Design of Medical Devices
Conference 2019

Innovation Workshop
April 15th

DMD Conference
April 16th-18th

Graduate Minneapolis & McNamara Alumni Center, Minneapolis, MN
Welcome to the 18th Annual University of Minnesota Design of Medical Devices Conference

The Design of Medical Devices Conference was created in 2001 to enhance collaboration between academia and industry, promote policy, research and educational initiatives as they relate to medical device design and to support medical devices education at the University of Minnesota.

This forum, uniquely positioned in the middle of one of the most significant medical device communities in the world, has provided invaluable insight and leadership to promote the future of this evolving industry. Conference attendance has more than tripled since its inception and we look forward to continued growth.

The success of this conference is due in large part to the continued support from our industry sponsors and University of Minnesota partners. On behalf of the DMD Executive Planning Committee, we want to thank you for your support and hope you enjoy this year’s conference!

Sincerely,
2019 Design of Medical Devices Conference Executive Planning Committee

The Design of Medical Devices Conference is presented by the University of Minnesota’s Earl E. Bakken Medical Devices Center (part of the Institute for Engineering in Medicine), the College of Science & Engineering and the Department of Mechanical Engineering.

Connecting to the Wireless Networks

**Graduate Minneapolis**
Network: GraduateConvention
Password: DMD2019 *(case-sensitive)*
For technical assistance call: 612-362-6662

**McNamara Alumni Center**
Network: UofM Guest
Open a web browser and follow the prompts to gain access

@umndmd                                                        #dmdconf
Design of Medical Devices Conference
2019 Corporate Sponsors

Premier Level

Abbott
Boston Scientific
Johnson & Johnson MEDICAL DEVICES COMPANIES
Medtronic

Executive Level

ASME Institute for Engineering in Medicine
University of Minnesota
Driven to Discover™

AdvancedTek

Supporting Level

7-SIGMA Simulation Systems
ARCHIMEDES Center for Medical Device Security
ARKCO SALES
BOMATEC

Device Talks

Earl E. Bakken Medical Devices Center
University of Minnesota
Driven to Discover™

Elkem

Medical Industry Leadership Institute

FANG Consulting

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Haldeman Homme, Inc

Technical Products Division

IPRIME

Medical Alley Association

Minnesota NanoCenter

Research Computing

University of Minnesota
Driven to Discover™

Quartus Engineering

Technology Commercialization

University of Minnesota
Driven to Discover™

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unite
http://www.unite.umn.edu

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Engineering World Health

APS American Preclinical Services

Characterization Facility
University of Minnesota
Driven to Discover™

Lillehei Heart Institute

University of Minnesota
Advanced Preclinical Imaging Center

Altair Medical Design Briefs
**Medical Device Innovation Workshop**

_“Becoming a Medical Technology Innovator”_  
Monday, April 15, 2019 | Pinnacle Ballroom, Graduate Minneapolis

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<td>Check-in and Continental Breakfast</td>
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<tr>
<td>8:00 am</td>
<td>Welcome and Introduction</td>
<td>Paul Iaizzo &amp; William Durfee, University of Minnesota</td>
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<tr>
<td>8:30 am</td>
<td>“How New Medical Products are Developed”</td>
<td>William Durfee, University of Minnesota</td>
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<td>9:00 am</td>
<td>“Global Markets for Medical Devices”</td>
<td>Tim Laske, Medtronic</td>
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<td>9:40 am</td>
<td>“Market Assessment for a New Medical Device”</td>
<td>Mike Finch, Children’s of Minnesota Hospitals and Clinics</td>
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<td>Networking Break</td>
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<td>10:45 am</td>
<td>“Creativity Basics: Warming the Brain”</td>
<td>Barry Kudrowitz, University of Minnesota</td>
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<td>11:10 am</td>
<td>Innovation Exercise 1</td>
<td>Generate an Idea that Solves a Need</td>
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<td>Networking Lunch</td>
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<tr>
<td>1:00 pm</td>
<td>“Evaluating Your Medical Device Idea Using Bench Tests, Animal Tests and Clinical Trials”</td>
<td>Paul Iaizzo, University of Minnesota</td>
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<td>1:30 pm</td>
<td>“Medical Device Regulations”</td>
<td>Paul Iaizzo, University of Minnesota</td>
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<td>2:00 pm</td>
<td>“Reimbursement for Medical Devices”</td>
<td>Matt Cooper, 3M</td>
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<td>“Protecting Your Intellectual Property Through Patents”</td>
<td>William Durfee, University of Minnesota</td>
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<td>Networking Break</td>
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<tr>
<td>3:20 pm</td>
<td>“Ethnography and Design Process”</td>
<td>Nicole Parks &amp; Danny Gelfman, Medtronic</td>
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<td>4:00 pm</td>
<td>Innovation Exercise 2</td>
<td>Develop a New Medical Technology Product</td>
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<td>Team Presentations</td>
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<td>5:10 pm</td>
<td>“The Corporate View of Technology Assessments and Acquisitions”</td>
<td>Sanjiv Arora, Medtronic</td>
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<td>5:40 pm</td>
<td>Panel Discussion: Medical Technology Innovation</td>
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<td>6:00 pm</td>
<td>Adjourn</td>
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**SAVE THE DATE:** MONDAY, APRIL 6, 2020  
www.dmd.umn.edu/workshop
THANK YOU

to the participants of the 11th Annual 5.10k Road Race & Fun Run

The 2018-19 Earl E. Bakken Medical Devices Center Innovation Fellows Team and the 2019 Design of Medical Devices Conference Committee would like to thank the participants of this year’s 5.10k Fun Run and Road Race held Monday, April 15, 2019. Please join us next year for the 12th Annual 5.10k Road Race & Fun Run.

Save the Date

Monday, April 6, 2020

www.dmd.umn.edu/5K

A Special Thank You to the Technology Leadership Institute, UMN and Minnetronix Medical for your support of the 5.10k Fun Run & Road Race and the Innovation Fellows Program.
Tuesday, April 16, 2019

ORDER OF PRESENTATIONS MAY VARY, REFERENCE THE ONLINE PROGRAM FOR THE MOST UP TO DATE PRESENTATION DETAILS

7:00 A.M.  GRADUATE MINNEAPOLIS
REGISTRATION & CONTINENTAL BREAKFAST

8:00 A.M.  MERIDIAN BALLROOMS 1-4, GRADUATE MINNEAPOLIS
WELCOME & PLENARY SESSION
Sponsored by Johnson & Johnson
Moderator: Arthur Erdman, University of Minnesota
Keynote Address: Medical Device Security
Kevin Fu
University of Michigan

10:00 A.M. - 10:30 A.M.
SPONSOR EXHIBIT SHOWCASE
MERIDIAN FOYER, GRADUATE MINNEAPOLIS

10:30 A.M. - 12:00 P.M.
CONCURRENT TECHNICAL SESSIONS

ROBOTICS 1: NEUROBOTICS
Meridian Ballroom 1, Graduate Minneapolis
Session Organizer:
Andrew Grande, University of Minnesota
Tim Kowalewski, University of Minnesota

Introduction to Neurobotics
Andrew Grande
University of Minnesota

Robotic Assessment Following Stroke
Douglass Cook
Queen’s University

Recent Advances in Precision Cerebrovascular Imaging and Therapy with Ultrasound
Emad Ebbini
University of Minnesota

WristBot, A New Robotic Platform for the Neurorehabilitation of Wrist and Hand Function
Naveen Elangovan
University of Minnesota

Robotic Neurorehabilitation: Clinical and Commercial Challenges and Opportunities
Jürgen Konczak
University of Minnesota

BIG DATA, DIGITAL HEALTH AND ADVANCED DIAGNOSTICS: TRENDS AND IMPLICATIONS FOR MEDICAL DEVICE INNOVATORS
Meridian Ballrooms 2/3, Graduate Minneapolis
Session Organizer:
Ryan Egeland, Cardiovascular Systems, Inc.

This session will include a presentation of trends and implications of the changing technical, clinical, and competitive landscape for medical device innovators. The session will include significant time for audience participation and engagement.

11:30 A.M. - 12:00 P.M.
Lunch break

12:00 P.M. - 1:30 P.M.
Lunch and networking

CM&RS 1: THE ASME V&V 40 STANDARD
Meridian Ballroom 4, Graduate Minneapolis
Session Organizer:
Marc Horner, ANSYS, Inc.

An Introduction to the ASME V&V 40 Standard
Marc Horner
ANSYS, Inc.

Device Success Stories with V&V40
Jeffrey Bischoff
Zimmer Bionet

Verification in Computational Modeling of Medical Devices
Ismael Guler
Boston Scientific Corporation

REIMBURSEMENT FOR MEDICAL TECHNOLOGY
Ski-U-Mah, McNamara Alumni Center
Session Organizer:
Greg Peterson, University of Minnesota
Panelists:
Kathy Sherwood
Inspire Medical Systems
Steve Clark
HealthyIO
Mark Leahey
Medical Device Manufacturers Association

12:15 P.M.  MEMORIAL HALL, MCNAMARA ALUMNI CENTER
KEYNOTE LUNCHEON PRESENTATION
Sponsored by Boston Scientific Corporation
Moderator: William Durfee, University of Minnesota
Keynote Address:
Innovation in Medtech: Capitalizing on Change? Opportunities & Challenges
Ian Meredith
Boston Scientific Corporation

(There are a separate billable event, meal tickets are required.)

