Welcome to the 7th Annual Institute for Engineering in Medicine (IEM) Conference!

As you know, the mission of IEM is to seek innovative engineering solutions to tomorrow’s medicine and health care needs through organized interdisciplinary and multidisciplinary research. We fulfill this mission by fostering collaborations between engineering and biomedical faculty at the University of Minnesota and between University faculty and industrial colleagues.

We have the privilege to represent more than 275 IEM faculty members from over 85 academic departments on campus, along with their students and collaborators.

Today’s event opens with four plenary talks by nationally recognized leaders. These talks will be followed by “working lunches” where IEM members can learn about IEM’s new and ongoing initiatives and students can engage in a professional development session. A poster session highlighting research of IEM members and other University faculty, ending with poster awards, will conclude the Conference.

This Conference is designed to offer rich opportunities to learn about cutting edge research, IEM group grants and other support mechanisms, and IEM professional education and outreach activities. We hope that you enjoy the event and look forward to your continued interest and support. Please contact us at iem@umn.edu with ideas that can improve what we do. Together, we will make a difference in tomorrow’s medicine and healthcare through engineering innovation.

David Odde, Ph.D. (2019 IEM Annual Conference Chair)
Medtronic Endowed Associate Director, Strategic Research Initiatives,
Institute for Engineering in Medicine

John Bischof, Ph.D. (2019 IEM Annual Conference Co-Chair)
Director, Institute for Engineering in Medicine

Paul Iaizzo, Ph.D.
Medtronic Endowed Associate Director, Professional Education and Outreach,
Institute for Engineering in Medicine
ABOUT IEM

The Institute for Engineering in Medicine is an interdisciplinary organization that creates and supports research collaborations between engineers, scientists, and medical professionals at the University of Minnesota and provides research and partnership opportunities to the wider medical industry. With over 275 affiliated researchers representing 85 departments across the Twin Cities campus, IEM provides University faculty, students, and external partners with world-class resources to drive innovation in medicine and to find solutions for the great medical challenges of today and tomorrow.

ORGANIZATION

The new IEM Organizational Chart below captures the broad vision for the Institute’s engagement with the University, industry, and students in grades 6-12. Part of Dr. Bischof’s opening talk and the two faculty-oriented lunch options are dedicated to elaborating on this chart.
INSTITUTE for ENGINEERING in MEDICINE

IEM EXECUTIVE COMMITTEE

John Bischof, Ph.D.
Director, Institute for Engineering in Medicine,
Distinguished McKnight University Professor,
Carl and Janet Kuhrmeyer Chair, Mechanical
Engineering,
Medtronic-Bakken Endowed Chair for Engineering in Medicine

Paul Iaizzo, Ph.D.
Medtronic Endowed Associate Director,
Professional Education and Outreach,
Institute for Engineering in Medicine,
Director, Visible Heart Laboratory,
Professor of Surgery

David Odde, Ph.D.
Medtronic Endowed Associate Director, Strategic Research Initiatives
Institute for Engineering in Medicine,
Professor of Biomedical Engineering

Arthur Erdman, Ph.D.
Richard C. Jordan Professor, Morse Alumni
Distinguished Teaching Professor, Mechanical Engineering
Director, Earl E. Bakken Medical Devices Center

Michael Garwood, Ph.D.
Co-Director, Center for Magnetic Resonance Research (CMRR), Professor of Radiology
Malcolm B. Hanson Endowed Chair in Radiology

Tom Hays, Ph.D.
Department Head, Professor
Genetics, Cell Biology, and Development

David Largaespada, Ph.D.
Director, Brain Tumor Program, Masonic Cancer Center
Associate Director for Basic Sciences, Masonic Cancer Center
Professor of Pediatrics, Genetics, Cell Biology, and Development

Tay Netoff, Ph.D.
Director, Center for Neuroengineering
Associate Professor of Biomedical Engineering

Brenda Ogle, Ph.D.
Head, Department of Biomedical Engineering
Professor, Department of Pediatrics
Director, Stem Cell Institute

Angela Panoskaltsis-Mortari, Ph.D.
Vice Chair for Research and Professor of Pediatrics
Professor of Medicine
Director, University of Minnesota 3D Bioprinting Facility
Director, Cytokine Reference Laboratory
Associate Director, TL1 Program (CTSI)

Theresa Reineke, Ph.D.
Distinguished McKnight University Professor
Professor of Chemistry

Sara Shumway, M.D.
Professor, Division of Cardiothoracic Surgery,
Department of Surgery
Vice Chief, Division of Cardiothoracic Surgery

SCIENTIFIC ADVISORY BOARD

Warren Chan, Ph.D.
Professor of Chemistry and the Institute of Biomaterials and Biomedical Engineering,
University of Toronto
Associate Editor, ACS Nano

Sanjay Kumar, M.D., Ph.D.
Professor and Associate Chair of Bioengineering
UC Berkeley
Professor of Chemical and Biomolecular Engineering at UC Berkeley and a Faculty Scientist in the Biological Systems & Engineering Division of Lawrence Berkeley National Laboratory

Alexander Revzin, Ph.D.
Professor
Department of Biomedical Engineering
University of California, Irvine

Mehmet Toner, Ph.D.
Professor of Health Sciences and Technology
Harvard-MIT Division of HST

INDUSTRY ADVISORY BOARD

J. Fernando Bazan, Ph.D.
Biotech entrepreneur & organizer, Center for Engineered Biology

Matthew M. Cooper, MD MBA FACS
Global Senior Medical Director & Director, Patient Safety C.O.E.
Health Care Business Group
3M

Liza Davis
Director, R&D
Boston Scientific

Dominique Davidow, Ph.D.
Director of Research & Development – Whole Organs
Miromatrix

Sebastian Eriksson Giwa, Ph.D.
Cofounder of Osmium Health, Sylvantica Biotech, and Organ Preservation Alliance
Cofounder of Elevian, Osimum Health, Sylvantica Biotech, and the Organ Preservation Alliance

David M. Knapp, Ph.D.
Vice President, Research and Development
Boston Scientific

Tim Laske, Ph.D.
Vice President of Research and Business Development - AF Solutions
Medtronic

Kathleen Motzenbecker
Senior Vice President
The Medical Alley Association

Sean O’Neil
Vice President, Enterprise Architecture
Optum

Rhonda Robb
COO
Cardiovascular Systems, Inc.

