Design of Medical Devices Conference

April 17 - 19, 2007
Radisson University Hotel • Minneapolis, Minnesota

In cooperation with:

www.me.umn.edu/dmd
Welcome! We are excited to present the 2007 University Of Minnesota Design of Medical Devices Conference. This 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 support the graduate fellowship program.

Over the years, 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 in promoting the future of this evolving industry. Conference attendance has more than doubled in size since its inception, and we expect it to grow even larger.

The success of this conference is due in large part to the continued support from our University of Minnesota partners and industry sponsors. On behalf of the entire DMD planning committee, we thank you. We hope you enjoy this year’s conference!

Sincerely,
Arthur Erdman, Ph.D.
Conference Chair
Richard C. Jordan Professor and Morse Alumni Distinguished Teaching Professor
Department of Mechanical Engineering
University Of Minnesota

A Special Thanks to:

DMD Corporate Sponsors:
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Medical Industry Leadership Institute at CSOM
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Minnetonix
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Pace Analytical
Patterson Thuente Skaar Christensen
Pulse Innovation
Schwegman Lundberg Woessner Kluth
Solid Design & Prototype
Starkey
St. Jude Medical
STI Surgical Technologies

2007 DMD Planning Committee:
Jennifer André, Conference Coordinator
Ameya Bapat, Department of Mechanical Engineering
Victor Barocas, Ph.D., Department of Biomedical Engineering
Will Durfee, Ph.D., Program Chair
Art Erdman, Ph.D., Conference Chair
Tonya Femal, Biomedical Engineering Institute
Paul Iaizzo, Ph.D., President’s Conference Chair
Nancy Johnson, Department of Mechanical Engineering
Michael Peterson, Department of Mechanical Engineering
Jessica Schynoll, Biomedical Engineering Institute
Gary Williams, Department of Surgery

The University of Minnesota:
Biomedical Engineering Institute
Institute of Technology
Office of the President
Academic Health Center
Department of Mechanical Engineering

The University of Minnesota Design of Medical Devices International Advisory Board:
Just L. Herder, Ph.D. Delft University of Technology
The Netherlands

Ming-Yih Lee, Ph.D.
Chang Gung University, MMERC Ministry of Education
Taiwan R.O.C.
1. Always put the patient first.

2. Help clinicians improve and extend lives.

3. Remember that quality is everyone's job.

4. Believe in what you are doing.

5. Do it right.

Find out what else we believe at bostonscientific.com.