2:00 P.M. - 3:30 P.M.
CONCURRENT TECHNICAL SESSIONS

SCIENTIFIC POSTER SESSION 1
Wearables, MEMs & Nano and Sensors
Pinnacle Ballroom, Graduate Minneapolis
Full list of titles & authors are on page 12
All posters available to view 8:00 a.m. - 5:30 p.m.

HUMAN FACTORS
Meridian Ballroom 1, Graduate Minneapolis
Session Organizer:
Kathleen Harder, University of Minnesota
Vera Shuman, 3M

Understanding User Needs and Product Design in US and Global Markets
Greg Johnson
Worrell

HUMAN FACTORS CONT.
Meridian Ballroom 1, Graduate Minneapolis
Analysis and Evaluation for Medical Device Usability
John Kruse
3M

Using Augmented Reality to Accelerate Product Development
M. Robert Garfield
Abbott

CARDIAC KEYNOTES
Meridian Ballrooms 2/3, Graduate Minneapolis
Session Organizer:
Paul Iazzoo, University of Minnesota

Total Artificial Heart
William Cohn
Texas Medical Center

Monitoring the Heart Rhythms of Free-Ranging Brown and American Black Bears - Lessons Learned and Potential Applications to Human Medicine
Tim Laske
Medtronic

REHABILITATION 1
Meridian Ballroom 4, Graduate Minneapolis
Session Organizer:
Andrew Hansen, Minneapolis VA Health Care System
Elizabeth Hisao-Weckslers, University of Illinois at Urbana-Champaign

Encouraging Innovation in Medical Rehabilitation Devices
Alison Cernich
National Center for Medical Rehabilitation Research (NICHD/NIH)

Research, Development, and Translation of Medical Devices in the Veterans Health Administration
Brian Schulz
RR&D/ORD/VHA

Ryan Davis
Midwest Department of Veterans Affairs

EMERGING MEDICAL INNOVATION VALUATION COMPETITION
A.I. Johnson Great Room, McNamara Alumni Center
Session Organizer:
Mike Finch, Children’s Minnesota Hospitals and Clinics
Randy Nelson, Evergreen Medical Technologies, Inc.

Brace Yourself! A sensor enabled bracing system designed for young girls with scoliosis.
Isabel Newsome
Georgia Institute of Technology

Laparoscopic Grasper
Milton Aguirre
Milton Medical Innovations B.V.

At-home System to Select Blood Pressure Drugs that Work for Individual Patients
Brian Lucas
Rights, Inc.

Safe Manual Ventilation with the Bag Valve Mask
Prathamesh Prabhudesai
MBID

Haris Shekhani
MBID

SD-Collar, Wearable Non-invasive Medical Device for the Treatment of the Voice Disorder Spasmodic Dysphonia
Arash Mahnan
University of Minnesota
Complete the DMD Attendee Survey by May 1, 2019!

Your input is greatly appreciated! As a thank you for your participation, we will randomly draw two names from the pool of those who have successfully submitted the survey. The winners will receive (1) Complimentary Registration to the 2020 DMD Conference. Check your e-mail for the link to the 2019 DMD survey.

The winners will be chosen and notified shortly after the survey closes.

Tuesday, April 16, 2019

ORDER OF PRESENTATIONS MAY VARY, REFER TO THE ONLINE PROGRAM FOR THE MOST UP TO DATE PRESENTATION DETAILS

EMERGING MEDICAL INNOVATION VALUATION COMPETITION cont.
Utilizing Vein Tap to Mitigate Difficult Venipunctures
Craig Tromborg
Creative Engineering Technologies

JUDGES:
Paul Gam, Zurich Medical
Karen Kaehler, University of Minnesota
Greg Peterson, University of Minnesota

CM&RS 2: RESPIRATORY & NASAL AIRWAY MODELING
Session Organizer:  Ski-U-Mah, McNamara Alumni Center
Marc Horner, ANSYS, Inc.

Penetration of Nasal Sprays Beyond the Nasal Valve: Physical principles to maximize nasal drug delivery.
Guilherme Garcia
Marquette University

Evaluation of Airway via Computational Fluid Dynamics Pre- and Post-Treatment with Maxillary Skeletal Expansion in Adult Orthodontic Patients
Andrew Fraser
UCLA Orthodontics

Role of Computational Fluid Dynamics and Physiologically-based Pharmacokinetic Modeling in Development of Orally Inhaled and Nasal Drug Products
Ross Walenga
U.S. Food & Drug Administration

Verification and Validation to Guide Bioequivalence Models of Generic Nasal Sprays
Marc Horner
ANSYS, Inc.

3:30 p.m. - 4:00 p.m.
SPONSOR EXHIBIT SHOWCASE
MERIDIAN FOYER, GRADUATE MINNEAPOLIS

4:00 p.m. - 5:30 p.m.
CONCURRENT TECHNICAL SESSIONS

SCIENTIFIC POSTER SESSION 2
Human Factors, Surgical Tools and Neuroengineering
Pinnacle Ballroom, Graduate Minneapolis

Full list of titles & authors are on page 13. All posters available to view 8:00 a.m. - 5:30 p.m.

LEFT VENTRICULAR ASSIST DEVICES (LVADs)
Session Organizer:  Meridian Ballroom 1, Graduate Minneapolis
Michael Eggen, Medtronic

Current Perspectives on LVADs
Ranjit John
University of Minnesota

LVAD Technology: Viewpoints from VAD Patients and VAD Coordinators
Sarah Schettle
Mayo Clinic

Ventricular Assist Devices – General Overview and In Vitro Evaluations
Narendra Simha
Medtronic

WEARABLE MEDICAL TECHNOLOGIES 1
Session Organizer:  Meridian Ballrooms 2/3, Graduate Minneapolis
Lucy Dunne, University of Minnesota

Smart Wearable Ankle Sprain Suit
Romulo Maggay
Analog Devices

Dynamic Anthropometry: The Key to Improved Performance in the Next Generation of Medical Wearables
Linsey Griffin
University of Minnesota

A Product Design Approach to Prosthetic Design
Susan Sokolowski
University of Oregon

Smart Wearables
Matt Mesnik
Cutting Edge Healthcare Consulting

REHABILITATION 2
Session Organizer: Meridian Ballroom 4, Graduate Minneapolis
Andrew Hansen, Minneapolis VA Health Care System

Elizabeth Hsiao-Wecksler, University of Illinois at Urbana-Champaign

Prosthetic Limbs that can Turn, Traverse Uneven Terrain, and Carry Loads… All without accumulating perspiration
Glenn Klute
U.S. Department of Veterans Affairs

REHABILITATION 2 cont.

Transitioning a Research Tool into a Consumer Product: The Wheelchair In-Seat Activity Tracker
Stephen Sprigle
Georgia Institute of Technology

A Trunk Control Device Prototype to Improve Functional Workspace and Offloading for Persons with SCI
Christine Olney
Minneapolis VA Health Care System
Gary Goldish
Minneapolis VA Health Care System

CLINICAL CASE 2: ENDOVASCULAR
Session Organizer:  A.T. Johnson Great Room, McNamara Alumni Center
Dr. Rosemary Kelly, University of Minnesota

Surgeon:  Dr. Amy Reed, University of Minnesota

SBIR/STTR FUNDING OPPORTUNITIES: STARTUPS & SMALL BUSINESS FUNDING FOR BIOMEDICAL & BEHAVIORAL RESEARCH
Session Organizer:  Ski-U-Mah, McNamara Alumni Center
Pat Dillon, MNSBIR

Panels:
Juliana Elstad
Impleso Medical
Cora Leibig
Chromatic 3D Materials
Kathy Tune
Fourth Element Capital
Alison Cernich
National Center for Medical Rehabilitation Research

5:30 p.m. - 7:30 p.m.
STUDENT DESIGN SHOWCASE
University Hall, McNamara Alumni Center
See Page 11 for Additional Information

7:30 p.m. ADJOURN

Complete the DMD Attendee Survey by May 1, 2019!