Erik Scott, Ph.D.
Director, Advanced Development | RTG Implantables
Bakken Fellow, Technical Fellow at Medtronic
Medtronic, LLC

Dale Wahlstrom
Founder and CEO
ACT3, LLC Life Science Consulting

Adrienne Watson, Ph.D.
Senior Director, Preclinical Research
Recombinetics
8:30 - 9:00 am  Networking (Coffee and Muffins provided)

9:00 - 9:05 am  Welcome Remarks
Mostafa Kaveh, Ph.D.
Dean, College of Science and Engineering
University of Minnesota

9:05 - 9:30 am  State of the Institute for Engineering in Medicine
John Bischof, Ph.D.
Director, Institute for Engineering in Medicine
University of Minnesota

9:30 - 10:00 am  Distinguished Keynote Talk
Symbiosis and Autopoiesis of Engineering and Medicine
Jakub Tolar, M.D., Ph.D.
Dean of the Medical School and Vice President for Clinical Affairs
University of Minnesota

10:00 - 10:30 am  Distinguished Keynote Talk
Critical Partnerships Drive Healthcare Innovation: A Biomedical Engineering Perspective
Brenda Ogle, Ph.D.
Head, Department of Biomedical Engineering
Professor, Department of Pediatrics
Director, Stem Cell Institute
University of Minnesota

10:30 - 10:45 am  Coffee Break

10:45 - 11:15 am  Distinguished Keynote Talk
Guiding Biomedical Innovation to Meet Clinical Needs in Ovarian Cancer Treatment: Why We Struggle to Win the Fight
Melissa Geller, M.D., M.S.
Associate Professor and Division Director of Gynecologic Oncology
Department of Obstetrics, Gynecology and Women’s Health
University of Minnesota

11:15 - 11:45 am  Distinguished Keynote Talk
Engineering the Future of Health
Bruce Tromberg, Ph.D.
Director, National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health
Director, Beckman Laser Institute, Medical Clinic and Professor of Biomedical Engineering and Surgery, University of California, Irvine
IEM Awards
2018-2019 IEM Group Grant Recipients
Engineering in Medicine Doctoral Fellowship Recipients

Industrial Fellows Inductees:
Dawn Bardot, Ph.D. - Director, Cloud-based Service Technologies, Abiomed
Mark Hjelle - Senior Product Line Manager, Heraeus Medical Components
Adrienne Watson, Ph.D. - Vice President of Research and Development, Recombinetics
Heather Webb - Front End Innovation Manager, 3M

12:00 - 12:10 pm  
Lunch Break: Provided in The Commons area. Return with your lunch to one of the three lunch session rooms. Lunch Session seating is first come, first serve.

12:15 - 1:30 pm  
Lunch Sessions
Room 1:  Strategic Research Initiatives - Johnson Great Room
David Odde, Ph.D.
Medtronic Endowed Associate Director, Strategic Research Initiatives, Institute for Engineering in Medicine

Room 2:  Professional Education and Outreach - Ski-U-Mah
Paul Iaizzo, Ph.D.
Medtronic Endowed Associate Director, Professional Education and Outreach, Institute for Engineering in Medicine

Room 3:  Student Career Development (ending at 1:10) - Heritage Gallery
Moderator: Matthew Johnson, Ph.D.
Associate Professor and Institute for Translational Neuroscience Scholar, Department of Biomedical Engineering
“Preparing for a Career in Academia”
Cari S. Dutcher, Ph.D.
Associate Professor, Department of Mechanical Engineering
“Preparing for a Career in Industry”
Perry B. Hackett, Ph.D.
Professor, Center for Genome Engineering, Department of Genetics, Cell Biology and Development

1:30 - 2:50 pm  
Student and Postdoctoral Poster Session* and Networking

2:50 - 3:00 pm  
Poster Award Announcements
David Odde, Ph.D.
Medtronic Endowed Associate Director, Institute for Engineering in Medicine

* Important Note: Posters must be up on the designated poster panel by 1:30pm, and at least one author must be present 1:30-2:30pm. For posters in the Poster Award Competition, the first non-faculty author must be present 1:30 - 2:30pm.
CONNECTING TO FREE WIRELESS NETWORK
Network Name: U of M Guest
(For access and to connect to the wireless network, please enter your email address)

THE MCNAMARA ALUMNI CENTER
200 SE Oak St, Minneapolis, MN 55455
JAKUB TOLAR, M.D., PH.D.
Dean of Medical School, Vice President for Clinical Affairs

Jakub Tolar is the Dean of the University of Minnesota Medical School and a Distinguished McKnight Professor in the Department of Pediatrics, Blood and Marrow Transplantation. He is also the Vice President for Clinical Affairs at the University of Minnesota, Board Chair for University of Minnesota Physicians, and co-leader of M Health Fairview, the Joint Clinical Enterprise between the University of Minnesota Medical School, University of Minnesota Physicians, and Fairview Health Services.

An internationally recognized physician and researcher, Dr. Tolar is known for his care of patients with recessive dystrophic epidermolysis bullosa. His research is focused on using hematopoietic stem cell transplant as a treatment for rare genetic disorders. Originally from the Czech Republic, Dr. Tolar received his medical education in Prague at Charles University. In 1992, he came to the University of Minnesota, where he completed his Ph.D. in Molecular, Cellular & Developmental Biology and Genetics.