Every 5 Seconds we help improve another life
### 2007 Design of Medical Devices
**Tuesday April 17**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>7:00 a.m.</td>
<td>Registration and Continental Breakfast, Pre-Function Area</td>
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</table>
| 8:15 a.m. | **Conference Welcome and Plenary Session**  
Ballrooms A-D  
Sponsored by Boston Scientific  
Moderators: Arthur Erdman, Department of Mechanical Engineering, and William Durfee, Department of Mechanical Engineering, University of Minnesota  
"Medical Robotics and Computer-Integrated Interventional Medicine: Coupling Information to Action in 21st Century Operating Rooms"  
Keynote: Russell Taylor, Johns Hopkins University |
| 9:15 a.m. | Sponsor Exhibits, Pre-Function Area                                                            |
| 10:00 a.m. | **Concurrent Technical Sessions**  
**Ophthalmic Engineering**  
Session 1A, Ballroom A  
Session Chair: Victor Barocas, Department of Biomedical Engineering, University of Minnesota  
"Collagen Processing for Tissue-Engineered Corneas"  
Rachael Crable, University of Minnesota  
"Non-invasive imaging of the eye with micron scale resolution"  
Tamer Akkin, Department of Biomedical Engineering, University of Minnesota  
"What Are the Important Barriers to Transscleral Drug Delivery?"  
Victor Barocas, Department of Biomedical Engineering, University of Minnesota |
| 10:00 a.m. | **Medical Electronics**  
Session 1B, Ballroom B  
Session Chair: Richard A. Nazarian, President and CEO, Minnetronix  
"Short-Range Wireless Communications for Medical Devices"  
Ramesh Harjani, Department of Electrical and Computer Engineering, University of Minnesota  
"Reliable Power for Life Sustaining Devices"  
Robin Tichy, Micro Power Electronics  
"Tactics for Successful Electronic Medical Device Product Development"  
Lynn Ihlenfeldt, Minnetronix  
"Adaptive Power and Dynamic Range Analog and Mixed Signal Electronics for Extended Battery Life"  
Bertan Bakaloglu, Arizona State University |
| 10:30 a.m. | **Orthopaedic Devices**  
Session 1D, Ballroom D  
Session Chairs: Joan E. Bechtold, Orthopaedic Biomechanics Research Laboratory, Hamenpin County Medical Center, and Peter Blanco, Bioscience Development  
"Mussel Shell Protein Adhesives for Use in Orthopaedics"  
Thomas Mozer, Nerites Corporation  
"Antimicrobial Bone Graft Substitute"  
Michael Danilich, Luna Innovations  
"An Innovative New Business Model for Creating Early Stage Orthopedic Companies from New Technologies"  
Paddy Muller, DiscoveryOrtho Partners  
"Venture Capital Viewpoint"  
Dave Stassen, Split Rock Investments |
| 10:30 a.m. | **Dental Devices**  
Session 1N, Nolte Room  
Session Chair: Judith Buchanan, School of Dentistry, University of Minnesota  
"Dental Education Software"  
Eric Herbranson, Brown & Herbranson Imaging  
"Digital Technology Developments for Fabricating Indirect Dental Restorations"  
Daniel Krueger, 3M  
"The Virtual Dental Patient"  
Ralph DeLong, School of Dentistry, University of Minnesota  
"Guidance vs. Navigation in Dental Implant Planning and Placement"  
Douglas Erickson, Prosthodontist, Duluth MN |
| 12:00 p.m. | Break for Lunch                                                                               |
| 12:15 p.m. | Lunch  
HHH Room  
Sponsored by The University of Minnesota  
Moderator: Arthur Erdman, Department of Mechanical Engineering, University of Minnesota  
"Trends in Medical Device Litigation"  
Keynote: The Honorable Donovan W. Frank  
U.S. District Judge, District of Minnesota |

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**Keywords:** Medical Devices, Orthopaedics, Dental, Electronics, Imaging, Robotics, Biomechanics.
2007 DESIGN OF MEDICAL DEVICES
TUESDAY APRIL 17

LIVE SURGERY
Session 2C, Ballrooms C & D

"Cardiac Surgery"
Kenneth K. Liao, MD
Department of Surgery, University of Minnesota

Dr. Ken Liao, a University of Minnesota surgeon, will be performing a cardiac procedure at the University of Minnesota Medical Center - Fairview. The surgery will be transmitted to the conference room via live video feed. Dr. Liao will discuss the limitations and design opportunities for tools used in cardiac surgery. A second surgeon will moderate a Q&A session. There will be a collection of surgical tools for the audience to manipulate. The session will open with a brief tutorial by the moderator on the surgical procedure.

MEDICAL DEVICE DESIGN WORKSHOP
Session 2N, Nolte Room
Session Chair: Craig Sampson, IDEO Chicago

2:00 p.m.

Craig Sampson, Head of Global Health Practice for IDEO, will lead a workshop on customer-oriented design of medical devices.

Scientific Poster Show, Exhibits and Cash Bar Reception
Session 3P, Ballrooms A & B, Pre-Function Area
Sponsored by St. Jude Medical

3:30 p.m.

The University of Minnesota Biomedical Engineering Institute presents this scientific poster session. More than 60 professional and student posters will be presented showcasing biomedical engineering related research. Technical posters on a wide range of medical devices. Student poster competition. Reception.

5:00 p.m.
Adjourn

WEDNESDAY APRIL 18

7:00 a.m.
Registration and Continental Breakfast, Pre-Function Area

Concurrent Technical Sessions

CARDIOVASCULAR I: STRUCTURAL HEART DISEASE
Session 4A, Ballroom A
Session Chair: Tim Leske, Medtronic

"Aortic Stent Grafting"
Grayson Wheatley, Arizona Heart Institute

"Developing a Percutaneous Heart Valve"
Dan Gladney, Heart Lotus Technologies

"Transcatheter Pulmonic Valves"
Tim Leske, Medtronic

"The Use of the Visible Heart in the Design of Devices for Treating Structural Heart Disease"
Paul Izzo, Department of Surgery, University of Minnesota

8:15 a.m.