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Wednesday, April 17, 2019

ORDER OF PRESENTATIONS MAY VARY, REFERENCE THE ONLINE PROGRAM FOR THE MOST UP TO DATE PRESENTATION DETAILS

7:00 A.M.  GRADUATE MINNEAPOLIS

REGISTRATION & CONTINENTAL BREAKFAST

8:00 A.M.  MERIDIAN BALLROOMS 2/3, GRADUATE MINNEAPOLIS

THREE-IN-FIVE COMPETITION
Competition Co-Chairs:
Randy Schniebl, Boston Scientific Corporation
Paul Rothweiler, University of Minnesota

Hao Su
The City University of New York

Emma Schinstock
University of Minnesota

Jon Schrope
National Institutes of Child Health and Human Development

Direct Illumination of Micro Stent Implants for the Treatment of Glaucoma (DMD2019-3251)
Rohan Katoh
Georgia Institute of Technology

Towards Flexible Stereable Instruments for Office-based Laser Eye Surgery (DMD2019-3309)
Loris Ficher
Worcester Polytechnic Institute

Narendra Narasimhan
Vanderbilt University

Design of a Folding-Frame Ergonomic Wheelchair (DMD2019-3227)
Emily Hein
University of Minnesota

Tool for Transbronchial Biopsies of Peripheral Lung Nodules (DMD2019-3274)
Gills Fai
University of Minnesota Duluth

Novel Inverted Tubular Design for Improved Endoscope Positioning (DMD2019-3294)
Ankit Saxena
Penn State University

Nasal Spray Device for Administration of Two-Part Drug Formulations (DMD2019-3216)
Davin Rautiola
University of Minnesota

JUDGES:
Stephanie Board, Abbott
John Deedrick, Fourth Element Capital
Pamela Goldberg, Medical Device Innovation Consortium
Paul Hindrichs, ActiveOrtho
Pinar Karaca-Mandic, University of Minnesota
Del Lawson, 3M Medical Solutions Division
Michael O’Connor, Medtronic

10:00 A.M. - 10:30 A.M.
SPONSOR EXHIBIT SHOWCASE
MERIDIAN HOYER, GRADUATE MINNEAPOLIS

10:30 A.M. - 12:00 P.M.
CONCURRENT TECHNICAL SESSIONS

IEM BIOTECHNOLOGY SYMPOSIUM 1: CELLS AS DEVICES: ENGINEERING THE GENOME
Session Organizer:
David Largaespada, University of Minnesota

Cells as Devices: Engineering the Genome
Perry Hackett
University of Minnesota

Semi-synthesis of a Neuroprotective Natural Product of Unknown Origin
Michael Smanski
University of Minnesota

Using Genome Engineering to Create Biomedical Swine Models
Adrienne Watson
Recombinitics

Transposons and Targeted Nuclease for Cancer Gene and Pathway Discovery
David Largaespada
University of Minnesota

WEARABLE MEDICAL TECHNOLOGIES 2
Session Organizer:
Lars Oddsson, RxFunction, Inc.

Lucy Dunne, University of Minnesota

The Design and Development of a Smartphone Balance Trainer for Home-based Balance Rehabilitation
Kathleen Stenko
University of Michigan

The HabitAware Journey
Aneela Iddani
HabitAware

A New Paradigm for Physical Therapy
Tom Waddell
TheraTec LLC

The Walkasins Journey - The walk2Wellness Trial and Entering the Market
Lars Oddsson
RxFunction, Inc.

MEDICAL DEVICE INNOVATION
Session Organizer:
Joseph Hale, University of Minnesota

Panels:
Kirk Froggatt
University of Minnesota
Jack Germanson
Medtronic
Chris Kuehn
AdrenaCard
Kevin Nickels
University of Minnesota

CLINICAL CASE 3: ROBOTIC GYNECOLOGIC PROCEDURE
A.I. Johnson Great Room, McNamara Alumni Center
Session Organizer:
Dr. Rosemary Kelby, University of Minnesota

Surgeon:
Dr. Melissa Geller, University of Minnesota

ADVANCES IN CARDIOVASCULAR MEDICAL DEVICES
Ski-U-Mah, McNamara Alumni Center
Moderator:
Paul Iaizzo, University of Minnesota

A Deep Learning Approach for the Automatic Identification of the Left Atrium within CT Scans (DMD2019-3283)
Alex Deakyne
University of Minnesota

The Impact of Patient Specific Vascular Structure on Localized Cooling in the Human Heart (DMD2019-3223)
Nathan Spangenberg
Rowan University

Profiling Multiscale Frequency State of Normal Phonocardiogram: Feasibility Study (DMD2019-3301)
Shivaram Poigai Arunachalam
Mayo Clinic

The Use of 3D Printing in the Surgical Planning of Left Ventricular Assist Device Placement in Pediatric Patients with Non-Compaction C9 (DMD2019-3321)
Michael Bateman
University of Minnesota

12:15 P.M.  MEMORIAL HALL, McNAMARA ALUMNI CENTER

KEYNOTE LUNCHEON PRESENTATION
Sponsored by Medtronic
Moderator: Paul Iaizzo, University of Minnesota

Emerging Medical Innovation Valuation Competition Awards presented by Karen Kach, University of Minnesota
Keynote & Award Presentation: Introduced by Bill Murray, Deloitte

The Digital Frontier of Medical Device Innovation
Dawn Bardot, Medtronic

Recipient of the 2019 DMD Conference Award
(Keynote lunches are a separate billable event, meal tickets are required.)

2:00 P.M. - 3:30 P.M.
CONCURRENT TECHNICAL SESSIONS

IEM BIOTECHNOLOGY SYMPOSIUM 2: CANCER BIOENGINEERING
Session Organizer:
Paolo Provenzano, University of Minnesota

Mechanically Complex Tumor Microenvironments Drive Disease Progression & Resistance to Therapy: A case for re-engineering the tumor microenvironment
Paolo Provenzano
University of Minnesota

Biomaterial Approaches to Study and Treat Metastatic Cancer
Samira Azarin
University of Minnesota

Focal Tumor Ablation Augments Immunotherapy to Promote Tumor Growth Control & Formation of Tumor Antigen-specific Tissue Resident Memory CD8+ T Cells
Brandon Burbach
University of Minnesota

Microsystems for Cultivation & Analysis of Cancer Cells
Alexander Rezvani
Mayo Clinic

A Digital Simulator for Cancer Progression
David Oddo
University of Minnesota

6  CARDIOVASCULAR TRACK  CLINICAL CASES  CYBERSECURITY  TECHNOLOGY DEVELOPMENT  DEVICE DESIGN INNOVATION  IEM BIOTECHNOLOGY SYMPOSIUM  DEVICE DESIGN PROCESS
Wednesday, April 17, 2019

ORDER OF PRESENTATIONS MAY VARY, REFERENCE THE ONLINE PROGRAM FOR THE MOST UP TO DATE PRESENTATION DETAILS

CYBERSECURITY 1: MEDICAL DEVICE
CYBERSECURITY EXPECTATIONS
Meridian Ballrooms 2/3, Graduate Minneapolis

Session Organizer:
Bill Aerts, Archimedes Center for Medical Device Security

Industry Expectations for Security of Medical Devices
Ken Hoyne
Boston Scientific Corporation

Regulatory Expectations for Security of Medical Devices
Suzanne Schwartz
U.S. Food & Drug Administration

Medical Device Security by Design
Lucas Rice
Deloitte

ROBOTICS 2: COMPUTATIONAL SURGERY & SURGICAL ROBOTICS
Meridian Ballroom 4, Graduate Minneapolis

Session Organizer:
Tim Kowalewski, University of Minnesota

From Tool to Assistant: Developing Adaptive Surgical Robots for the Operating Room
Ann Majewicz Fey
The University of Texas at Dallas

Automated Surgical Coaching using Data Science
Anand Malpani
Johns Hopkins University

Robotic Surgery Readiness: Prospective Randomized Controlled Study of Surgical Robotics
Thomas Lendvay
University of Washington

Recent Advances in Task-based Efficiency Metrics during Robotic-assisted Surgery
Anthony Jac
Intuitive Surgical

SCIENTIFIC POSTER SESSION 3
Computer Modeling & Simulation and Special Devices
Pinnacle Ballroom, Graduate Minneapolis

Full list of titles & authors are on page 14
All posters available to view 8:00 a.m. - 5:30 p.m.

CARDIAC ELECTROPHYSIOLOGY PERSPECTIVES: DEVICE DEVELOPMENT, CLINICAL PRACTICE & COMPUTATIONAL SIMULATIONS
A.I. Johnson Great Room, McNamara Alumni Center

Session Organizer:
Tim Iles, University of Minnesota

Cardiac Electrophysiology Device Development: From Conceptualization to Clinical Practice, Successes and Failures
Boaz Avitall
University of Illinois Chicago

Catheter Ablation of Cardiac Arrhythmias
Henri Roukoz
University of Minnesota

The Role of Computational Cardiac Electrophysiology in Medical Device Development - Practical Applications
Darrell Swenson
Medtronic

NEUROENGINEERING 1
Ski-U-Mah, McNamara Alumni Center

Session Organizer:
Suhasa Kodandaramaiah, University of Minnesota

The Next Generation Artificial Intelligence Enabled Brain-Machine Interfaces and Neuroprosthetics
Zhi Yang
University of Minnesota

Engineering Brain Networks to Treat Mental Illness
Alik Widge
University of Minnesota

Printed Electronics for Flexible and Customizable Neural Interface Devices
Sarah Swisher
University of Minnesota

3:30 P.M. - 4:00 P.M.

