Objectives:
- Identify the key factors in the healthcare sector and their market roles
- Understand the historical evolution of the healthcare sector, hospitals, and physicians as professions
- Understand the market opportunities offered by different sectors of the health economy
- Evaluate healthcare policy and reform in the U.S. and globally
- Understand the interrelationships between the markets and their influence on consumers and the overall healthcare system