Where Science Meets Innovation

A Joint Meeting of NANS & NIC

June 25–29, 2016
Baltimore, MD
Sheraton Inner Harbor

Jointly provided by the Congress of Neurological Surgeons, North American Neuromodulation Society, and Neural Interfaces Conference.
St. Jude Medical continues to pioneer new therapies backed by clinical evidence to provide clinicians access to treat more patients across the entire disease continuum. We are proud to offer the broadest range of interventional pain therapies, including neurostimulation of the DRG, so you have more options to tailor pain relief for more patients.
Meeting Overview
The North American Neuromodulation Society (NANS), in collaboration with the Neural Interfaces Conference (NIC) Steering Committee, is pleased to announce a joint scientific conference June 25–29, 2016, at the Sheraton Inner Harbor in Baltimore, MD.

The conference will bring together a diverse group of scientists, engineers, and clinicians representing the basic and applied science aspects of neural interfaces and neuromodulation. The goal of the conference is to foster collaboration between these groups and provide an in-depth overview on the research and development of implantable medical devices and techniques along with their eventual integration into clinical practice, as well as provide the practical uses of neuromodulation and decision making in your practice.

The joint conference will provide a forum for the presentation and discussion of state-of-the-art developments in areas that include neural stimulation, neural plasticity, functional electrical stimulation, deep brain stimulation, auditory prosthesis, cortical prosthesis, peripheral nerve interfaces, biomaterials, microelectrode array technology, brain computer/machine interfaces, and other emerging areas. We also anticipate participation by representatives from federal government agencies as well as industry, creating excellent opportunities for sharing new ideas and networking.

Learning Objectives
Upon completion of this educational activity, participants should be able to
- explain the fundamentals and mechanisms of neuromodulation
- discuss the principles and management of chronic pain, especially with respect to headaches and complex regional pain syndrome
- describe the relationship between neuromodulation, rehabilitation, and biomedical engineering
- discuss the legal issues pertaining to neuromodulation treatments
- recognize new modalities and research in the expanding field of neuromodulation.

Accreditation and Credit Designation Statements
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the Congress of Neurological Surgeons (CNS), the North American Neuromodulation Society, and the Neural Interfaces Conference. The CNS is accredited by the ACCME to provide continuing medical education for physicians.

The CNS designates this live activity for a maximum of 26 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Physicians of Osteopathic Medicine: The American Osteopathic Association (AOA) accepts AMA PRA Category 1 Credits™ as AOA Category 2-B credit.

Joseph J. Pancrazio, PhD
Meeting Co-Chair

Steven Falowski, MD
Meeting Co-Chair

Parag Patil, MD PhD
Meeting Co-Chair
### Saturday, June 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7–8 am</td>
<td>Registration</td>
</tr>
<tr>
<td>7–8 am</td>
<td>Continental Breakfast</td>
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<tr>
<td>8–10 am</td>
<td>Chesapeake Ballroom</td>
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<td></td>
<td>Plenary Session 1 (PL01)</td>
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<tr>
<td>8–8:20 am</td>
<td>Welcome</td>
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<tr>
<td></td>
<td>Parag Patil, MD PhD</td>
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<td></td>
<td>Peter Konrad, MD PhD</td>
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<td>Steven Falowski, MD</td>
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<tr>
<td>8:20–8:40 am</td>
<td>Fresh Outlook on FBSS</td>
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<td>Steven Falowski, MD</td>
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<tr>
<td>8:40–9 am</td>
<td>Data for ESI/Injections</td>
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<td></td>
<td>Salim Hayek, MD PhD</td>
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<tr>
<td>9–9:20 am</td>
<td>IT Therapy for Pain</td>
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<td></td>
<td>Lawrence Poree, MD PhD</td>
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<tr>
<td>9:20–9:40 am</td>
<td>Clinical Evidence: Tonic</td>
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<td>Richard North, MD</td>
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<tr>
<td>9:40–10 am</td>
<td>Clinical Evidence: Burst</td>
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<td>Jason Pope, MD</td>
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<tr>
<td>10–10:30 am</td>
<td>Break</td>
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<tr>
<td>10:30 am–Noon</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>Plenary Session 2 (PL02)</td>
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<tr>
<td>10:30–10:48 am</td>
<td>Clinical Evidence: HFS</td>
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<td></td>
<td>Sean Li, MD</td>
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<tr>
<td>10:48–11:06 am</td>
<td>Clinical Evidence: DRG</td>
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<tr>
<td></td>
<td>Tim Deer, MD</td>
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<tr>
<td>11:06–11:24 am</td>
<td>Clinical Evidence: PNS</td>
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<tr>
<td></td>
<td>Christopher Winfree, MD</td>
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<tr>
<td>11:24–11:42 am</td>
<td>Clinical Evidence: Intracranial</td>
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<td></td>
<td>Parag Patil, MD PhD</td>
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<tr>
<td>11:42 am–Noon</td>
<td>Lunch</td>
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<tr>
<td>1:30–3 pm</td>
<td>Chesapeake Ballroom</td>
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<td></td>
<td>Plenary Session 3 (PL03)</td>
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<tr>
<td>1:30–1:48 pm</td>
<td>What Spine MRI Findings Are Relevant for Pain</td>
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<td></td>
<td>John Carrino, MD MPH</td>
</tr>
<tr>
<td>1:48–2:06 pm</td>
<td>Science to Clinical Research: Bridging the Gap</td>
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<td></td>
<td>Timothy Marjenin, FDA</td>
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<tr>
<td>2:06–2:24 pm</td>
<td>Neuromodulation at the Cellular Level</td>
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<td>Yun Guan, MD PhD</td>
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<tr>
<td>2:24–2:42 pm</td>
<td>Electrical Field Modeling in Neuromodulation</td>
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<td>Scott Lempka, MD</td>
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<tr>
<td>2:42–3 pm</td>
<td>Closed Loop/ECAPS</td>
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<td>Chengyuan Wu, MD</td>
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<tr>
<td>3–3:30 pm</td>
<td>Break</td>
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<tr>
<td>3:30–5 pm</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>Plenary Session 4 (PL04)</td>
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<tr>
<td>3:30–3:48 pm</td>
<td>History of Neuromodulation</td>
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<tr>
<td></td>
<td>Tim Deer, MD</td>
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<tr>
<td>3:48–4:06 pm</td>
<td>Opioid Prescribing in the Context of Recent Public Policy Initiatives</td>
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<td></td>
<td>Steven Stanos, MD</td>
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<tr>
<td>4:06–5 pm</td>
<td>Panel Discussion: Choosing Among Modalities</td>
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<tr>
<td></td>
<td>Moderators:</td>
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<tr>
<td></td>
<td>Steven Falowski, MD; Parag Patil, MD PhD; Ashwini Sharan, MD</td>
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<tr>
<td>6–8 pm</td>
<td>Hyatt Regency Baltimore on the Harbor Pisces 15th Floor</td>
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<td>Welcome Reception</td>
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### Sunday, June 26