BRENDA OGLE, PH.D.
Head, Department of Biomedical Engineering
Professor, Department of Pediatrics
Director, Stem Cell Institute
University of Minnesota

Brenda Ogle is Professor and Head of Biomedical Engineering, Professor of Pediatrics, and Director of the Stem Cell Institute at the University of Minnesota. Her research team investigates the impact of extracellular matrix proteins on stem cell behavior, especially in the context of the cardiovascular system. The primary strength of her laboratory is the ability to span multiple subdisciplines within both basic science (i.e., stem cell biology, cell-cell fusion, and extracellular matrices) and engineering (cytometry, instrumentation, and 3D printing) fields. Her work has received funding from the National Institutes of Health, the National Science Foundation, the Department of Defense, the American Heart Association, the Coulter Foundation, Regenerative Medicine Minnesota, and MnDRIVE. She has partnered on research projects with Becton Dickinson, iCyt, and Medtronic. Professor Ogle is an elected fellow of the American Institute for Medical and Biological Engineering and a member of the Board of Directors of the Biomedical Engineering Society. She has served as co-chair of the Women’s Faculty Cabinet at the University and is recipient of the Mullen-Spector-Truax Women’s Leadership Award.
DISTINGUISHED KEYNOTE SPEAKERS

MELISSA GELLER, M.D., M.S.
Associate Professor and Division Director of Gynecologic Oncology, Department of Obstetrics, Gynecology and Women’s Health

Melissa Geller completed medical school at Chicago Medical School and went on to complete an Internship and Residency in Obstetrics and Gynecology and a surgical Fellowship in Gynecologic Oncology at the University of Minnesota. In addition, Dr. Geller completed a Galloway Fellowship in the Department of Surgery, Gynecology Division at Memorial Sloan Kettering Cancer Center in New York and a Master of Science degree in Clinical Research through the University of Minnesota School of Public Health.

Dr. Geller specializes in the treatment and management of gynecologic malignancies, with a significant portion of her effort concentrated on exploiting natural killer cells for ovarian cancer therapy. To this end, she has led multiple clinical trials involving immunotherapy in advanced gynecologic malignancies and holds an American Cancer Society Clinical Scholar Award for her translational research. Dr. Geller also leads the Translational Working Group of the Masonic Cancer Center on gynecologic cancers. She currently serves on the NRG Oncology Developmental Therapeutics Committee and is the NRG PI at the University of Minnesota. She is leading a first-of-its-kind study in ovarian cancer to determine if maintenance therapy using an “IL-15 superagonist” can boost the immune system against disease recurrence in women who have completed chemotherapy.

BRUCE J. TROMBERG, PH.D.
Director, National Institute of Biomedical Imaging and Bioengineering

In his 30-plus-year academic and scientific career, Dr. Tromberg has been the principal investigator for multiple NIH grants going back as far as 1994. This includes 20 years as principal investigator for the Laser Microbeam and Medical Program (LAMMP), an NIH National Biomedical Technology Resource Center where several cutting-edge technologies have been developed and disseminated to laboratories and clinics around the world. In addition to advisory committee appointments with numerous national and international entities, Dr. Tromberg has provided expertise on NIH working groups, review committees, and boards, including the NIBIB National Advisory Council from 2012-2016.

Dr. Tromberg’s research spans biophotonics and biomedical optics, two rapidly growing fields that use light to image and conduct therapy at the molecular, cellular, and tissue levels. He has co-authored more than 450 publications and holds 18 patents for biophotonics technologies and their applications in areas such as cancer, neuroscience, and vascular disease. He specializes in new technology development as well as the “bench to bedside” clinical translation, validation, and commercialization of promising methods designed to improve human health.
CANCER

C1  The Role of Motor-Clutch Mediated Migration in Glioblastoma Progression
Sarah Anderson; UMN

C2  In Vitro Investigation of NK/Cancer Cell Interactions in Metastasis
Bomberger HE, Kodal B, Felices M, Wood DK; UMN

C3  Focal Tumor Ablation by Irreversible Electroporation Augments Immunotherapy for Control of Tumor Growth and Promotes Formation of Tumor Antigen-Specific Tissue Resident Memory CD8+ T Cells
Brandon J. Burbach, Stephen D. O'Flanagan, Meagan R. Rollins, Joseph R. Slaughter, Katharine M. Young, Meredith Song, Qi Shao, Samira M. Azarin, John C. Bischof, Yoji Shimizu; Dept. of Laboratory Medicine and Pathology, Center for Immunology, Masonic Cancer Center, Dept. of Mechanical Engineering, Dept. of Chemical Engineering and Materials Science, UMN

C4  In Vitro Model of Metastasis to Study Plasticity of Cancer Cell Migration Throughout the Metastatic Cascade
Elizabeth Crist; UMN

C5  Defining Optimal Dendritic Cell Phenotype to Promote Maximal Antigen-Dependent T Cell Activation
Victoria Granger; UMN

C6  Engineering Multifunctional Ligand-Enzyme Fusions for Early Cancer Detection
Abbigael Harthorn, Benjamin Hackel; Dept. of Biomedical Engineering, UMN

C7  Energy-based Focal Therapy and Immunotherapy for Improved Primary and Systemic Cancer Control
Minhan Jiang; UMN

C8  Iron Oxide-Loaded Polymer Scaffolds for Non-Invasive Ablation of Ovarian Cancer Cells
Tiffany Lam, Alyssa Moy, Victoria Granger, Qi Shao, Hak Rae Lee, Stephen O'Flanagan, John Bischof, Samira Azarin; Dept. of Chemical Engineering and Materials Science, Dept. of Laboratory Medicine and Pathology, Dept. of Mechanical Engineering, UMN; Dept. of Biomedical Engineering, University of Michigan

C9  3D Bioprinted Metastatic Models via Reconstruction of Tumor Microenvironments
Fanben Meng, Daeha Joung, Michael McAlpine, Carolyn Meyer, Angela Panoskaltsis-Mortarib, Daniel Vallera; Dept. of Radiation Oncology, Dept. of Mechanical Engineering, Dept. of Pediatrics, UMN