MEMS/NANO I: NANOTOXICOLGY
Session 4B, Ballroom B
Session Chair: Christy L. Haynes, Department of Chemistry, University of Minnesota

"Nanoparticle Enhancement of Thermal Therapy Without Toxicity"
John Bischof, Department of Mechanical Engineering, University of Minnesota

"Assessing Nanoparticle Cytotoxicity with Amperometry"
Christy L. Haynes, Department of Chemistry, University of Minnesota

"Developing Practices for Safe Handling of Nanoparticles in a Development Stage Enterprise"
Robert Heier, Nanopore

NEURAL I: SYMPOSIUM ON FRONTIERS OF NEURAL ENGINEERING
Session 4C, Ballroom C
Session Chair: Bin He, Department of Biomedical Engineering, University of Minnesota

"Nerve Interface for Prosthetic Design"
Dominique M. Durand, Case Western Reserve University

"Neuroengineering: From Brain Computer Interface to Brain Control of Prostheses"
Nilesh Thakor, Johns Hopkins University

"Functional Electrophysiological Neuroimaging"
Bin He, Department of Biomedical Engineering, University of Minnesota

PRODUCT DESIGN/BUSINESS DEVELOPMENT I: HUMAN FACTORS IN DEVICE DESIGN
Session 4D, Ballroom D
Session Chair: Nic Ward, University of Minnesota and Richard Stein, Boston Scientific

"Supporting Your User: Changing the Design Viewpoint for Medical Devices"
Robert North, Human Centered Strategies

"Ethnographic Research for Medical Product Development"
Stephen Wilcox, Design Science, Philadelphia PA

"Bench-top to Bedside User Interactions with Medical Devices"
Mary Beth Privilera, University of Cincinnati

MEDICAL POLYMERS I: SELECTION OF MEDICAL POLYMERS
Session 4N, Nolte Room
Society of Plastics Engineers Special Session
Session Chair: Ajay Gupta, Boston Scientific

"Selection of Materials for Medical Applications"
Karl Hoppe, RTP

"Biocon Polymers for the Medical Industry"
Jim Howard, Biocon

"The Healthcare Industry: Trends and their Impact on Applications and Materials"
Homero Endara, GE Plastics

8:15 a.m.