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7–8 am</td>
<td>Continental Breakfast</td>
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<tr>
<td>8–11:40 am</td>
<td>Vista Labs—Baltimore</td>
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<tr>
<td></td>
<td>Clinical Session: Certificate of Attendance (COA)*</td>
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<tr>
<td>Opening Remarks</td>
<td>Parag Patil, MD PhD</td>
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<td></td>
<td>Joseph Pancrazio, PhD</td>
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<tr>
<td>8–10:05 am</td>
<td>Cadaver Time (25 minutes at each station)</td>
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<tr>
<td></td>
<td>Bryan Hoelzer, MD</td>
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<td></td>
<td>Eric Lee, MD</td>
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<td></td>
<td>Sean Li, MD</td>
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<td>Chengyuan Wu, MD</td>
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<tr>
<td></td>
<td>Michael Saulino, MD</td>
</tr>
<tr>
<td>10:05–10:20 am</td>
<td>Break</td>
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<tr>
<td>10:20–10:40 am</td>
<td>Enhancing Success with Spinal Implantable Therapies for Pain</td>
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<td></td>
<td>Salim Hayek, MD PhD</td>
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<tr>
<td>10:40–11 am</td>
<td>Emerging Technology</td>
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<td>Todd Sitzman, MD</td>
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<tr>
<td>11–11:20 am</td>
<td>Complex Cases</td>
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<td></td>
<td>Jennifer Sweet, MD</td>
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<tr>
<td>11:20–11:40 am</td>
<td>IT Management</td>
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<td>Lawrence Poree, MD PhD</td>
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<td></td>
<td>*Non-CME session</td>
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### Agenda

**8 am–Noon**
**Vista Labs—Baltimore**  
**Fellows Course (RFS)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>8–8:20 am</td>
<td><strong>Patient Selection</strong></td>
<td>Steven Falowski, MD</td>
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<tr>
<td>8:20–8:40 am</td>
<td><strong>Technique/Surgical Skills</strong></td>
<td>Jennifer Sweet, MD</td>
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<tr>
<td>8:40–9 am</td>
<td><strong>SCS Versus Pump</strong></td>
<td>Jason Pope, MD</td>
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<tr>
<td>9–9:20 am</td>
<td><strong>Enhancing Success with Implantable Therapies for Pain</strong></td>
<td>Salim Hayek, MD PhD</td>
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<tr>
<td>9:20–9:40 am</td>
<td><strong>Open Panel</strong></td>
<td>Steven Falowski, MD</td>
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<td>Jason Pope, MD</td>
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<td></td>
<td></td>
<td>Jennifer Sweet, MD</td>
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<tr>
<td>9:40–10 am</td>
<td><strong>Break</strong></td>
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### 1:30–5 pm
**Neuromodulation in Practice**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>1:30–2 pm</td>
<td><strong>Integration of Specialties</strong></td>
<td>Steven Falowski, MD</td>
</tr>
<tr>
<td>2–2:30 pm</td>
<td><strong>Building a Practice</strong></td>
<td>Todd Sitzman, MD</td>
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<tr>
<td>2:30–3 pm</td>
<td><strong>Contract Negotiation</strong></td>
<td>Michael Yang, MD</td>
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### 8 am–Noon
**Chesapeake Ballroom I and II**  
**Neural Engineering Session: Emerging Technology and Innovation in Neuromodulation (NIC)**