C10  Engineering anti-EpCAM Fibronectin Based Nanorings for Immunotherapy
Ellie Mews, Clifford Csizmar, Carston Wagner; Dept. of Medicinal Chemistry, UMN

C11  Predictive Glioma Mouse Models of Human GBM Subtypes
Ghaidan A. Shamsan, Chao J. Liu, Brooke Braman, Rebecca L. Klank, David J. Odde, Susan Rathe, Barbara Tschida, S. Joseph McFarren, David A. Largaespada, Aaron Sarver, H. Brent Clark; Dept. of Laboratory Medicine and Pathology, Dept. of Biomedical Engineering, Masonic Cancer Center, Institute for Health Informatics, UMN

C12  Liposome Loaded Biomaterial Scaffolds as a Cytokine Delivery Platform for Precise Local Modulation of the Tumor Immune Microenvironment
Abby Silbaugh, Joseph Vallin, Francisco Pelaez, Mihee Kim, Samira Azarin; UMN

C13  A Pseudo-Energy Landscape Analysis Highlights the Role of Single-Cell Heterogeneity in Cancer Dormancy
Harish Venkatachalapathy, Hak Rae Lee, Samira M. Azarin, Casim A. Sarkar; Dept. of Biomedical Engineering, Dept. of Chemical Engineering and Materials Science, UMN
**CARDIOVASCULAR**

**CA1**  
Cardiovascular Diseases: Mechanics, Properties, and Behavior of the Aorta  
Jill Arada; UMN

**CA2**  
Developing Experimental Methods and Techniques for the Visualization of Cardiac Myofibril Damage  
Renee Brigham, Tinen Illes, Paul Iaizzo; Dept. of Surgery, Dept. of Biomedical Engineering, UMN

**CA3**  
A Novel Model of Intracranial Aneurysm to Guide the Development of Less Invasive Therapies  
Casey Chitwood, Theodore Jennings, Duane Nguyen, Andrew Grande, Brenda Ogle; Dept. of Biomedical Engineering, Stem Cell Institute, Masonic Cancer Center, Lillehei Heart Institute, Institute for Engineering in Medicine, Dept. of Neurosurgery, UMN; Dept. of Biology, Mancaelester College; Dept. of Biomedical Engineering, University of Wisconsin

**CA4**  
Expression of the Calcium-Activated Chloride Channel Anoctamin-1 in the Mitochondria of Pulmonary Artery Endothelial Cells  
Michael W. Cypress, Stephanie Adaniya, Yuta Suzuki, Richard Clements, Jin O-Uchi, Bong Sook Jhun, Gaurav Choudhary; UMN

**CA5**  
Automated Multiclass Cardiac Volume Segmentation and Model Generation  
Alex J. Deakyne, Erik N. Gaasedelen, Tinen L. Illes, Paul A. Iaizzo, FHRS; Dept. of Surgery, Bioinformatics and Computational Biology, UMN

**CA6**  
Atrial Fibrillation (AF) is an Arrhythmic Heart Condition  
Yugene Guo; UMN

**CA7**  
Diffusion and Toxicity Limited Cryopreservation of Arteries with Radiofrequency Heated Metal Forms  
Zonghu Han, Zhe Gao, Anirudh Sharma, John Bischof; UMN

**CA8**  
Dynamic Multiscale Entropy and Multiscale Frequency for Rotor Identification  
Xiangzhen Kong, Vasanth Ravikumar, Preethy Parthibhan, Henri Roukoz, Siva Mulpuru, Elena Tolkacheva; Dept. of Electrical Engineering, Dept. of Biomedical Engineering, Division of Cardiology, UMN; Mayo Clinic

**CA9**  
Embedding Dimension Method to Discriminate AF from NSR using ECG  
Jieun Lee, Elena Tolkacheva; Dept. of Biomedical Engineering, Dept. of Electrical Engineering, UMN

**CA10**  
Optical Mapping to Study Whole Organ Cardiac Electrophysiology  
Preethy Parthibhan, Vasanth Ravikumar, Elena Tolkacheva; Dept. of Biomedical Engineering, UMN

**CA11**  
Synthesis of Prazosin Analogs as Next-Generation Anti-Hypertensives  
Kaelan R. Patel, Ingrid R. Aragon, Chastity L. Healy, Megan Nguyen, Ramaiah Muthyalal, Timothy O’Connell, Yuk Sham; Dept. of Integrative Biology and Physiology, Dept. of Experimental and Clinical Pharmacology, Bioinformatics and Computational Biology Program, UMN

**CA12**  
Assessment of Phrenic Nerve Function Following Ablation Therapies  
Ramirez DA1,2, Voce D1, Iaizzo P PhD FHRS2; Dept. of Biomedical Engineering, Dept. of Surgery, UMN

**CA13**  
Novel Mapping Techniques for Phase Singularity Detection using Simulated Intracardiac Electrograms  
Vasanth Ravikumar, Elizabeth Annoni, Preethy Parthibhan, Sharon Zlochiver, Siva Mulpuru, Elena Tolkacheva; Dept. of Electrical Engineering, Dept. of Biomedical Engineering, UMN; Mayo Clinic

**CA14**  
Quantifying Ventricular Contractility to Evaluate Function in Human Hearts during Ex-Vivo Organ Perfusion  
E. Schinstock, A. Shaffer, P. Iaizzo; Dept. of Surgery, Dept. of Mechanical Engineering, UMN
CA15 Influence of Tyrosine Phosphorylation of Mitochondrial Calcium Uniporter (MCU) on Regulating Mitochondrial Calcium Uptake
Yuta Suzuki, Jessica L Cao, Stephanie M Adaniya, Michael W. Cypress, Bong Sook Jhun, Jin O-Uchi; Medicine, UMN; Rhode Island Hospital, Brown University