SPONSOR EXHIBIT SHOWCASE
MERIDIAN FOYER, GRADUATE MINNEAPOLIS

4:00 P.M. - 5:30 P.M.

CONCURRENT TECHNICAL SESSIONS

IEM BIOTECHNOLOGY SYMPOSIUM 3: ALZHEIMER’S DISEASE & AGING
Meridian Ballroom 1, Graduate Minneapolis

Session Organizer:
Jonathan Sachs, University of Minnesota

Developing Therapeutics to Treat Aging
Laura Niedernhofer
University of Minnesota

Brain MRI Scanner for Real World Environments and Populations
Michael Garwood
University of Minnesota

Trauma-induced Tauopathy
Patrick Alford
University of Minnesota

A Novel Small Molecule Screening Platform for Targeting Toxic Oligomeric forms of Amyloid Proteins in Neurodegenerative Disease
Jonathan Sachs
University of Minnesota

CYBERSECURITY 2: MEDICAL DEVICE
CYBERSECURITY RESPONSES
Meridian Ballrooms 2/3, Graduate Minneapolis

Session Organizer:
Bill Aerts, Archimedes Center for Medical Device Security

Healthcare Provider Responses to Medical Device Security
Kevin McDonald
Mayo Clinic

Manufacturer responses to Medical Device Security
Chris Tyberg
Abbott

Panel Discussion: Device Security Expectations for Graduates from Healthcare Providers and Manufacturers
Kevin Fu
University of Michigan
Jennifer Reicherts
Fairview Health Services
Matt Russo
Medtronic

CURRENT ISSUES IN MEDICAL TECHNOLOGY IP
Meridian Ballroom 4, Graduate Minneapolis

Session Organizer:
Vaughn Schmid, University of Minnesota

USPTO: Recent Updates and Changes
Linda Dvorak
US Patent & Trademark Office

101: Eligible Subject Matter in view of new USPTO Guidelines
Amy Salmela
Patterson Thuente IP

Secret Sales and 102 in light of Helsinn
Ryan Kobs
Shumaker & Sieffert, P.A.

SCIENTIFIC POSTER SESSION 4
Orthopedics & Rehabilitation and Cardiovascular
Pinnacle Ballroom, Graduate Minneapolis

Full list of titles & authors are on page 15
All posters available to view 8:00 a.m. - 5:30 p.m.

CLINICAL CASE 4: MINIMALLY INVASIVE MITRAL VALVE REPAIRS
A.I. Althum Great Room, McNamara Alumni Center

Session Organizer:
Dr. Rosemary Kelly, University of Minnesota
Surgeon:
Dr. Rochus Voeller, University of Minnesota

NEUROENGINEERING 2
Ski-U-Mah, McNamara Alumni Center

Session Organizers:
TaNer Akkin, University of Minnesota
Alexandre Opitz, University of Minnesota

Functional Optical Imaging of Cerebral Hemodynamics during Cardiac Arrest and Resuscitation
Bernard Choi
University of California, Irvine

Ultrasound Stimulation of Peripheral Nerves and End- Organs for Treating Health Disorders
Hubert Lim
University of Minnesota

Advancing Deep Brain Stimulation Therapies to Treat Motor and Non-motor Symptoms in Parkinson’s Disease
Luke Johnson
University of Minnesota

5:30 P.M. - 7:00 P.M.

IEM & DMD CAREER EVENT
UNIVERSITY HALL, McNAMARA ALUMNI CENTER
SEE DMD WEBSITE FOR PARTICIPATING COMPANIES ONSITE REGISTRATION AVAILABLE FOR JOB SEEKERS

7:00 p.m. ADJOURN
## Thursday, April 18, 2019
### ORDER OF PRESENTATIONS MAY VARY, REFERENCE THE ONLINE PROGRAM FOR THE MOST UP TO DATE PRESENTATION DETAILS

<table>
<thead>
<tr>
<th>Time</th>
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<tr>
<td>7:00 A.M.</td>
<td>GRADUATE MINNEAPOLIS</td>
<td><strong>REGISTRATION &amp; CONTINENTAL BREAKFAST</strong></td>
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| 8:00 A.M. - 10:00 A.M. | **CONCURRENT SESSIONS**                      | **EMERGING TECHNOLOGY FORUM**
|             |                                               | **“CLINICAL APPLICATIONS OF MIXED REALITIES”**         |
|             | Meridian Ballrooms 2-4, Graduate Minneapolis | Welcome and Introduction: Dawn Bardot, Medtronic       |
|             |                                               | Keynote Presentation:                                  |
|             |                                               | Changing the Way Doctors & Patients Understand & Treat Disease: From medical imaging into virtual and 3D-printed models. Beth Ripley VA Puget Sound Health Care System |
|             |                                               | Presentations:                                         |
|             |                                               | Beyond the Hype: The Second Rise of Virtual Reality    |
|             |                                               | Evan Suma Rosenberg University of Minnesota            |
|             |                                               | Visual, Acoustic and Tactile approaches to Augmentation in Medical Device Operation and Training |
|             |                                               | Jack Stubbs University of Central Florida              |
|             |                                               | Augmented Reality Healthcare Solution Enabling Clinicians to Scale Expertise Beyond Conventional Boundaries |
|             |                                               | Matt Ginn Proximie                                     |
| 10:00 A.M. - 10:15 A.M. | SPONSOR EXHIBIT SHOWCASE |
|             | MERIDIAN FOYER, GRADUATE MINNEAPOLIS          | **EMERGING TECHNOLOGY FORUM**
|             |                                               | **“CLINICAL APPLICATIONS OF MIXED REALITIES”**         |
|             | Meridian Ballrooms 2-4, Graduate Minneapolis | Moderator: Dawn Bardot, Medtronic                      |
|             |                                               | Panelists:                                              |
|             |                                               | Amy Alexander Mayo Clinic                              |
|             |                                               | Mark Wehde Mayo Clinic                                 |
|             |                                               | Gayle Rose BD Technologies and Innovation               |
|             |                                               | Mike Ryan Medtronic                                    |
|             |                                               | Medtronic                                              |
|             |                                               | Jack Stubbs University of Central Florida              |

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| 10:15 A.M. - 11:45 A.M. | **CONCURRENT SESSIONS**                      | **ADVANCES IN MEDICAL DEVICES 1**
|             | Meridian Ballroom 1, Graduate Minneapolis    | Moderator:                                              |
|             |                                               | Matthew Johnson, University of Minnesota               |
|             |                                               | A Method and Mechanism for Harvesting Intact Autograft for Osteochondral Transplantation (DMD2019-3260) Pradipta Biswas University of Central Florida |
|             |                                               | Novel Bio-synthetic Graft for Tracheal Reconstruction in Pediatric Patients with Congenital Tracheal Stenosis: In Vitro Studies of Axial, and Bending Biomechanics (DMD2019-3226) Teja Karkhanis Texas A&M University |
|             |                                               | Wearable Non-Invasive Neuromodulation Device for the Symptomatic Treatment of the Voice Disorder Spasmodic Dysphonia (DMD2019-3219) Arash Mahnan University of Minnesota |
|             |                                               | Advancing Deep Brain Stimulation Lead Technology (DMD2019-3312) Julia Slopsema University of Minnesota |
|             |                                               | Measurement and Comparison of Multi-Electrode Placement for Bioelectrical Impedance Analysis (DMD2019-3265) JungHun Choi Georgia Southern University |
|             |                                               | Quantification of Spasticity in Upper-Arm Muscles Using the PVRM (Position, Velocity and Resistance Meter) (DMD2019-3279) Seung Yun Song University of Illinois Urbana-Champaign |

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| 12:15 P.M. | MEMORIAL HALL, MCNAMARA ALUMNI CENTER         | **LUNCHEON KEYNOTE & AWARDS**
|             |                                               | Sponsored by Abbott                                    |
|             |                                               | Moderator: Arthur Erdman, University of Minnesota      |
|             |                                               | Three-in-Five Competition Awards presented by Randy Schiestl, Boston Scientific Corporation |
|             |                                               | Transforming Healthcare with New Technologies          |
|             |                                               | Jennifer Esposito Magic Leap                          |
|             |                                               | (Keynote lunches are a separate billable event, meal tickets are required.) |

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| 2:00 P.M.  |                                               | **TOURS DEPART AT 2:00 P.M.**
|             |                                               | Following the Keynote Luncheon, guided tours will depart from the DMD table at the back of Memorial Hall. Tour descriptions are on pg 9. |