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>8–8:15 am</td>
<td><strong>SPARC Program Introduction</strong></td>
<td>Eugene Civillico, PhD</td>
</tr>
<tr>
<td>8:15–9:30 am</td>
<td><strong>Deliverables: The 12 Current U18 SPARC Projects</strong></td>
<td>Steve Lewis, PhD</td>
</tr>
</tbody>
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**Speakers**
- Dominique Durand, PhD  
- Marthe Howard, PhD (for Jim Wells)  
- Brian Davis, PhD  
- John Hossack, PhD  
- Lucy Vulchanova, PhD  
- Timothy Bruns, PhD  
- Kingman Strohl, MD  
- Charles Horn, PhD  
- Aydin Farajidavar, PhD  
- Marthe Howard, PhD  
- Jeffrey Ardell, PhD  
- Aaron Mickle, PhD

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>9:30–10 am</td>
<td><strong>Break</strong></td>
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<tr>
<td>10–11 am</td>
<td><strong>Data Sharing Town Hall</strong></td>
<td>Timothy Bruns, PhD</td>
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<tr>
<td>10–10:15 am</td>
<td><strong>Data Sharing Town Hall: Goals for the Scientific Community</strong></td>
<td>NIH Program Staff</td>
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<tr>
<td>10:15–10:30 am</td>
<td><strong>Data Sharing Town Hall: NIH Data Coordination Center “Tool”</strong></td>
<td>NIH Program Staff</td>
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<tr>
<td>10:30–10:45 am</td>
<td><strong>Data Sharing Town Hall: Platforms for Data Sharing</strong></td>
<td>Charles Horn, PhD</td>
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<td></td>
<td>Timothy Bruns, PhD</td>
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<tr>
<td>10:45–11 am</td>
<td><strong>Q&amp;A</strong></td>
<td>Grace Peng, PhD</td>
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### 11 am–Noon
**Case Studies: Diving Into Neuromodulation Systems—A Greater Understanding of Mechanisms Will Drive Greater Clinical Benefit**  
**Moderator:** Marthe Howard, PhD

**Speakers**
- Steve Lewis, PhD  
- Kingman Strohl, MD  
- Jeffrey Ardell, PhD

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>11:15–11:30 am</td>
<td><strong>Data Sharing Town Hall: NIH Data Coordination Center “Tool”</strong></td>
<td>NIH Program Staff</td>
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<tr>
<td>11:30–11:45 am</td>
<td><strong>Data Sharing Town Hall: Platforms for Data Sharing</strong></td>
<td>Charles Horn, PhD</td>
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<td></td>
<td>Timothy Bruns, PhD</td>
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<tr>
<td>11:45–12 pm</td>
<td><strong>Q&amp;A</strong></td>
<td>Grace Peng, PhD</td>
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### 6–9 pm
**American Visionary Art Museum Reception**  
*Sponsored by St. Jude Medical*

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>6–9 pm</td>
<td><strong>American Visionary Art Museum Reception</strong></td>
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*Non-CME session*
## Monday, June 27

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>7–7:45 am</td>
<td>Continental Breakfast</td>
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<tr>
<td>8 am–3:30 pm</td>
<td>Invitation only. Device Access Workshop*</td>
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<tr>
<td>8–8:15 am</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>NIC Opening Plenary Session</td>
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<td></td>
<td>Joseph Pancrazio, PhD</td>
<td>Parag Patil, MD PhD</td>
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<tr>
<td>8:15–9:20 am</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>Using Targeted Neuroplasticity to Trigger Widespread Beneficial</td>
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<tr>
<td></td>
<td>Plasticity: Part 1 (PL05)</td>
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<tr>
<td>8:15–8:20 am</td>
<td>Introduction</td>
<td>Jonathan Wolpaw, MD</td>
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<tr>
<td>8:20–8:50 am</td>
<td>Neuroplasticity and the Negotiated Equilibrium Hypothesis</td>
<td>Jonathan Wolpaw, MD</td>
</tr>
<tr>
<td>8:50–9:20 am</td>
<td>Using Reflex Conditioning to Improve Walking in People with Spinal Cord Injury</td>
<td>Aiko Thompson, PhD</td>
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<tr>
<td>9:20–9:50 am</td>
<td>Break with Exhibitors and Posters</td>
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<tr>
<td>9:50–11:05 am</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>Using Targeted Neuroplasticity to Trigger Widespread Beneficial</td>
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<tr>
<td></td>
<td>Plasticity: Part 2 (PL06)</td>
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<td></td>
<td><strong>Moderator:</strong> Jonathan Wolpaw, MD</td>
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<tr>
<td>9:50–10:20 am</td>
<td>Making Words by Changing Minds: Treating Aphasia with Noninvasive</td>
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<td>Cortical Stimulation</td>
<td>Roy Hamilton, MD</td>
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<tr>
<td>10:50–11:05 am</td>
<td>Q&amp;A</td>
<td>Jonathan Wolpaw, MD</td>
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<tr>
<td>11:05–11:35 am</td>
<td>Chesapeake Ballroom</td>
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<td>Keynote: “Moving from Phenomena to Function—How Will Plasticity</td>
<td>Naomi Kleitman, PhD</td>
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<td>Improve Lives?”</td>
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<tr>
<td>11:35 am–Noon</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td><strong>Platform Presentations</strong></td>
<td>P. Hunter Peckham, PhD</td>
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<tr>
<td>Noon–1:30 pm</td>
<td>Clinical Data and The Science Behind High Frequency Spinal Cord</td>
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<td></td>
<td>Stimulation</td>
<td>Lunch Sponsored by NEVRO</td>
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<tr>
<td>1:30–3:15 pm</td>
<td>Chesapeake Ballroom</td>
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<td></td>
<td>New Stimulation Paradigms for Pain (PL07)</td>
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<tr>
<td>1:30–1:35 pm</td>
<td><strong>Introduction</strong></td>
<td>Zelma Kiss, MD PhD</td>
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<tr>
<td>1:35–2:05 pm</td>
<td>Perceptions Evoked by Different Patterns of Thalamic Stimulation</td>
<td>Fred Lenz, MD PhD</td>
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<tr>
<td>2:05–2:35 pm</td>
<td>Basic Mechanisms of Pain Suppression with Spinal Cord Burst Stimulation</td>
<td>Dirk De Ridder, MD PhD</td>
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<tr>
<td>2:35–3:05 pm</td>
<td>Mechanisms of Ultrahigh Frequency Stimulation in Spinal Cord</td>
<td>Jaimie Henderson, MD</td>
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<tr>
<td>3:05–3:15 pm</td>
<td><strong>Q&amp;A</strong></td>
<td>Zelma Kiss, MD PhD</td>
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<tr>
<td>3:30–6 pm</td>
<td>Harborview Gallery, Severn Room, Potomac Room</td>
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<td></td>
<td><strong>Poster Session 1 (Non-CME)</strong></td>
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## Tuesday, June 28