Concurrent Technical Sessions

9:45 a.m.
Sponsor Exhibits, Pre-Function Area
# 2007 Design of Medical Devices

**Wednesday April 18**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Location</th>
<th>Chair/Presenter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30 a.m.</td>
<td><strong>Cardiovascular II: Heart Failure</strong></td>
<td>Ballroom A</td>
<td>Kenneth Liao, Department of Surgery, University of Minnesota</td>
<td>“Medical Management of Congestive Heart Failure”</td>
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<td>Monika Colvin-Adams, Department of Medicine, University of Minnesota</td>
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<td><strong>Ventricular Assist: Non Surgical Approach</strong></td>
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<td>Ganesh Ravendran, Department of Medicine, University of Minnesota</td>
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<td></td>
<td><strong>Ventricular Assist Device Support of Congestive Heart Failure</strong></td>
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<td>Kenneth Liao, Department of Surgery, University of Minnesota</td>
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<td></td>
<td><strong>CardioWest TAH: The Cadillac of Mechanical Support Devices</strong></td>
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<td>Jack Copeland, University of Arizona</td>
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<td>10:30 a.m.</td>
<td><strong>MEMS/Nano II: Drug Delivery and Microfluidics</strong></td>
<td>Ballroom B</td>
<td>Ron Siegel, Department of Pharmaceutics, University of Minnesota</td>
<td>“Precision-Release Drug Delivery Systems”</td>
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<td>Daniel Pack, University of Illinois</td>
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<td><strong>Modifying Drug Release Profiles of Novel Polymer Coatings Using ElectroNanospray</strong></td>
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<td>Robert Hoer, Nanocoipa</td>
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<td><strong>Intraocular Aerosol Delivery During Vitrectomy</strong></td>
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<td>Timothy Wiedmann, College of Pharmacy, University of Minnesota</td>
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<td>10:30 a.m.</td>
<td><strong>Neural II: Neural Interfacing</strong></td>
<td>Ballroom C</td>
<td>Apostolos Georgopoulos, Department of Neuroscience, and Bin He, Biomedical Engineering, University of Minnesota</td>
<td>“Noninvasive Neural Engineering”</td>
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<td>A. David Redish, Department of Neuroscience, University of Minnesota</td>
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<td><strong>Brain Machine Interfaces: Tapping into Different Levels of Cortical Activity</strong></td>
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<td>Daniel Moran, Washington University</td>
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<td><strong>Interpreting the Neural Code: Open Questions and Needed Technologies</strong></td>
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<td>A. David Redish, Department of Neuroscience, University of Minnesota</td>
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<td>10:30 a.m.</td>
<td><strong>Product Design/Business Development II: Government Funding</strong></td>
<td>Ballroom D</td>
<td>Jim Stice, Twin Star Medical</td>
<td>“Funding for Medical Products from the Department of Defense and the Defense Alliance”</td>
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<td>Paul Wagner, Minnesota Wire &amp; Cable Co.</td>
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<td><strong>SBIR/STTR in Minnesota Medical Device Companies</strong></td>
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<td>Betsy Lufts, MN SBIR/STTR Assistance Program</td>
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<td><strong>SBIR Experience</strong></td>
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<td>Jim Stice, Twin Star Medical</td>
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<td>10:30 a.m.</td>
<td><strong>Medical Polymers II: Designing Medical Devices with Polymers I</strong></td>
<td>Ballroom A</td>
<td>Sean Merz, Ashland Inc.</td>
<td>“Gears for Medical Applications”</td>
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<td>Roderick Kleiss, Kleiss Gears, Inc.</td>
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<td><strong>Gas Phase FTIR, An Alternative Test Method for the Measurement of Residual Ethylene Oxide by Gas Phase FTIR</strong></td>
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<td>Mark Schwab, Pace Analytical Life Sciences, LLC</td>
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<td>12:00 p.m.</td>
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<td><strong>Break for Lunch</strong></td>
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<td>12:15 p.m.</td>
<td><strong>Medical Device Metamorphosis: A Biosensor--Biotech--Broadband Bonanza</strong></td>
<td>HHH Room</td>
<td>Stephen Oesterle, MD Senior Vice President for Medicine and Technology, Medtronic, Inc.</td>
<td>“Medical Device Metamorphosis: A Biosensor--Biotech--Broadband Bonanza”</td>
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<tr>
<td>2:00 p.m.</td>
<td><strong>Cardiovascular III: Coronary Artery Disease</strong></td>
<td>Ballroom A</td>
<td>Jay Kokata, Boston Scientific</td>
<td>“Devices for Coronary Artery Disease (CAD): Past, Present &amp; Future”</td>
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<td>Rob Schwartz, Minneapolis Heart Institute</td>
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<td><strong>Surface Characterization of CAD Devices</strong></td>
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<td>John Newman, Evans Analytical Group</td>
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<td><strong>Mechanical Characterization of CAD Devices</strong></td>
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<td>Brian Berg, Boston Scientific Corporation</td>
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<td><strong>An Overview of Coatings for CAD Devices</strong></td>
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<td>Bob Hergenrother, Sumerodics Corporation</td>
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<td>2:00 p.m.</td>
<td><strong>MEMS/Nano III: Nanoparticles-Applications in Imaging, Diagnostics and Therapy</strong></td>
<td>Ballroom B</td>
<td>Allison Hubel, Department of Mechanical Engineering, University of Minnesota</td>
<td>“Multi-layered Nanotherapeutics”</td>
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<td><strong>Applications of Functionalized Magnetic Nanoparticles</strong></td>
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<td>Sang-Hyun Oh, Department of Electrical and Computer Engineering, University of Minnesota</td>
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<td><strong>Development of Quantum Dots to Identify Expression of IGF1R in Breast Cancer</strong></td>
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<td>Hue Zhang, Cancer Center, University of Minnesota</td>
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<td><strong>MR Imaging with Nanoparticle Contrast Agents</strong></td>
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<td>Patrick Bolan, Department of Radiology, University of Minnesota</td>
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</tr>
</tbody>
</table>
2007 DESIGN OF MEDICAL DEVICES
WEDNESDAY APRIL 18