CA16 Computational Modeling for Dissection of Left Atrial Appendage Aneurysm: Advancing Knowledge of Congenital Heart Diseases and Aiding Surgical Planning
Amanda Tenhoff, Tinen Iles, Sameh Said, Massimo Griselli, Paul Iaizzo; Dept. of Surgery, Biomedical Engineering, Bioinformatics and Computational Biology, Pediatrics, Physiology, UMN

CA17 Open Source Platform for Visualizing Clinical Intracardiac Electrograms on a Patient-Specific 3D Heart Model
Sanket Thakare, Vasanth Ravikumar, Xiangzhen Kong, Siva K. Mulpuru, Elena Tolkacheva; Dept. of Biomedical Engineering, Dept. of Electrical Engineering, UMN; Dept. of Cardiovascular Medicine, Mayo Clinic

CA18 Coronary Artery Disease
Thomas Valenzuela; UMN

CA19 Cholesterol Effects on Monolayer Structure, Stability, and Surface Rheology
Cain Valtierrez-Gaytan, Steven Patton, Ian Williams, Todd Squires, and Joseph Zasadzinski; Dept. of Chemical Engineering and Materials Science, UMN; Dept. of Chemical Engineering, University of California Santa Barbara

MEDICAL DEVICES
D1 Gamification of Physical Rehabilitation: Developing a Proprioceptive Training Exercise for a Wrist Robot
C. Curry, N. Elangovan, R. Gardos Reid, J. Xu, J. Konczak; UMN

D2 Models of Femoral Arteries and Veins for Transcatheter Device Design
Mikayle Holm, Kendall Emfield, Tinen Iles, Paul Iaizzo; Dept. of Surgery, UMN

D3 Unique Computational Visualization of a Vessel Manipulation During Large Bore Transcatheter Insertions Viewed in Virtual Reality
Mikayle A. Holm, Rohan Thakur, Tinen L. Iles, Paul A. Iaizzo, UMN

D4 Designing a Fixture for the Radiographic Carpometacarpal Stress View
Leah Johnson, Corey McGee; UMN

D5 Targeted Ultrasound Modulation of the Cholinergic Anti-inflammatory Pathway
Claire Kaiser; UMN

D6 A Non-Invasive Wearable Device for Symptomatic Treatment of the Voice Disorder Spasmodic Dysphonia
Arash Mahnan, Juergen Konczak; UMN

D7 Medical Soft Robots: Overcoming Scaling Challenges
Gillian J. McDonald, Khoi H.T. Nguyen, Andrew W. Grande, Timothy M. Kowalewski; Dept. of Mechanical Engineering, Dept. of Neurosurgery, UMN

D8 Characterization of Annular Transducer for Photoacoustic Imaging
Joshua Punnoose, Shai Ashkenazi; UMN
D9  Ultra Hearing: Effects of Body-Coupled Amplitude-Modulated Ultrasound Stimulation for a New Hearing Technology  
Gerardo Rodriguez Orellana; UMN

D10  Design for a Low-cost, Pressure-controlled Catheter Testing System  
Aaron Tucker, Paul Rothweiler, Art Erdman; Earl E. Bakken Medical Devices Center, UMN

D11  Computational Modeling of Transradial Catheterization: Development of Educational and Translational Models  
Matthew Welter, Mikayle Holm, Alex Deakyne, Tinen Iles, Paul Iaizzo; Dept. of Surgery, Dept. of Biomedical Engineering, UMN

D12  Transseptal Puncture with Large-Bore Transcatheter Delivery Systems: Investigations into Crossing Forces, Atrial Septum Dilation, and Tissue Damage to the Fossa Ovalis  
Jorge D. Zhingre Sanchez, Michael G. Bateman, Paul A. Iaizzo; Visible Heart® Laboratories, Institute for Engineering in Medicine, Dept. of Biomedical Engineering, Dept. of Surgery, UMN

FRONTIER AND EMERGING AREAS

EF1  Dilatational Rheology of Lysopc and Its Effect on Acute Respiratory Distress Syndrome (ARDS)  
Sourav Barman and Joseph Zasadzinski; Dept. of Chemical Engineering and Material Science, UMN

EF2  Combined Microfluidic-Computational Approach to Quantify the Effect of Sickle-Cell Disease on Blood Rheology  
Marisa S. Bazzi, José M. Valdez, David K. Wood, Victor H. Barocas; Dept. of Chemical Engineering and Material Science, Dept. of Biomedical Engineering, UMN

EF3  A Rheological Approach to Design an Effective Lung Surfactant Replacement Therapy  
Clara Ciutara, Joseph Zasadzinski; Dept. of Chemical Engineering and Materials Science, UMN

EF4  Leveraging Droplet Microfluidics to Produce a High-Throughput, ECM-Based Model of Lung Fibrosis  
Katherine A. Cummins, David K. Wood; Dept. of Biomedical Engineering, UMN

EF5  Self-Assembled Plasmonic 3D Nanostructures for Surface Enhanced Raman Scattering  
Chunhui Dai, Kriti Agarwal, Ritu Jha, Zihao Lin, Razketh Awal, Kalpna Gupta, JeongHyun Cho; Dept. of Electrical and Computer Engineering; Dept. of Medicine; UMN

EF6  A Deep Sequence-Function Platform Identifies More Potent Oncocin Variants  
Matthew DeJong, Katharian Fransen, Seth Ritter, Benjamin Hackel; Department of Chemical Engineering and Materials Science; UMN

EF7  Power Requirement Estimation for Different Stride Lengths in Hybrid FES-Orthosis Gait  
Yusra Farhatullah; UMN

EF8  Multifunctional Peptide Coatings for Dental Implants  
Nicholas G. Fischer, Dina G. Moussa, Erik Skoe, David De Jong, Conrado Aparicio; Minnesota Dental Research Center for Biomaterials and Biomechanics (MDRCBB)