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<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>7–8 am</td>
<td>Continental Breakfast</td>
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<tr>
<td>8–9:30 am</td>
<td>Chesapeake Ballroom</td>
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<tr>
<td></td>
<td>Closed Loop DBS for Depression: Advantages, Disadvantages, and Design Considerations (PL08)</td>
<td></td>
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<tr>
<td>8–8:05 am</td>
<td><strong>Introduction</strong></td>
<td>Eran Klein, MD PhD</td>
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<tr>
<td>8:05–8:30 am</td>
<td>Iterative Strategies to Refine and Optimize DBS for Depression: Is a Closed Loop System the Critical Next Step?</td>
<td>Helen Mayberg, MD</td>
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<tr>
<td>8:30–8:55 am</td>
<td>Closed-Loop DBS: Lessons from Brain-Computer Interfacing</td>
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<td></td>
<td>Alik Widge, MD PhD</td>
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<tr>
<td></td>
<td>*Non-CME session</td>
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<tr>
<td>8:55–9:20 am</td>
<td>Identifying Network Level Targets for Closed Loop DBS in Depression</td>
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<td></td>
<td>Heather Dawes, PhD</td>
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<tr>
<td>9:20–9:30 am</td>
<td><strong>Q&amp;A</strong></td>
<td>Eran Klein, MD PhD</td>
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<tr>
<td>9:30–9:45 am</td>
<td>Break with Exhibitors and Posters</td>
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<tr>
<td>9:45–11:30 am</td>
<td>Chesapeake Ballroom</td>
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<td>Autonomic/Peripheral Neuromodulation Devices: Existing and Emerging Therapies (PL09)</td>
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<tr>
<td>9:45–9:50 am</td>
<td><strong>Introduction</strong></td>
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<td><strong>Moderators:</strong></td>
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<td>Kip Ludwig, PhD</td>
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<td>Douglas Weber, PhD</td>
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<td>9:50–10:05 am</td>
<td>Recent Clinical Landscape for Deployment</td>
<td>Kip Ludwig, PhD</td>
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<td>10:05–10:20 am</td>
<td>Hypoglossal Nerve Stimulation: A New Implanted Neuromodulation Treatment for Obstructive Sleep Apnea</td>
<td>Quan Ni, PhD</td>
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<td>10:20–10:35 am</td>
<td>Vagal Nerve Stimulation: Clinical Outcomes and Next Steps</td>
<td>Shivkumar Sabesan, PhD</td>
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<td>10:35–10:50 am</td>
<td>GSK-Autonomic Nerve Interface Roadmap</td>
<td>Daniel Chew, PhD</td>
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<td>10:50–11:05 am</td>
<td>Dorsal Root Ganglion Stimulation: The Past, the Present, and the Future</td>
<td>James Fitzgerald, PhD</td>
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Agenda

11:05–11:30 am  
Q&A  
Douglas Weber, PhD  
Kip Ludwig, PhD

11:30 am–12:30 pm  
DRG Therapy: Power to Give More Patients More Relief  
Clinical Review and Early Experiences  
Lunch Sponsored by St. Jude Medical

12:30–1:30 pm  
Harborview I  
B1: Regulatory Assessments for Neural Interfaces (B01)

12:30–12:35 pm  
Introduction  
Eugene Civillico, PhD

12:35–12:55 pm  
Eric Lovett, PhD

12:55–1:15 pm  
Quan Ni, PhD

1:15–1:30 pm  
Q&A  
Eugene Civillico, PhD

12:30–1:30 pm  
Harborview II  
B2: SBIR/STTR Funding in Neural Engineering (B02)