NEURAL III: NEURAL IMAGING
Session 6C, Ballroom C
Session Chair: Bin He, Department of Biomedical Engineering, University of Minnesota

"Geometric Approaches in Brain Imaging"
Guillermo Sapiro, Department of Electrical and Computer Engineering, University of Minnesota

"Imaging Seizures in Brain Slices"
Theoden Neff, Department of Biomedical Engineering, University of Minnesota

"Simultaneous Recording and Integration of fMRI and EEG Induced by Visual Stimuli"
Zhongming Liu, Department of Biomedical Engineering, University of Minnesota

"A Non-invasive Study of Neurovascular Coupling"
Yanyin Zhang, University of Minnesota

PRODUCT DESIGN/BUSINESS DEVELOPMENT III: MEDICAL DEVICE STARTUPS
Session 6D, Ballroom D
Session Chair: Doug Johnson, Office of Business Development, University of Minnesota

"What NOT To Do With a Medical Device Company"
Tom Hedner, Denali Medical
Rich Lunsford, Acorn
Jeff Williams, University Venture Center
Buzz Benson, GP Sightline Partners

MEDICAL POLYMERS III: POLYMER PROCESSING AND DESIGN
Session 6N, Nolte Room
Society of Plastics Engineers Special Session
Session Chair: Paul Rothweiler, Aspen Research

"The Analysis of Moisture Content Outgassed from Materials used in Medical Devices by Gas Phase FTIR"
Mark Schwab, PACE Analytical Life Sciences, LLC

"Use of UV Curing Processes for Improvement of Pressure Sensitive Adhesive Performance"
John Spevacek, Aspen Research

"Spinstack, 2-Shot and Multi-Component Technology"
Jim Grossman, Juno, Inc.

3:30 p.m. Sponsor Exhibits, Pre-Function Area

Concurrent Technical Sessions

CARDIOVASCULAR IV: ARRHYTHMIAS
Session 7A, Ballroom A
Session Chair: Scott Sakaguchi, Department of Medicine, University of Minnesota

"Non-Contact Mapping of Arrhythmias"
Graydon Beatty, St. Jude Medical

"Implantable Monitors: Arrhythmia, Fluid and Pressure"
Andres Belalcazar, Transcend Medical

"New Developments in Cardiopulmonary Resuscitation"
Keith Lurie, Advanced Circulatory Systems and University of Minnesota

MEMS/NANO IV: BIOMEMS / NEMS
Session 7B, Ballroom B
Session Chair: Tianhong Cui, Department of Mechanical Engineering, University of Minnesota

"Bioanalytic Techniques Using Recombinant DNA Technology"
Sylvia Daunert, University of Kentucky

"Self-Assembled Biosensors"
Tianhong Cui, Department of Mechanical Engineering, University of Minnesota

"A Review of Passive Wireless Sensing Technologies and MEMS Integration for Biomedical Sensors"
A. Serdar Sezen, Department of Mechanical Engineering, University of Minnesota

"NEURAL IV: NEURAL MODULATION"
Session 7A, Ballroom A
Session Chair: Scott Sakaguchi, Department of Medicine, University of Minnesota

"Implantable Biomimetic Electronics as Neural Prostheses for Lost Memory Function"
Theodore Berger, University of Southern California

"Mechanism of Deep Brain Stimulation and the Treatment of Movement Disorders"
Greg Molnar, Medtronic

"Cutting-Edge Treatment of Ischemic Stroke"
Adrian Darieslhi, Department of Neurology, University of Minnesota

"Cutting-Edge Treatment of Hemorrhagic Stroke"
Vallabh Janardhan, Department of Neurology, University of Minnesota

MEDICAL POLYMERS IV: DESIGNING MEDICAL DEVICES WITH POLYMERS II
Session 7N, Nolte Room
Society of Plastics Engineers Special Session
Session Chair: Jeff Voelker, GE Polymers