**7:00 A.M.**
**REGISTRATION & CONTINENTAL BREAKFAST**

**8:00 A.M. - 10:00 A.M.**
**CONCURRENT SESSIONS**

**EMERGING TECHNOLOGY FORUM**
**“CLINICAL APPLICATIONS OF MIXED REALITIES”**
Meridian Ballrooms 2-4, Graduate Minneapolis
Welcome and Introduction: Dawn Bardot, Medtronic
Keynote Presentation:
Changing the Way Doctors & Patients Understand & Treat Disease: From medical imaging into virtual and 3D-printed models.
Beth Ripley
VA Puget Sound Health Care System
Presentations:
Beyond the Hype: The Second Rise of Virtual Reality
Evan Suma Rosenberg
University of Minnesota
Visual, Acoustic and Tactile approaches to Augmentation in Medical Device Operation and Training
Jack Stubbs
University of Central Florida
Augmented Reality Healthcare Solution Enabling Clinicians to Scale Expertise Beyond Conventional Boundaries
Matt Ginn Proximie

**ADVANCES IN MEDICAL DEVICES 1**
Meridian Ballroom 1, Graduate Minneapolis
Moderator:
Matthew Johnson, University of Minnesota
A Method and Mechanism for Harvesting Intact Autograft for Osteochondral Transplantation (DMD2019-3260)
Pradipta Biswas University of Central Florida
Novel Bio-synthetic Graft for Tracheal Reconstruction in Pediatric Patients with Congenital Tracheal Stenosis: In Vitro Studies of Axial, and Bending Biomechanics (DMD2019-3226)
Teja Karkhanis Texas A&M University
Wearable Non-Invasive Neuromodulation Device for the Symptomatic Treatment of the Voice Disorder Spasmodic Dysphonia (DMD2019-3219)
Arash Mahnan University of Minnesota
Advancing Deep Brain Stimulation Lead Technology (DMD2019-3312)
Julia Slopsema University of Minnesota
Robert Cass Heraeus Medical Components
Measurement and Comparison of Multi-Electrode Placement for Bioelectrical Impedance Analysis (DMD2019-3265)
JungHun Choi Georgia Southern University
Quantification of Spasticity in Upper-Arm Muscles Using the PVRM (Position, Velocity and Resistance Meter) (DMD2019-3279)
Seung Yun Song University of Illinois Urbana-Champaign

**ADVANCES IN MEDICAL DEVICES 2**
Meridian Ballroom 1, Graduate Minneapolis
Moderator:
Carl Nelson, University of Nebraska-Lincoln
Cost Effective Laparoscopic Trainer Utilizing Magnetic-Based Position Tracking (DMD2019-3212)
Matthew Boutelle University of Central Florida
Modular Self-reconfigurable Robot for Autonomous Rehabilitation Assistance in Daily Living Tasks for Spinal Cord Injury Patients (DMD2019-3240)
Carl Nelson University of Nebraska-Lincoln
Wenlong Zhang Arizona State University
Optimal Design of a Parallel Robot for Dental Articulation (DMD2019-3209)
Carl Nelson University of Nebraska-Lincoln

**12:15 P.M.**
**MEMORIAL HALL, MCNAMARA ALUMNI CENTER**
**LUNCHEON KEYNOTE & AWARDS**
Sponsored by Abbott
Moderator: Arthur Erdman, University of Minnesota
Three-in-Five Competition Awards presented by Randy Schiestl, Boston Scientific Corporation
Transforming Healthcare with New Technologies
Jennifer Esposito Magic Leap
(Keynote lunches are a separate billable event, meal tickets are required.)

**2:00 P.M.**
**ADJOURN**
GUIDED TOURS

Tours are Thursday, April 18 at 2:00 p.m.* and will depart from Memorial Hall, McNamara Alumni Center. Please sign-up at the conference registration desk before 12:00 p.m. on Thursday, April 18.

Bioprinting Facility [www.bioprint.umn.edu]
The UMN’s Bioprinting Facility studies human cell viability, proliferation, migration, and differentiation, as well as tissue morphogenesis, in three-dimensionally printed tissue constructs. We synthesize synthetic and natural biomaterials for use as “inks” in bioprinting projects, including decellularized extracellular matrix solutions. We employ a variety of bioprinting techniques and hydrogel crosslinking methods.

*ONLY Tue., April 16 at 10 a.m. & 3:30 p.m., Depart from the DMD Registration Desk, Graduate Minneapolis

Characterization Facility (CharFac) [www.charfac.umn.edu]
The CharFac provides academic and industrial partners access to state-of-the-art characterization methods which measure material properties from the micron-to the sub-nanometer scale. Our staff has extensive experience with the materials characterization of medical devices using light, x-rays, scanning probe and electron beam methods. We do both open research and proprietary work, and can perform the experiments for you or train you on the use of our extensive instrumentation: scanning and transmission electron microscopes, x-ray scattering/diffraction, Raman and Infrared spectroscopy and microscopy, surface analytical along with an extensive range of atomic force microscopy and nano-indentation methods.

*Consultation and technical support.

Experimental Surgical Services (ESS) [www.ess.umn.edu]
We are experts in designing and conducting the appropriate research to determine the safety and efficiency of medical devices. We have more than 25 years of experience in pre-clinical assessment for the medical industry. In fact, we are the industry leader in researching and testing cardiac devices and surgical techniques. Over 500 open heart procedures and 1,500 procedures are completed annually. ESS is directed by Richard Bianco in the pre-clinical assessment of virtually every animal model. In-house surgeons work with device companies to develop and validate research methods, provide consultation as necessary and offer interpretative and technical support.

Earl E. Bakken Medical Devices Center (Bakken MDC) [www.mdc.umn.edu]
The Bakken MDC is dedicated to advancing medical device innovation through creating new knowledge and educating the next generation of medical device innovation leaders. It is a unique interdisciplinary program that resides within IEM. The Bakken MDC aims to strengthen interdisciplinary research among faculty in the health sciences and engineering in areas specifically related to medical device. We train the next generation of inventors (including the Innovation Fellows Program) and foster new relationships with medical device industry and government agencies to improve health care worldwide.

*Additional Tours on Tue., April 16 & Wed., April 17 at 10 a.m. & 3:30 p.m., Depart from the DMD Registration Desk, Graduate Minneapolis

Minnesota Nano Center (MNC) [www.mnc.umn.edu]
The MNC is a state-of-the-art facility for interdisciplinary research in nanoscience and applied nanotechnology. The center offers a comprehensive set of tools in two clean rooms for fabricating new micro- and nanoscale devices, such as integrated circuits, advanced sensors, and microfluidic systems. The MNC is also equipped to support nanotechnology research that spans many science and engineering fields, in areas as diverse as cell biology, high performance materials, and biomedical device engineering. This interdisciplinary work takes place in two new specialized labs to support interdisciplinary research in bio-nanotechnology and nano/micrometer-scale materials. Tour attendees will see the MNC’s new class 10 clean room and its fabrication tools, as well as our new applications labs devoted bio-nanotechnology and nanomaterials. PLEASE NOTE: Attendees will be required to wear clean-room coveralls and boots during this tour, please dress accordingly in slacks and closed toe shoes only.

*Additional Tours on Tue., April 16 & Wed., April 17 at 3:30 p.m., Depart from the DMD Registration Desk, Graduate Minneapolis

Visible Heart® Laboratories (VH Labs) [www.vhlab.umn.edu]
Dr. Paul Iaizzo has been at the UMN since 1990, performing research and teaching graduate and undergraduate courses. In 1997, Dr. Iaizzo and his co-workers created the VH Labs in collaboration with Medtronic. Today, the labs are a premiere place to perform translational systems physiology research that ranges from cellular and tissue studies to organ and whole body investigations. VH Labs also has a unique human heart library. VH Labs embodies a creative atmosphere which is energized by some of the best and brightest students at the University. Our staff has over 100 years of collective research experience and functions as a highly efficient and productive team.

*Additional Tours on Wed. April 17 at 10 a.m., Depart from the DMD Registration Desk, Graduate Minneapolis

Wearable Technology Lab (WTL) [www.wtl.design.umn.edu]
WTL is an interdisciplinary research laboratory directed by Dr. Lucy Dunne and Dr. Brad Holschuh. Founded in 2009, WTL’s research focuses on the intersection between apparel and new technology. New technology opens new frontiers in understanding the human body, mind, and capability through pervasive sensing, actuation, and interaction. Housed in the University of Minnesota's College of Design, WTL students hail from backgrounds in everything from aerospace engineering to fashion design, and are immersed in an integrated, multi- and inter-disciplinary research program.

*ONLY Tue., April 16 at 10 a.m., Transportation: Take the Campus Shuttle (free) departs from Coffman and drops off near McNeal Hall on the St. Paul campus. Shuttles runs every 5-10 minutes. Lab Location: 1985 Buford Avenue, 240 McNeal Hall, St. Paul, MN: 612.624.9700
FEATURED EXHIBITS

Tuesday & Wednesday from 8:00am-4:00pm (closed during lunches)
Thursday from 8:00am-12:00pm
Think 4, Graduate Minneapolis

A Heart to Learn
www.vhlab.umn.edu

This is an interactive display of perfusion fixed human hearts courtesy of the Visible Heart® Laboratories and the Department of Surgery. This is a unique library of human hearts received from organ donors and their families via LifeSource and the University of Minnesota’s Anatomy Bequest Program.