12:30–12:35 pm  
Introduction  
Patrick Rousche, PhD

12:35–12:50 pm  
Stephanie Fertig, MBA

12:50–1:05 pm  
Mark Lehmkuhle, PhD

1:05–1:20 pm  
Timothy Wagner, PhD

1:20–1:30 pm  
Q&A  
Patrick Rousche, PhD

1:30–3 pm  
Chesapeake Ballroom  
Development of an Optimal Somatosensory Neural Interface (PL10)  
Moderator: Lee Miller, PhD

1:30–1:35 pm  
Introduction  
Lee Miller, PhD

1:35–1:53 pm  
Peripheral Nerve Stimulation to Restore Sensation to Human Amputees  
Dustin Tyler, PhD

1:53–2:11 pm  
Cortical Stimulation to Restore Touch in Paralyzed Human Patients  
Robert Gaunt, PhD

2:11–2:29 pm  
All-Optical Manipulation and Interrogation of Mouse Visual Sensory Circuits  
James Marshel, PhD

2:29–2:47 pm  
A Biomimetic Cortical Interface to Restore Proprioception  
Lee Miller, PhD

2:47–3 pm  
Q&A  
Lee Miller, PhD

3–3:15 pm  
Break with Exhibitors and Posters

3:15–3:45 pm  
Chesapeake Ballroom  
Ultrahigh Density Neural Interfaces (PL11)  
Moderator: Florian Solzbacher, PhD

3:15–3:20 pm  
Introduction  
Florian Solzbacher, PhD

3:20–3:45 pm  
Big Is Just the Beginning: The Challenges of Heterogeneous Neural Data  
Zachary Ives, PhD

3:45–4:10 pm  
Visual Exploration for Situational Awareness  
Yarden Livnat, PhD

4:10–4:35 pm  
Scaling Neural Interface Hardware to 1,000 Channels and Beyond  
Shawn Kelly, PhD

4:35–4:45 pm  
Q&A  
Florian Solzbacher, PhD

5–7:30 pm  
Harborview Gallery, Severn Room, Potomac Room  
Poster Session 2 (Non-CME)

Wednesday, June 29

7–8 am  
Continental Breakfast

8–10 am  
Chesapeake Ballroom  
Emerging Methods of Wireless Neuromodulation (PL12)  
Moderator: Daniel Freeman, PhD

8–8:05 am  
Introduction  
Daniel Freeman, PhD

8:05–8:30 am  
A Transistor-Less, Wireless Neural Stimulator  
Daniel Freeman, PhD

8:30–8:55 am  
Acoustic Neuromodulation Using Focused Ultrasound: Experiences from Animals to Humans  
Seung Schik Yoo, PhD MBA

8:55–9:20 am  
Remote Neural Modulation Using Electromagnetic Waves  
Sarah Stanley, PhD

9:20–9:45 am  
Medical Devices Incorporating Nanotechnology: An Overview and Challenges  
Girish Kumar, PhD
9:45–10 am
Q&A
Daniel Freeman, PhD

10–10:20 am
Break with Exhibitors

10:20 am–Noon
Chesapeake Ballroom
Optical Interfaces: Optogenetic and Infrared Modalities for Modulating the Nervous System (PL13)
Moderators:
Cristin Welle, PhD
Hillel Chiel, PhD

10:20–10:25 am
Introduction
Cristin Welle, PhD
Hillel Chiel, PhD

10:25–10:45 am
Optical Perturbation of the Nervous System with Pulsed Infrared Light: Progress Toward In Vivo Clinical Implementation
Anita Mahadevan-Jansen, PhD

10:45–11:05 am
Optical Cochlear Implants: Challenges for a Clinical Translation
Claus-Peter Richter, MD PhD

11:05–11:25 am
Looking Toward Clinical Use of Optogenetic Technology for Therapeutics
Chris Towne, PhD

11:25–11:45 am
Multifunctional Fibers: Flexible Tools for Neural Tissue Interrogation
Polina Anikeeva, PhD

11:45 am–Noon
Q&A
Cristin Welle, PhD
Hillel Chiel, PhD

Noon–12:30 pm
Lunch

12:30–1:30 pm
Harborview I
B3: Maximizing the Value of Neural Interface Data (B03)
Moderator: Richard North, MD

12:30–12:35 pm
Introduction
Richard North, MD

12:35–1:20 pm
Jane Shipley

1:20–1:30 pm
Q&A
Richard North, MD

12:30–1:30 pm
Harborview II
B4: Funding Neuroprostheses Technology and Translation
Moderator: Kevin Otto, PhD

12:30–12:35 pm
Introduction
Kevin Otto, PhD

12:35–1:20 pm
Stephanie Fertig, MBA
Felipe Aguel, PhD
Nick Langhals, PhD
Douglas Weber, PhD
Roy Katso, PhD
Tracey Wheeler, PhD

1:20–1:30 pm
Q&A
Kevin Otto, PhD

1:30–3:15 pm
Chesapeake Ballroom
Unconventional Neural Interfaces (PL14)
Moderator: Douglas Weber, PhD