"Complex Part Inspection: Optical Technology for Speed, Accuracy and Completeness"
Craig Crum, CGI Technologies

"Rapid Tooling (Successes, Myths, and Medical Successes)"
Jim Mishek, Vista Technologies

5:30 p.m. Adjourn
## 2007 DESIGN OF MEDICAL DEVICES
### THURSDAY APRIL 19

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.</td>
<td>Registration and Continental Breakfast, Pre-Function Area</td>
</tr>
<tr>
<td>8:00 a.m.</td>
<td><strong>PRESIDENT’S 21ST CENTURY INTERDISCIPLINARY CONFERENCE:</strong></td>
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<tr>
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<td>&quot;INVENTING MEDICAL DEVICES&quot;</td>
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<tr>
<td></td>
<td><strong>Welcome and Introductions</strong></td>
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<tr>
<td></td>
<td>Paul Iaizzo, Departments of Surgery, Physiology, and Biomedical Engineering, University of Minnesota</td>
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<td>Frank Cerra, MD, Sr. V.P for Health Sciences, Academic Health Center, University of Minnesota</td>
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<td><strong>Keynote Presentation</strong></td>
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<td>Dean Kamen</td>
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<td>Inventor, Physicist, and Entrepreneur</td>
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<td><strong>Keynote Presentation</strong></td>
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<td>John S. Njarian, MD</td>
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<td>Professor, Department of Surgery, University of Minnesota</td>
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<td>10:00 a.m.</td>
<td>Sponsor Exhibits, Pre-Function Area</td>
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<tr>
<td>11:00 a.m.</td>
<td><strong>A PATENTABLE IDEA FOR A MEDICAL DEVICE: HOW AND WHEN TO PATENT IT</strong></td>
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<td>Session 1, Ballrooms B-D</td>
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<td>Moderator: R. Timothy Mulcahy, PhD, VP for Research, University of Minnesota</td>
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<td>Scott Augustine, MD, CEO, Augustine Biomedical &amp; Design</td>
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<td>Michael F. Moore, Director, Patents &amp; Technology Marketing, University of Minnesota</td>
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<td>Arthur Erdman, PhD, Professor, Department of Mechanical Engineering, University of Minnesota</td>
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<td>12:30 p.m.</td>
<td><strong>AWARDS LUNCH</strong></td>
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<td>HHH ROOM</td>
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<td>&quot;Catalyzing Inventors in the State of Minnesota: Who, How and When&quot;</td>
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<td>Keynote: Dale Wahlstrom</td>
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<td>Chair, The BioBusiness Alliance of Minnesota</td>
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<td>V.P., Cardiac Rhythm Mgmt, Ventures, Medtronic, Inc.</td>
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<td>1:45 p.m.</td>
<td><strong>NEGOTIATING IP: ACADEMIA, OTHER COMPANIES AND FOREIGN COUNTRIES</strong></td>
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<td>Session 2, Ballrooms B-D</td>
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<td>Moderator: Doug Johnson, Director, Office of Business Development, University of Minnesota</td>
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<td>Jagjit S. Gill, PhD, CEO, Sage Medical Inc.</td>
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<td>Don Gerhardt, President and CEO, LifeScience Alley</td>
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<td>3:00 p.m.</td>
<td><strong>IP AT THE UNIVERSITY OF MINNESOTA: DEVELOPING IT, CONFLICTS OF INTEREST AND ETHICS</strong></td>
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<td>Session 3, Ballrooms B-D</td>
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<td>Moderator: Richard Blanco, Assoc. V.P., Regulatory Affairs, University of Minnesota</td>
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<td>Jeffrey Kahn, PhD, Director, Center of Bioethics, University of Minnesota</td>
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<td>Claudia R. Atkison, JD, PhD, Emory School of Medicine</td>
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<tr>
<td>4:15 p.m.</td>
<td><strong>Keynote Presentation - Ballrooms B-D</strong></td>
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<td>&quot;The Care and Feeding of an Early Stage Medical Device Company&quot;</td>
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<td>B. Kristine Johnson, General Partner</td>
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<td>Affinity Capital Management</td>
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<td>5:00 p.m.</td>
<td>Adjourn</td>
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