Perfusion fixation dilates these hearts as if they were filled with blood (diastole). Additionally, computer stations will be available to introduce The Atlas of Human Cardiac Anatomy and utilize during the display.

The Atlas of Human Cardiac Anatomy is an interactive educational site created and maintained by the Visible Heart® Laboratories at the University of Minnesota in collaboration with Medtronic. This site features images created from the Visible Heart® project, a novel educational tool which allows for viewing functional human cardiac anatomy from within.

Beyond the Hype:
The Rise of VR in Healthcare
illusioneering.cs.umn.edu

Visit this interactive display to explore why there has been a recent rush to adopt Virtual Reality (VR) by the medical community. Talk with some of the leading VR researchers about the expanding availability of VR tools, and how the University has used them to improve patient outcomes. This VR hands-on demonstration is a collaboration between the Earl E. Bakken Medical Devices Center and Department of Computer Science in the College of Science and Engineering at the University of Minnesota.
1. “Development of an Affordable Prototype Pneumatic Hand Prosthesis and Control System”
Kaelan Schorger, Mechanical Engineering Department, California State University Maritime

2. “Can YOU See the Difference?”
Shae Millinowisch, Dylan Cooke, Mary Farrelly, Andrew Spreitzer and Whitney Ryan, Department of Biomedical Engineering, University of Iowa

3. “Recumbent Pediatric Scales for In-Ambulance Use”
Rachana Kotapalli, Jonathan Lee and Kayla Rettig, Biomedical Engineering, The University of Alabama at Birmingham

4. “HVAD Battery and Driveline Changing Assistive Device”
Katherine Cabel, Wyatt Klass, Marisa Mortari, Lauren Rasor and Brett Vander Ploeg, Roy J. Carver Department of Biomedical Engineering, University of Iowa

5. “H.A.N.A. The Heart Attack Notification Agent”
Anna Fuquay, Madeline McLaughlin, Ahoura Mortazavi, Shazana Nadee and Carissa Nel, Weldon School of Biomedical Engineering, Purdue University

6. “Neonatal Umbilical Catheterization Training Device”
Airabella Castillo, Hannah Dobroski, Ashley Hoffman, Jesse Liszewski and Tia McCoy, Roy J. Carver Department of Biomedical Engineering, University of Iowa

7. “A Smart Cooling Vest for People with Thermoregulatory Disorder”
Satesh Mahadeo, Artur Zych, Dilar Sanakov, Tzu-Hao Huang, Shuangyue Yu and Hao Su, Department of Mechanical Engineering, The City College of New York

8. “PI Wedge: A New Angle on Pressure Injuries”
Rachel Cron, William Heritch and Austin Silver, Roy J. Carver Biomedical Engineering Department, The University of Iowa

9. “A Non-invasive Blood Pressure Monitor for Patients with LVAD Devices”
Rebecca Cohen, William Ding, Howard Li and Erick Lorenzana, Department of Biomedical Engineering, Duke University

10. “Dressing Down the Cost of Burn Treatment”
Sandra Castillo, Ana De La Torre, Jesse Haworth, Ellie Lehmann and Adam Weiland, Roy J. Carver Department of Biomedical Engineering, University of Iowa

Justin Yuen, Kevin Nogacz, Yen Cheng Chi, Fahmida Ferdoust, Shuangyue Yu, Tzu-Hao Huang and Hao Su, Mechanical Engineering Department, The City College of New York

Mia Poleksic, Logan Muckenhirn, Mike Ho, Henry Conlan and Michael Bielecki, Roy J. Carver Department of Biomedical Engineering, University of Iowa

Fay Petersen, Laura Laupus, Kelly Chandler and Yulianna Jimenez, Department of Biomedical Engineering, The University of Alabama at Birmingham

Greg Derk, Kennedy Poro, Lindsey Stickler, Grant Billimack and Marco Nino, Roy J. Carver Department of Biomedical Engineering, University of Iowa

15. “A Novel Assistive Intubation Strategy in Non-Controlled Settings”
Jason Cooper, Kyle Janson, Zhiwei Kang and Ashish Vankara, Department of Biomedical Engineering, Duke University

16. “An Endoscopic Tool for Pectin-Based Patches in Visceral Organ Wound Repair”
Steven Burcat, Yiling Fan, Valerie Peng and Sarah Southerland, Department of Mechanical Engineering, Massachusetts Institute of Technology

17. “A Device to Enable Remote Real-Time Viewing of Capsule Endoscopy Images”
Olivia Crudup, Brody DeSilva, Wade Ogburn and Alexander Thomas, Department of Biomedical Engineering, The University of Alabama at Birmingham

18. “Soft Ankle Exoskeleton for Gait to Help Assistance of Children with Cerebral Palsy in Home Settings”
Eljona Pushaj, Varinder Singh, Abdul Shohatee, Mohammed Baba, Hao Su and Tzu-Hao Huang, Department of Mechanical Engineering, City College of New York

Showcase Judges:
Dawn Bardot, Medtronic
Mike Bateman, University of Minnesota
Pat Dillon, MNSBIR
Venketesh Dubey, Bournemouth University
Michael Eggen, Medtronic
Jim Fairman, QFO Labs
Danny Gefman, Medtronic
Joseph Hale, University of Minnesota
Andrew Hansen, Minneapolis VA Health Care System
Kathleen Harder, University of Minnesota
Elizabeth Hsiao-Wecksler, University of Illinois at Urbana–Champaign
Carl Nelson, Univeristy of Nebraska-Lincoln
Nicole Parks, Medtronic
Steven Saliterman, University of Minnesota
Vaughn Schmid, University of Minnesota
Alena Talkachova, University of Minnesota
Gregory Voss, Minneapolis VA Health Care System
“An Inter-Device Accuracy Comparison of Consumer Sleep Trackers” DMD2019-3205
Erik Zavrel, Department of Biomedical Engineering, Cornell University; Ana Krieger, Center for Sleep Medicine, Weill Cornell Medicine

“Design of a Soft Ankle Joint Device for Correction of Inversion/Eversion Angle During Aquatic Therapy” DMD2019-3206
Joey Nyugen, The Polytechnic School, Ira A. Fulton School of Engineering, Arizona State University; Shubhu Majumder and Ajay Verma, Department of Electrical Engineering, University of North Dakota; Chunwu Wang, College of Information and Technology, Jilin Normal University; Abdiaziz Mohamed, Department of Electrical Engineering, University of North Dakota; Lewis Archer, Department of Aviation, University of North Dakota; Kouvyr Tavakolian, Department of Electrical Engineering, University of North Dakota; Nicholas Wilson, Department of Aviation, University of North Dakota

“MobileGyro: Android Application for Bluetooth Gyroscope Tracking with Potential for Impact in Rehabilitative Processes” DMD2019-3225
Noah Scott, Rui Li and Zion Tse, College of Engineering, University of Georgia

“Wearable Smart Glasses for Assessment of Eye-Contact Behavior in Children with Autism” DMD2019-3221
Ashwin Rajkumar and Chetan Arora, Mechanical and Aerospace Engineering, NYU Tandon School of Engineering; Barry Katz, Operant Systems, Inc.; Vikram Kapila, Mechanical and Aerospace Engineering, NYU Tandon School of Engineering

“Haptic Neurofeedback Device for Parkinson’s Patients” DMD2019-3207
Joseph Krigbaum and Alvaro Rascon, School of Biological and Health Systems Engineering, Ira A. Fulton School of Engineering, Arizona State University; Sushrut Gandhi, School for Engineering of Matter, Transport, and Energy, Ira A. Fulton School of Engineering, Arizona State University; Dhiraj Patil and Bryan Roquemore, The Polytechnic School, Ira A. Fulton School Engineering, Arizona State University; Trent Maruyama, Barrow Neurological Institute, St. Joseph's Hospital and Medical; Panagiotis Polygerinos, The Polytechnic School, Ira A. Fulton School Engineering, Arizona State University

“Investigation of Subjective User Experiences of Applied Passive Compression on Varying Upper Body Locations” DMD2019-3272
J. Walter Lee, Esther Foo, Simon Ozbek and Brad Holschuh, Wearable Technology Lab, College of Design, University of Minnesota

“Smart Shoes with Adaptive Sampling for Outpatient Daily Health Monitoring” DMD2019-3213
Julie Vuong, Zhi Qiao, and Wenlong Zhang, The Polytechnic School, Ira A. Fulton School Engineering, Arizona State University

“Giant Magnetoresistive Based Handheld System for Rapid Detection of Human Nt-Probnp” DMD2019-3264
Wei Wang, Department of Veterinary Population Medicine, University of Minnesota; Todd Klein, Zepto Life Technology, LLC; James Collins, Department of Veterinary Population Medicine, University of Minnesota

Jianfeng Yang, Tzu-Hao Huang, Shuangyue Yu, Xiaolong Yang and Hao Su, Lab of Biomechatronics and Intelligent Robotics, Department of Mechanical Engineering, The City University of New York; Shuo-Hsiu Chang and Gerard Francisco, Department of Physical Medicine and Rehabilitation, University of Texas Health Science Center at Houston