1:30–1:35 pm
Introduction
Douglas Weber, PhD

1:35–1:52 pm
Neural Interface Engineering: Roadmap to Emerging Solutions
TK Kozai, PhD

1:52–2:09 pm
Recent Advances in Neural Dust, a Platform for Peripheral and Central Nervous System Recording
Michel Maharbiz, PhD

2:09–2:26 pm
Measurement of Neural Activity by Ramen Scattering and Phase Detection
Kevin Young, PhD

2:26–2:43 pm
Conducting Polymer Nanowires as Neural Interfaces
Christine Payne, PhD

2:43–3 pm
Engineering Biomolecules for Noninvasive Imaging and Control
Mikhail Shapiro, PhD

3–3:15 pm
Q&A
Douglas Weber, PhD

3:15–3:30 pm
Closing Remarks: Adjournment
Joseph Pancrazio, PhD
Parag Patil, MD PhD
NANS Executive Committee
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Positional Interest Codes

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Christopher R. Butson, PhD
Consulting Agreement—Functional Neuromodulation (2), St. Jude Medical (2); Royalty—Intelect Medical (8)

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Salary—GlaxoSmithKline (5)

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Consulting Agreement—Boston Scientific (2)

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Ownership Interest—Neurotargeting (7)

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Patent to be submitted by U of M—University of Minnesota (10)

Quan Ni, PhD
Salary—Inspire Medical Systems (5)

Richard B. North, MD
Other—Algostim LLC (2), Medtronic, Inc. (6), Neuromodulation Foundation, Inc. (7), St. Jude Medical, Inc. (6), StimQ LLC (2), Stimwave Inc. (6)

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Ownership Interest—Enspire DBS Therapy (8), NDI Medical (8), SPR Therapeudics (8)

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David Provenzano, MD
Other—American Society of Anesthesiologists (6), American Society of Regional Anesthesia and Pain Medicine (6)

Richard Rauck, MD
Other—World Institute of Pain (6)

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Intellectual Property—Northwestern University (5), Resonance Medical, LLC (10); Ownership Interests—Resonance Medical, LLC (10)

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Florian Solzbacher, PhD
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Salary—Circuit Therapeutics, Inc. (3); Stock—Circuit Therapeutics, Inc. (3)

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Kevin W. Young, PhD
Intellectual Property Rights—Rehabilitation Institute of Chicago (10)

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Chris Welber, MBA
Cristin Welle, PhD
Tracey Wheeler, PhD
Alik S. Widge, MD PhD
Christopher J. Winfree, MD
FACS
Jonathan Wolpaw, MD
Chengyuan Wu, MD MSBmE
Seung Schik Yoo, PhD MBA
Clinical Neuromodulation

Room: Potomac

(1) Noninvasive Treatment of Postoperative Cauda Equina Syndrome Pelvic Pain and Urinary Incontinence: A Case Series
Yuriy Ivanov

(2) Mapping Threshold Response of Cortical Neurons to Pulsed Uniform Electric Field
Aman Aberra (Diversity Travel Award winner)

(3) Novel Predictive Spinal Cord Stimulation Algorithm for Chronic Pain
Haigreeva Yedla

(4) Effects of Alternating Current Trans-Cranial Stimulation on Pain Related Depression and Neuropathic Pain
Kenan Gungor

(5) Outcomes of 1 kHz Subperception Spinal Cord Stimulation in Patients with Failed Paresthesia Based Stimulation
Kyung Soo Hong

(6) Safe Direct Current Stimulation for the Treatment of Asthma Attack
Gene Fridman

(7) Quantification of Beta Oscillatory Activity in the EEG with Progression of Parkinson's Disease
Christina Behrend

(8) Subthreshold Stimulation of the Dorsal Root Ganglia Yields Paresthesia-Free Analgesia
William Cusack

(9) L2-L3 Dorsal Root Ganglia Stimulation Induces Low Back Pain Relief: A Preliminary Report
William Cusack

(10) Dorsal Root Ganglia Stimulation for Painful Diabetic Peripheral Neuropathy: A Preliminary Report
William Cusack

(11) Real-World Clinical Outcomes of Multiple Waveform Spinal Cord Stimulation: A Prospective Global Registry
Nitzan Mekel-Bobrov

(12) Assessment of Patient Experience: Data Analytic Approaches Combining New and Established Pain Outcome Measures
Nitzan Mekel-Bobrov

(13) Real-World Outcomes Study of Multimodal Spinal Cord Stimulation Using New 32-Contact Surgical Lead Paddle
Nitzan Mekel-Bobrov

(14) Differential Mechanisms of Action Between Paresthesia and Paresthesia-Free SCS: A PET Study
Nitzan Mekel-Bobrov

(15) Real World Utilization of Subperception (≤ 1.2 khz) Spinal Cord Stimulation
Nitzan Mekel-Bobrov

Frank McDonnell

(17) Ultrasound Neuromodulation: Is It Direct Neural Activation or Vibratory Cochlear Activation of the Brain?
Hubert Lim

(18) Comparison of Neural Activity During Tonic and Burst Spinal Cord Stimulation: A SUNBURST Substudy
Lalit Venkatesan

(19) Thoracic Radiculopathy Following Spinal Cord Stimulator Implantation Treated with Corticosteroids
Ryan Holland