EF9  Predicting Recombinant Yield Using High-Throughput Assays and Machine Learning  
Alexander Golinski, Katelynn Mischler, Matt Fossing, Nicole Neurock, Sid Laxminarayan, Ben Hackel; UMN
EF10  **Mucoadhesive Polymer Wafers for Sublingual Delivery of Protein and DNA Vaccines**  
Samuel M. Hanson, Leah Novik, Noah Nathan, Shailbala Singh, Jagannadha K. Sastry, Michael Barry, Chun Wang; Dept. of Biomedical Engineering, UMN; MD Anderson Cancer Center, Mayo Clinic

EF11  **Multi-Scale Analysis of Microtubule Dynamics Regulation by the Drug Colchicine**  
Mahya Hemmat, Michael Braman, David J. Odde; Dept. of Mechanical Engineering, Dept. of Biomedical Engineering, UMN

EF12  **Developing and Characterizing FLIM Probes to Quantify and Detect Sub-cellular Kinase Activity**  
Sampreeti Jena, Scout Allendorf, Erica Pratt, Oscar Bastidas, Laurie L. Parker; Dept. of Biochemistry, Molecular Biology and Biophysics, UMN

EF13  **Enterobactin-Inspired Catecholate Ligands for 68 Ga PET**  
Fiona Armstrong-Pavlik, M. Andrey Joaqui-Joaqui, Christopher Naas, Raju Mandapati, Valerie Pierre; UMN

EF14  **Vertebral Kinematics: Biplane Radiography Validation of Shape-Matching Via Ultrasound Echo Time MRI Bone Models**  
Craig C. Kage, Mary H. Foltz, Matthew MacEwen, Mohsen Akbari-Shandiz, Casey P. Johnson, Nathaniel E. Helwig, Arin M. Ellingson; Division of Rehabilitation Science, Dept. of Biomedical Engineering, Dept. of Veterinary Clinical Sciences, Center for Magnetic Resonance Research, Dept. of Psychology, School of Statistics, Division of Physical Therapy, Dept. of Orthopaedic Surgery, UMN; Rehabilitation Medicine Research Center, Mayo Clinic

EF15  **Diagnostic Nanoplatforms: Engineering Multifunctional Fluorinated Nanosensors for 19 F MRI Diagnostic Applications**  
Amani L. Lee, Christy L. Haynes, William C.K. Pomerantz; UMN

EF16  **Computing Radial Basis Function Support Vector Machine using DNA via Fractional Coding**  
Xingyi Liu, Keshab Parhi; Department of Electrical and Computer Engineering; UMN

EF17  **High-Throughput Approaches for Engineering Ligand specificity and Translatability**  
Patrick S. Lown, Lawrence A. Stern, Benjamin J. Hackel; Dept. of Chemical Engineering and Materials Science, UMN

EF18  **Modeling, Simulation, and Coevolutionary Study of TLQP-21 Peptide and its Cognate Complement 3a Receptor (C3aR1)**  
Megin E. Nguyen, Bhavani S. Sahu, Alessandro Bartolomucci, Yuk Y. Sham; Department of Integrative Biology and Physiology, Bioinformatics and Computational Biology Program; UMN

EF19  **Validating Coating Method of Iron Oxide Nanoparticles for Nanowarming**  
Jacqueline Pasek-Allen, Zhe Gao, Anna Rudie, Rameshu Rallabandi, Jon Rainier, John Bischof; 1. Dept. of Biomedical Engineering, UMN; 2. Dept. of Chemistry, University of Utah

EF20  **A Novel Method to Study the Dynamics of Influenza Virus Replication for Enhancing Vaccine Productivity**  
Thu Phan, Elizabeth J. Fay, Christopher Stach, Ryan A. Langlois, Wei-Shou Hu; Dept. of Chemical Engineering and Materials Science, Dept. of Microbiology and Immunology, Dept. of Biochemistry, Molecular Biology and Biophysics, UMN

EF21  **Reliability and Validity of Software-Aided Fluoroscopic Visual 2D Assessment of Shoulder Kinematics Using Single Plane Fluoroscopy**  
Gaura Saini, Justin L. Staker, Keraloos M. Abdelmessih, Jackson L. Davis, Leah J. Grinvalsky, Brent L. Johnson, Christina L McCann, Lucas O’Neil, Tyler S. Peters, Claire L. Wheatley, Paula M. Ludewig; Rehabilitation Medicine; UMN

EF22  **Effect of Multi-Parametric MR Images on Accuracy of U-Net Liver Segmentations**  
Sara L. Saunders, Anil Chauhan, Patrick J. Bolan, Justin R. Ryder; Dept. of Biomedical Engineering, Dept. of Radiology, Center for Magnetic Resonance Research, Dept. of Pediatrics, Center for Pediatric Obesity Medicine, UMN
**Endothelialized Microfluidics to Study Vaso-occlusion in Sickle Cell Disease**
Samantha Schad, David Wood; Department of Biomedical Engineering; UMN

**Self-Assembly of Colloidal Plasmonic-Magnetic Nanoparticles for Fabrication of Functional Nanostructure**
Jiajia Sun, Kai Wu, Diqing Su, Zongqian Shi, and Jian-Ping Wang; State Key Laboratory of Electrical Insulation and Power Equipment, Xi’an Jiaotong University; Dept. of Electrical and Computer Engineering, Dept. of Chemical Engineering and Material Science, UMN

**Characterization of Naturally Occurring Bacteriocin IIa Antimicrobial Proteins to Map Sequence-Function Relationships**
Daniel T. Tresnak, Benjamin J. Hackel; UMN

**Self-Assembling Phosphoramidate Pronucleotides: Enzyme Responsiveness and Structure-Assembly Relationships**
Harrison T West, Clifford M Csizmar, and Carston R Wagner; Dept. of Medicinal Chemistry, UMN

**Detection and Identification of Nano-labels Inside Cells by Ferromagnetic Resonance**
Yali Zhang, Mohammad Reza Zamani Kouhpanji, Zohreh Nemati Porshokouh, Bethanie Stadler, Rhonda Franklin; UMN