“Design of a Soft Ankle Joint Device for Correction of Inversion/Eversion Angle During Aquatic Therapy” DMD2019-3206
Joey Nyugen, The Polytechnic School, Ira A. Fulton School of Engineering, Arizona State University; Shubhu Majumder and Ajay Verma, Department of Electrical Engineering, University of North Dakota; Chunwu Wang, College of Information and Technology, Jilin Normal University; Abdiaziz Mohamed, Department of Electrical Engineering, University of North Dakota; Lewis Archer, Department of Aviation, University of North Dakota; Kouvyr Tavakolian, Department of Electrical Engineering, University of North Dakota; Nicholas Wilson, Department of Aviation, University of North Dakota

Tzu-Hao Huang, Jianfeng Yang, Eljona Pushaj, Viktor Silvanov, Shuangyue Yu, Xiaolong Yang and Hao Su, Lab of Biomechatronics and Intelligent Robotics, Department of Mechanical Engineering, The City University of New York; Shuo-Hsiu Chang and Gerard Francisco, Department of Physical Medicine and Rehabilitation, University of Texas Health Science Center at Houston

Shuangyue Yu, Hadia Perez, James Barkas, Mohamed Mohamed, Mohamed Eldaly, Tzu-Hao Huang, Xiaolong Yang, Hao Su, Lab of Biomechatronic and Intelligent Robotics, Grove School of Engineering, City College of New York; Maria del Mar Cortes, Icahn School of Medicine at Mount Sinai; Dylan Edwards, Moss Rehabilitation Research Institute

“Design Tradeoffs in the Development of a Wearable Soft Exoskeleton for Upper Limb Mobility Disorders” DMD2019-3285
Esther Foo, Heidi Woelfle and Brad Holschuh, Wearable Technology Lab, University of Minnesota

Simon Ozbek, Esther Foo, J. Walter Lee, Nicholas Schleif and Brad Holschuh, Wearable Technology Laboratory, Department of Design, Housing, and Apparel, University of Minnesota

Ellen Dupaler, Nika Gagliardi, Esther Foo, Simon Ozbek, Sophia Utset-Ward and Lucy Dunne, University of Minnesota

“Proof of Concept: Pressure Sensor for Tracking of Infant-Mother Kangaroo Care Durations” DMD2019-3311
Michael Weber and Abigail Clarke-Sather, University of Minnesota Duluth
“Human Factors Refinement of a Multimodal Laparoscopic Hand Tool” DMD2019-3204
M. Robert Garfield, Abbott; Mary Beth Privitera, Department of Biomedical Engineering, University of Cincinnati

“A Deployable Multi-tine Endoscopic Radiofrequency Ablation Electrode: Simulation and Validation in a Thermochromic Tissue Phantom” DMD2019-3214
Bradley Hanks, Fariha Azhar and Mary Frecker, Pennsylvania State University; Ryan Clement, Jenna Greaser and Kevin Snook, Actuated Medical, Inc.

“Bonding Dissimilar Substrates Using Novel Adhesive and Surface Treatment Methods” DMD2019-3224
Elizabeth Bales, Phyl Gaither, and Matthew Kihara, Elkem Silicomes

Jonathan Schrope, Bjorn Olmanson, Caleb Fick, Cameron Motamemi and Tayin Virayosin, Department of Biomedical Engineering, University of Minnesota; Zachary Miller, University of Minnesota Medical School, University of Minnesota; James Harmon, Department of Surgery, University of Minnesota Medical School, University of Minnesota; Paul Emerson, Boston Scientific

Narendra Narasimhan, Duke University; Katherine Riojas, Trevor Bruns, Jason Mitchell and Robert Webster, Vanderbilt University Mechanical Engineering; Robert Labadie, Vanderbilt Medical Center

“Direct Illumination of Micro Stent Implants for the Treatment of Glaucoma” DMD2019-3251
Jun Ueda, Terese Martinez, Rohan Katoch and Kentaro Takemura, Georgia Institute of Technology; Reay Brown, Atlanta Ophthalmology Assoc.

“Insertion Force of Polydopamine-Coated Needle on Phantom Tissues” DMD2019-3274
Gills Fai, Sarah Ostlie and Michael Grelinger, Mechanical and Industrial Engineering Department, University of Minnesota Duluth; Roy Cho and H. Erhan Dincer, Department of Medicine, University of Minnesota

“Design and Development of an Adaptive Bone Fracture Fixation System” DMD2019-3276
Christopher Herbert and Sudesh Sivarasu, Division of Biomedical Engineering, University of Cape Town

“Presurgical Planning for L Dorsi Position Optimization: Combined Simulation and Cadaver Study” DMD2019-3278
Seth Thompson, Division of Biomedical Engineering, The University of Cape Town; Stephen Roche and Dan Henderson, Groote Schuur Hospital Orthopaedics; Sudesh Sivarasu, Division of Biomedical Engineering, The University of Cape Town

“MRI-Guided, Transperineal Prostate Biopsy Using Fixed Coordinate Needle Guide: Initial Feasibility Study” DMD2019-3281
Pankaj Kulkarni, Sumit Laha, Sakura Sikander and Pradipita Biswas, University of Central Florida; Heather Cornnell, Florida Hospital; Ulas Bagci, University of Central Florida; Jeremy Burt, Florida Hospital; Sang-Eun Song, University of Central Florida

“Modular Redundancy for CSF Shunts” DMD2019-3291
Tom Viker and Jim Stice, Cerovations, LLC

“Microwave Ablation: A Potentially Minimally Invasive Solution for Gastric Motility Disorders” DMD2019-3293
Jacob Hardenburger and Punit Prakash, Kansas State University; Timothy Angeli and Leo Cheng, Auckland Bioengineering Institute, University of Auckland

“Novel Inverted Tubular Design for Improved Endoscope Positioning” DMD2019-3294
Ankit Saxena and Isaak Lagnese, Department of Mechanical and Nuclear Engineering, Pennsylvania State University; Eric Pauli and Randy Haluck, Department of Surgery, Penn State Hershey Medical Center; Barry Fell, Thermoplastic Products Corp; Jason Moore, Department of Mechanical and Nuclear Engineering, Pennsylvania State University

“Ultrasound Needle Tracking inside a Soft Phantom and Methods to Improve the Needle Tip Visualization” DMD2019-3299
Zahra Varnmokhasti and Bardia Konh, Department of Mechanical Engineering, University of Hawaii at Manoa; Omid Maghsoudi, Department of Bioengineering, Temple University; Yan Yu and Lydia Liao, Sidney Kimmel Medical College, Thomas Jefferson University

“Endoscopic End-Effector for Foreign Body Retrieval Using Shape Memory Alloy” DMD2019-3303
Evan Harris, Justin Buksa, Allan Schuster, Tim Kowaleski and Julianna Abel, Department of Mechanical Engineering, University of Minnesota

“A Curved Port Delivery System for Laser Interstitial Thermal Therapy of Brain” DMD2019-3305
Nnaoma Agwu, Kyle Deprow, John Williams and Jenna Gorlewicz, St. Louis University; Eric Leuthardt, Washington University in St. Louis

“3D Steerable Active Surgical Needle” DMD2019-3307
Saeed Karimi and Bardia Konh, University of Hawaii at Manoa

“Practical, Non-Invasive Measurement of Urinary Catheter Insertion Forces and Motions” DMD2019-3308
Amer Safdari, Medical Robotics and Devices Lab, Department of Biomedical Engineering, University of Minnesota; Xiaoyin Ling, Medical Robotics and Devices Lab, Department of Mechanical Engineering, University of Minnesota; Michael Tradewell, Medical Robotics and Devices Lab, Department of Medicine, University of Minnesota; Timothy Kowaleski, Department of Mechanical Engineering, University of Minnesota; Robert Sweet, Department of Urology, University of Washington

“Towards Flexible Steerable Instruments for Office-based Laryngeal Surgery” DMD2019-3309
Kevin O’Brien, Department of Computer Science, Worcester Polytechnic Institute; Zachary Boyer, Benjamin Mart and Cory Brolliar, Robotics Engineering Program, Worcester Polytechnic Institute; Thomas Carroll, Harvard Medical School, Brigham and Women’s Voice Program, Brigham and Women’s Hospital; Loris Fichera, Robotics Engineering Program and Department of Computer Science, Worcester Polytechnic Institute

“3D Anthropometric Assessment of Functional Hand Grasps for Surgeons and Medical Professionals” DMD2019-3310
Emily Seifert, Christopher Curry and Linsey Griffin, University of Minnesota
“Model-Based System, Safety and Security Co-Engineering Method and Toolchain for Medical Devices Design” DMD2019-3210
Marc Sango and Jean Godot, ALL4TEC; Antonio Gonzales and Ricardo Nolasco, RGB Medical Devices