(20) Safe Direct Current Stimulation for the Treatment of Chronic Peripheral Pain
Gene Fridman

Alexander Kent

(22) Spinal Cord Stimulator Outcomes: The Rutgers Experience
Ryan Holland

(23) Analgesic Effectiveness of Intrathecal Pump Therapy for Chronic Pancreatitis: Case Series
Edgar Martinez

(24) Peripheral Nerve Stimulation Restores Proprioceptive Sensation
Ivana Cuberovic

Deep Brain Stimulation

Room: Potomac

(25) A Biophysical Model to Predict Electrical Stimulation Evoked Response in Cortical and Subcortical Brain Regions
Ishita Basu

(26) Multimodal Exploration of Closed-Loop DBS
Shaun Patel

(27) Are Directional Deep Brain Stimulation Leads Safe? An Updated Assessment of Stimulation Safety
Ashley Kapron

(28) Cerebral Vasculature and Heterogeneity Outside the Brain Impact Predictions in Models of Deep Brain Stimulation
Bryan Howell

(29) Paired Electrical Stimulation to Alter Low-Frequency Brain Oscillation Synchrony in Fear Circuits
Meng-Chen Lo

(30) 17T Diffusion Tensor Imaging Elucidates Targets of Deep Brain Stimulation
Katie Warthen

(31) Advanced Stimulation Patterns for Directional Activation in DBS
Julia Slopsema

(32) A Multichannel System for Controlling Neurochemical Activity in the Nonhuman Primate Brain
Erika Ross

(33) Interactive Meshing and Simulation of Deep Brain Stimulation with Patient Specific Models
Andrew Janson

(34) Rapidly Reversible Behavioral Arrest During Fasciculus Retroflexus Deep Brain Stimulation in a Healthy Non-Human Primate
Jonathan Baker

(35) Spatial Characterization of Stimulation-Induced Neuronal Activity Around a Chronically Implanted Thalamic Deep Brain Stimulation Array
Matt Johnson

(36) Particle Swarm Optimization for Programming Deep Brain Stimulation Arrays
Edgar Pena (Diversity Travel Award winner)

(37) VIM DBS Spatial Summation Effects Along Horizontal Axis in ET Patients
Changqing Kao

(38) A Real-Time 'Neurotransmitter Clamp' for Systematically Probing Brain Networks by Controlling In Vivo Dopamine Release
James Trevathan
Poster Presentations

(39) Neurovascular Coupling During Deep Brain Stimulation
Sohail Noor

(40) Deep Brain Stimulation for Neuropathic Pain: Connectivity Analysis Within the Sensory Thalamus
Yagna Pathak

(41) Dbs Creates Impulse Control Disorders and Fails to Restore Parkinsonian Apathy and Action Selection Deficits
Collin Anderson

(42) Decoding Cognitive and Emotional States from Local Field Potentials Using a Bayesian Approach
Ali Yousefi

(43) Mapping the Functional Circuitry Effect of Ventral Segmental Area Deep Brain Stimulation
Megan Settell

(44) Optimized Programming Algorithm for Cylindrical and Directionally Segmented Deep Brain Stimulation Electrodes
Daria Nesterovich

Deep Brain Stimulation
Room: Harbor Gallery

(45) Nonlinear Atlas Creation for Retrospective DBS Cohort Analysis
Gordon Duffley

(46) Influence of Diffusion-Tensor Based Axon Orientation on the Prediction of Deep Brain Stimulation Effects
Johannes Vorwerk

(47) Reinforcement Learning for Phasic Disruption of Pathological Oscillations in a Model of Parkinson's Disease
Logan Grado

Models and Stimulation Paradigms
Room: Harbor Gallery

(48) Computational Evidence of Saphenous Nerve Recruitment During Percutaneous Tibial Nerve Stimulation for Overactive Bladder
Christopher Elder

(49) Developing a Three-Dimensional Atlas of Intraspinal Microstimulation-Evoked Muscle Activity in a Swine Model
Jonathan Calvert

(50) Comparing Burst SCS Paradigms on Acute Spinal Neural Activity in a Rat Model of Painful Radiculopathy
Beth Winkelstein

(51) Spinal Neuronal Activity Varies for SCS Modes After Painful Radiculopathy
Beth Winkelstein

(52) Development and Validation of a Computational Model to Investigate Dorsal Root Ganglion Stimulation
Alexander Kent

(53) Optimization of Genetic Algorithms for Design of Temporal Patterns of Stimulation
Isaac Cassar

(54) Development of Coupled Finite Element Analysis and Cellular Models for Dorsal Root Ganglion Stimulation
Xiaoyi Min

(55) Effect of Lead Position on Neural Recruitment During Dorsal Root Ganglion Stimulation: Computational Modeling Analysis
Alexander Kent

(56) Optimization of Return Electrodes in Neurostimulating Arrays
Thomas Flores

(57) Application of Musculoskeletal Modeling and Static Optimization to Prosthetic Hand Control
Misagh Mansouri

(58) Spike Activity in Somatosensory Cortex Due to Ultrasound Stimulation
Mark Hamilton

(59) Characterization of Spontaneous Activity in Adult DRG Neurons Cultured on Micro-Electrode Array
Bryan Black