**Behavioral and Electrophysiological Characterization of Harmaline-Tremor as a Preclinical Model of Essential Tremor**
E.M. Bello, M. Blumenfeld, J.K. Dao, F. Guedes, M.D. Johnson; Dept. of Biomedical Engineering, Institute for Translational Neuroscience, UMN

**Relationships Between the Spatial Map of Beta Band Oscillatory Power Through a Directional DBS Lead in Subthalamic Nucleus and Monopolar Stimulation Settings for Treating Parkinsonian Motor Signs**
A.K. Brinda, E. Lecy, C. Spencer, A.M. Doyle, M.D. Johnson; Dept. of Biomedical Engineering, Dept. of Neuroscience, UMN

**Stimulation of the Pallidothalamic Fiber Tract Reduces Dyskineties in Parkinson’s Disease: a Computational and Clinical Study**
Mojgan Goftari, Jiwon Kim, Elliot Johnson, Remi Patriat, Noam Harel, Matthew D. Johnson, Lauren E. Schrock; Dept. of Biomedical Engineering, Dept. of Chemical Engineering, Dept. of Neurology, Dept. of Radiology / CMRR, UMN

**Diffusion MRI at 10.5T in Nonhuman Primates**

**Novel Measure of Ankle Proprioceptive Acuity**
J. Holst-Wolf, A. Mahnan, J. Konczak; UMN

**Virtual Reality for Deep Brain Stimulation: A Framework to Develop Procedural Planning Software**
Bethany Juhnke, Muhammad Ahsan, and Arthur Erdman; UMN

**Contrast-Enhanced Serial Optical Coherence Scanner with Deep Learning Network Reveals Vasculature and White Matter Organization of Whole Mouse Brain**
Tianqi Li, Chao J. Liu, Taner Akkin; Dept. of Biomedical Engineering, UMN
<table>
<thead>
<tr>
<th>Posters</th>
<th>Title</th>
<th>Authors</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>N8</td>
<td>A Novel, Simple System for the Objective Assessment of Proprioceptive</td>
<td>J. Oh, A. Mahnan, J. Xu, J. Holst-Wolf, J. Konczak; UMN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deficits in Pediatric and Adult Clinical Populations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N9</td>
<td>Epidural Spinal Cord Stimulation (eSCS) Optimization for Restoration</td>
<td>Zixi Zhao, Isabel Peña Pino, Claire Zurn, Logan Grado, Uzma Samadani,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of Function in Spinal Cord Injury</td>
<td>Ann Parr, Andrew Lamperski, Theoden I Netoff, David Darrow; Dept. of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biomedical Engineering, Dept. of Neurosurgery, Dept. of Electrical and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer Engineering, UMN, Dept. of Neurosurgery, Hennepin County</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Center</td>
<td></td>
</tr>
<tr>
<td>N10</td>
<td>Erectile Dysfunction (ED) Due to the NeuroVascular Bundle (NVB) Nerve</td>
<td>Pegah Ranjbarnezhani; UMN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N11</td>
<td>Effects of Electrical Stimulation and Neuromodulatory Agents on</td>
<td>Bhaskar Ravishankar, Weston Upchurch, Paul A. Iaizzo, Tinen Iles,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contractile Properties of Ovine and Porcine Bladders In-Vitro</td>
<td>Guangjian Wang, Dwight E. Nelson, Gerald W. Timm; Dept. of Electrical</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering, Dept. of Urology, Visible Heart Laboratory, UMN</td>
<td></td>
</tr>
<tr>
<td>N12</td>
<td>Highly Tunable, Ultra-Low Power, Cellular-Level, Magnetic Neurostimu-</td>
<td>Renata Saha, Kai Wu, Diqing Su, and Jian-Ping Wang; Dept. of Electrical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lation Through Flexible Spintronic Nanostructures</td>
<td>and Computer Engineering, Dept. of Chemical Engineering and Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science, UMN</td>
<td></td>
</tr>
<tr>
<td>N13</td>
<td>Stimulation Paradigms to Evoke Unidirectionally Propagating Action</td>
<td>S. Sang, J. Slopsema, L. Lehto, S. Mangia, S. Michaeli, M.D. Johnson,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potentials</td>
<td>CMRR, Dept. of Biomedical Engineering, UMN</td>
<td></td>
</tr>
<tr>
<td>N14</td>
<td>Classification of Major Depressive Disorder from Resting- State fMRI</td>
<td>Bhaskar Sen, Bryon Mueller, Bonnie Klimes-Dougan, Kathryn Cullen, Keshab</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>K. Parhi; Dept. of Electrical and Computer Engineering, Dept. of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psychology, Dept. of Psychiatry, Dept. of Electrical and Computer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering, UMN</td>
<td></td>
</tr>
<tr>
<td>N15</td>
<td>Pacinian corpuscle (PC) Receptor in the Hypodermis Responsible for</td>
<td>Tiffany L. Senkow, Emily A. Chandler, Amy T. Moeller, Victor H. Barocas;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transducing High-Frequency (80-1000 Hz) Vibrator</td>
<td>Dept. of Biomedical Engineering, UMN; Twin Cities Orthopedics</td>
<td></td>
</tr>
<tr>
<td>N16</td>
<td>Comparison of Multiple Current Sources and Multiple Stimulation Sets</td>
<td>Julia Slopsema, Jordan Krieg, Alexandra Doyle, Matthew Johnson; UMN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with Subthalamic Nucleus Deep Brain Stimulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N17</td>
<td>Generation of Inner Ear Neurons Using a Blastocyst Complementation</td>
<td>Steevens, A., Griesbach, M., You, Y., Koeningsberg, C., Sanders, M.,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>in a Neurog1-deficient Mouse</td>
<td>Low, W., and Santi, P.; UMN</td>
<td></td>
</tr>
<tr>
<td>N18</td>
<td>Large-Scale, High-Resolution Brain Sensing with Flexible Magnetic</td>
<td>Diqing Su, Kai Wu, Chaoyi Peng, Renata Saha, Walter Low, Jian-Ping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nanosensors</td>
<td>Wang; UMN</td>
<td></td>
</tr>
<tr>
<td>N19</td>
<td>Orientation Selective Deep Brain Stimulation of Entorhinal Cortex in</td>
<td>L. Wu, S. Sang, L. Lehto, Jun Ma, Clairice Pearce, Walter Low, S.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rats with functional MRI study</td>
<td>Mangia, S. Michaeli; CMRR, Dept. of Neurosurgery, UMN</td>
<td></td>
</tr>
<tr>
<td>N20</td>
<td>A Stochastic Multiscale Model That Explains the Segregation of</td>
<td>Chuan Xue, Blerta Shtylla, Anthony Brown; Dept. of Mathematics, Ohio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Axonal Microtubules and Neurofilaments in Neurological Diseases</td>
<td>State University, Dept. of Mathematics, Pomona College, Dept. of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neuroscience, Ohio State University</td>
<td></td>
</tr>
<tr>
<td>N21</td>
<td>Alteration of Brain Connectivity and Behavior Using a Paired</td>
<td>Rebecca Young, Meng-chen (Jean) Lo, Sonia Olsen, Alik S. Widge;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Stimulation Paradigm in a Fear Regulated Circuit</td>
<td>Department of Psychiatry, UMN</td>
<td></td>
</tr>
</tbody>
</table>
REGENERATIVE MEDICINE AND TRANSPLANTATION