“Augmented Reality Aided Medical Device Design” DMD2019-3215
M. Robert Garfield, Abbott; Alex Dupont, Radius Innovation and Development

“Nasal Spray Device for Administration of Two-Part Drug Formulations” DMD2019-3216
Davin Rautila, Department of Pharmaceutics, University of Minnesota; Ronald Siegel, Department of Pharmaceutics, Department of Biomedical Engineering, University of Minnesota

“A Comparison of Two Segmental Bioelectrical Impedance Analysis Methods with Whole-Body Analysis” DMD2019-3217
Thomas Cannon and JungHun Choi, Department of Mechanical Engineering, Georgia Southern University

“Risk-Based Analysis of Femoral Stem Considering Uncertainty in its Design Parameters” DMD2019-3319
Godlove Wanki, Stephen Ekwaro- Osire and João Paulo Dias, Department of Mechanical Engineering, Texas Tech University; Americo Cunha, Institute of Mathematics and Statistics, Rio de Janeiro State University

“Simulating Coil Embolization Treatments of Intracranial Aneurysms using Computational Fluid Dynamics” DMD2019-3222
Nikhil Tulshibagwale, Department of Mechanical Engineering, University of Minnesota; Stephen Gent, Department of Mechanical Engineering, South Dakota State University

“Low Profile Airway Stent” DMD2019-3233
Cara Piazza, Chi Vang, Elizabeth Lindgren and Miles Wing, Earl E. Bakken Medical Devices Center, University of Minnesota

Aaron Tucker, Earl E. Bakken Medical Devices Center, University of Minnesota

“Formulation and Characterization of Thermoplastic Polyurethane-Based Steroid Eluting Devices” DMD2019-3254
Jessica Doan, Peter Phommahaxay, Sarah Olson and Matthew Petersen, ProMed Pharma LLC

“Impedance Controlled Hot Snare Polypectomy” DMD2019-3270
CurtisLee Thornton and JungHun Choi, Georgia Southern University

“Porcine Block Testing in Verification of a Reloadable Adrenaline Auto-Injector for Intramuscular Injections” DMD2019-3273
Gokul Nair and Giancarlo Beukes, Medical Devices Lab, Division of Bio-Medical Engineering, Department of Human Biology, University of Cape Town; Michael Levin, Division of Asthma and Allergy, University of Cape Town; Sudesh Sivarasu, Medical Devices Lab, Division of Bio-Medical Engineering, Department of Human Biology, University of Cape Town

“A Surface Curvature Technique for Analysing Scapular Dyskinesis” DMD2019-3275
Jaco Verster, Sudesh Sivarasu and Tinashe Mutsvangwa, Department of Biomedical Engineering, University of Cape Town; Janine Gray, Sport Science Institute of South Africa

“Design of a Novel Dosage Counter for a Low-Cost Sleeve Attachment for Enhanced Usability of Any Standard Pressurised Metered Dosage Inhaler” DMD2019-3277
Giancarlo Beukes and Gokul Nair, Medical Devices Lab, Division of Bio-Medical Engineering, Department of Human Biology, Faculty of Health Sciences, University of Cape Town; Mike Levin, Department of Paediatrics and Child Health, Red Cross Children’s Hospital; Sudesh Sivarasu, Medical Devices Lab, Division of Bio-Medical Engineering, Department of Human Biology, Faculty of Health Sciences, University of Cape Town

“Virtual Model for Legg-Clavé-Perthes: Preliminary Work to Develop a Minimally Invasive Preclinical Model” DMD2019-3288
Bethany Juhnke, Earl E. Bakken Medical Devices Center, University of Minnesota; Susan Novotny and Jennifer Laine, Orthopaedic Research, Gillette Children’s Specialty Healthcare; Ferenc Toth, Department Veterinary Population Medicine, University of Minnesota; Arthur Erdman, Earl E. Bakken Medical Devices Center, University of Minnesota

“Multimaterial 3D Printing for the Fabrication of Functional Stethoscopes” DMD2019-3297
Rachel Popkin, Fluvio Lobo and Jack Stubbs, Institute for Simulation and Training, University of Central Florida

“Towards Automated Manufacturing of Fiber-Reinforced Elastomeric Enclosures for Patient Specific Catheter Robots” DMD2019-3300
Ben Hamlen, Gillian McDonald, Mark Gilbertson, Daniel Ng and Timothy Kowalewski, University of Minnesota

“Self Contained Bioprinter for Cardiovascular and Cancer Research” DMD2019-3302
Prabhuhi Kharel, Likitha Somasekhar, Kevin Fernando and Kunal Mitra, Biomedical Engineering, Florida Institute of Technology

“A Product Design Approach to Prosthetic Design: A Case Study” DMD2019-3304
Susan Sokolowski and Zach Meyer, Product Design, University of Oregon

“Tuneable Resonance Actuators for Magnetic Resonance Elastography” DMD2019-3313
Waiman Meinhold, Georgia Institute of Technology; Efe Ozkaya, Stevens Institute of Technology; Jun Ueda, Georgia Institute of Technology; Mehmet Kurt, Stevens Institute of Technology
“Transitioning a Research Tool into a Consumer Product: The Wheelchair In-Seat Activity Tracker” DMD2019-3211
Stephen Sprigle, Sharon Sonenblum and JJ O’Brien, Rehabilitation Engineering and Applied Research Lab, Georgia Institute of Technology

“A Validation Study of an Innovative Medical Program to Reconstruct and Compute the Thoracic Volume” DMD2019-3218
Po-Chih Lee and Arthur Erdman, Department of Mechanical Engineering, University of Minnesota; Charles Ledonio, Globus Medical, Inc.; David Polly, Department of Orthopaedic Surgery, University of Minnesota

“Design of a Folding-Frame Ergonomic Wheelchair” DMD2019-3227
Emily Hein, Andrew Hansen, Greg Voss and Gary Goldish, Minneapolis VA Health Care System, University of Minnesota

“Design of the PlaySkin Air: a User-Controlled, Soft Pneumatic Exoskeleton” DMD2019-3231
Bai Li, Ben Greenspan, Thomas Mascitelli, Michael Raccuglia, Kayleigh Denner, Raymond Duda and Michele Lobo, University of Delaware

“Design of a Game-Based Rehabilitation System Using Kinect Sensor” DMD2019-3237
Venketesh Dubey and Soumya Manna, Faculty of Science & Technology, Bournemouth University

“Development of an Ankle-Foot Prosthesis for Physical Therapy” DMD2019-3238
Eric Nickel, Gregory Voss, Andrew Hansen and Sara Koehler-McNicholas, Minneapolis VA Health Care System, University of Minnesota

“Grasp Rehabilitator: A Mechatronic Approach” DMD2019-3242
Ashwin Kumar, Mechanical and Aerospace Engineering, NYU Tandon School of Engineering; Seda Bilaloglu and Preeti Raghavan, NYU Langone School of Medicine, Rusk Rehabilitation; Vikram Kapila, Mechanical and Aerospace Engineering, NYU Tandon School of Engineering

“A New Device for Protecting Air Embolism from Angiography; In-vitro Experimental Air Embolism Study” DMD2019-3247
Haluk Un, Silopi State Hospital; Huseyin Tore, University of Minnesota

Emma Schinstock, Xiaoyin Ling, Renato Conedera, Aaron Tucker and Justinus Hartoyo, Department of Mechanical Engineering, University of Minnesota; David Ramirez, Department of Biomedical Engineering, University of Minnesota

“Distributions of Arterial Calcification Along Transcatheter Delivery System Pathway” DMD2019-3259
Mikayle Holm, Department of Biomedical Engineering, University of Minnesota; Paul Iaizzo, Department of Biomedical Engineering and Department of Surgery, University of Minnesota

“Simulating Blood Flow in Healthy Swine Coronary Arteries after Bifurcation Stent Procedures” DMD2019-3292
Thomas Valenzuela, Michael Bateman, Tinen Iles and Paul Iaizzo, Departments of Biomedical Engineering and Surgery, Visible Heart® Laboratories, University of Minnesota

“The Development and Testing of a Fixation Apparatus for Inducing the Coaptation of the Cardiac Atrioventricular Valves” DMD2019-3298
Jorge Sanchez, Department of Biomedical Engineering, Department of Surgery, Visible Heart® Laboratories, University of Minnesota; Emma Schinstock, Department of Surgery, Department of Mechanical Engineering, Visible Heart® Laboratories, University of Minnesota; Michael Bateman, Department of Surgery, Visible Heart® Laboratories, University of Minnesota; Paul Iaizzo, Department of Biomedical Engineering, Department of Surgery, Visible Heart® Laboratories, University of Minnesota

“Towards a Generalized Model of Multivariable Ankle Impedance During Standing Based on the Lower Extremity Muscle EMG” DMD2019-3315
Lauren Knop and Guilherme Ribeiro, Michigan Technological University, Department of Mechanical Engineering – Engineering Mechanics; Mo Rastgaar, Purdue University, Polytechnic Institute

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