RM1  Microfluidic Real Time Metabolic Analysis of iPSC Derived RPE
Jane Baude, Kevin Viken, Lou Kidder, Deborah Ferrington, James Dutton, Bruce Hammer; Stem Cell Institute, Dept. of Therapeutic Radiology, Dept. of Ophthalmology and Visual Neurosciences, Center for Magnetic Resonance Research, UMN

RM2  Oral Tissue Adhesive Nanofiber Membranes
Sunil Kumar Boda, Conrado Aparicio; MDRCBB-Minnesota Dental Research Center for Biomaterials and Biomechanics, Department of Restorative Sciences, School of Dentistry, UMN

RM3  Iron Oxide Nanoparticle Loading and Removal in Rat Hearts for Nanowarming Application
Zhe Gao, Bat-Erdene Namsrai, Hattie L. Ring, Vasanth Ravikumar, Anirudh Sharma, Y Eugene Guo, Michael Garwood, Elena G. Tolkacheva, Erik Finger, John C. Bischof; UMN

RM4  Development of Polymeric Biomaterials using High-Throughput Experimentation and Statistical Learning
Ramya Kumar, Ngoc Le, Zhe Tan, Theresa M. Reineke; Dept. of Chemistry, Dept. of Chemical Engineering and Material Science, UMN

RM5  Photothermal Conversion of Gold Nanoparticles for Fast Laser Warming of Vitrified Biomaterials
Yilin Liu, Joseph Kangas, Yiru Wang, Kanav Khosla, Jacqueline Pasek-Allen, Li Zhan, Aaron Saunders, Steven Oldenburg, John Bischof; UMN

RM6  Influence of Manufacturing Variables on the Performance of Human Tissue Engineered Cartilage
Jill M. Middendorf, Nicole Diamontides, Sean Kim, Caroline Dugopolski, Stephen Kennedy, Eric Blahut, Itai Cohen, Lawrence J. Bonassar; UMN; Cornell University; Histogenics Corporation

RM7  Stem Cell Sources for Regenerative Strategies to Improve Durability of Skin/Implant Interfaces
Isha Mutreja, Deveeena Dey, Kirk Twaroski, Mehdi Belkhodja, Joan E. Bechtold, Jakub Tolar, Jonathan A. Forsberg, Thomas A. Davis, Conrado Aparicio; UMN; Hennepin County Medical Center; Uniformed Services University of the Health Sciences - Walter Reed National Military Medical Center; The Henry M Jackson Foundation for the Advancement of Military Medicine

RM8  Defined Vitronectin Surfaces for Liver Differentiation
Kevin Ortiz-Rivera; UMN

RM9  Vitrification and Nanowarming of Rat Livers
Anirudh Sharma, Bat-Erdene Namsrai, Hattie Ring, Zonghu Han, Zhe Gao, Charles Lee, Erik Finger, John Bischof; Dept. of Mechanical Engineering, Dept. of Surgery, Center for Magnetic Resonance Research (CMRR), UMN; Dept. of Mechanical Engineering, University of North Carolina

RM10  Graphene-Edge Dielectrophoresis for Biomedical Sensing Applications
Qun Su, In-Ho Lee, Sang-Hyun Oh, and Steven Koester; Dept. of Electrical and Computer Engineering, UMN

RM11  Cross-Talk Between Muscle Satellite Cells and Juxtavascular Niche is Mediated Through VEGF and Notch Signaling
Mayank Verma, Yako Asakura, Bhavani Sai Rohit Murakonda, Thomas Pengoe, Claire Latrocheg, Benedicte Chazaudh, Linda K. McLoont, Atsushi Asakurab; Medical Scientist Training Program; Stem Cell Institute; Paul & Sheila Wellstone Muscular Dystrophy Center; Dept. of Neurology, Dept. of Ophthalmology and Visual Neurosciences, UMN; Informatics Institute; San Raffaele Telethon Institute for Gene Therapy; Institut NeuroMyoGene, Université de Lyon
IEM uses Facebook, Twitter, and LinkedIn to interact with IEM members, the University of Minnesota community, members of industry, and the scientific community.

To connect with IEM through social media:

Facebook: @Institute.for.Engineering.in.Medicine
Twitter: @UMNIEM
Instagram: @umniem
LinkedIn: Institute for Engineering in Medicine - University of Minnesota

If you have any questions, please connect with us at iem@umn.edu.

We look forward to engaging with you and your groups!