(60) The Role of Sensory Adaptation in Artificial Tactile Intensity
Emily Graczyk

Bioelectronic Medicine
Room: Harbor Gallery

(61) Composition of Tears Induced by Electrical Stimulation of the Anterior Ethmoid Nerve
Mark Brinton

(62) Phasic Activation of the External Urethral Sphincter Increases Voiding Efficiency in Rat and Cat
Warren Grill

(63) Evaluating Sexual Arousal in a Female Rat Model with Pudendal and Tibial Nerve Stimulation
Lauren Zimmerman (Diversity Travel Award winner)

(64) Computational Model of the Effects of Kilohertz Frequency Waveform on Small Myelinated Model Axons
Nicole Pelot

(65) Neuronix Enables Continuous, Simultaneous Neural Recording and Electrical Stimulation
Zhi Yang

(66) Spinal Cord Stimulation in Sheep Models of Chronic Neuropathic Pain and Spinal Cord Injury-Induced Spasticity
John Miller

(67) Vagus Nerve Stimulation Reduces Traumatic Hemorrhage Via Spleen and alpha7 nAChR Signaling in Platelets
Jason Fritz

(68) Multimodal Recording and Stimulating System for Bioelectronic Medicine
Chunyan Li

Peripheral Nerve Interfaces
Room: Harbor Gallery

(69) Closed-Loop Control of a Virtual Prosthetic Hand by a Human Subject After Prior Amputation
David Kluger

(70) Motor Decoding and Sensory Stimulation for Upper-Limb Prostheses Using Implanted Neural and Muscular Electrode Arrays
Suzanne Wendelken

Peripheral Nerve Interfaces
Room: Severn

(71) Harnessing Normal Tissue Response to Create a Stable Neural Interface
Amitabha Lahiri

(72) Peripheral Nerve Stimulator Implant for Postherpetic Trigeminal Neuralgia
Arpit Patel

(73) Predicted Effect of Electrode Position on the Amplitude of Recorded Neural Signals Using Cuff-Like Technologies
Ilan Black

(74) Microneurography as a Tool for Testing Limb Prosthetics
Changqing Kao

(75) EMG-Bridge for Motor Function Rebuilding of Paralyzed Limbs
Zhi-Gong Wang
(76) Suppression of Scarring in Peripheral Nerve Implants by Drug Elution  
James Fitzgerald

(77) Extracting Neuroprosthetic Control Signals from Regenerative Peripheral Nerve Interfaces in Human Subjects  
Philip Vu

(78) Performance Metrics in Animals of a Peripheral Nerve Electrode Array  
Sikanth Vasudevan

(79) Saphenous Nerve Stimulation: A Potential Therapeutic Option for Overactive Bladder Symptoms  
Zainab Moazzam

(80) Pathway Discrimination in Peripheral Recordings Using Spatiotemporal Templates: A Simulation Study  
Ryan Koh

(81) A Parylene Cuff Electrode for Peripheral Nerve Recording and Stimulation  
Ellis Meng

(82) Directionally Sensitive Peripheral Nerve Recording Using Bipolar Nerve Cuff Electrode  
Parisa Sabetian

(83) Detecting Intestinal Inflammation: A Step Toward Developing Closed-Loop Technology for the Treatment of Inflammatory Bowel Disease  
Sophie Payne

(84) Surface Electrical Stimulation to Evoke Realistic Sensations  
Katharine Polasek

(85) Multi- and Single-Joint Selectivity Optimization of 8-Contact Composite Flat-Interface Nerve Electrodes on Human Femoral Nerves  
Max Freeberg

(86) Selectivity of Afferent Microstimulation at the DRG Using Epineural and Penetrating Electrode Arrays  
Ameya Nanivadekar

(87) Investigating Ultrasound Suppression and Activation Effects on Sciatic Nerve In Vivo  
Hongsun Guo

(88) High-Frequency Neuromodulation with Intrascalar Nerve Interface for Brachial Plexus Injury  
Christopher Duncan

(89) In Vitro Electrical Activity Characterization of Dissociated Dorsal Root Ganglia Neurons  
Kemal Bayat

(90) Physical Configuration of a Peripheral Nerve Interface for Chronic Use  
Samuel Bredesen

(91) Chronic High Density Longitudinal Intra-Fascicular Electrode Arrays for Peripheral Nerves  
John Lachapelle

(92) Combining Tissue-Engineering and Neural Interface Technologies to Control Prosthetic Devices  
Vidhi Desai

(93) Motor-Evoked Responses via Epidural Spinal Cord Stimulation Evaluated at Inter- and Intrasegmental Resolution  
Peter Grahn (Diversity Travel Award winner)

Auditory Prosthesis
Room: Harbor Gallery

(1) Evaluation of Focused Multipolar Stimulation for Cochlear Implants in Acute and Long-Term Deafened Animals  
Rob Shepherd

(2) Using Multiplanar CT, OCT, and IVUS to Locate Rhesus Vestibular Nerve for Single Unit Recording  
Shiyao Dong

(3) Towards Clinical Translation of Penetrating Multisite Microelectrode Arrays for the Brainstem  
Martin Han

(4) A MEMS Parylene Tube Cochlear Implant Device for Use in a Rat Model of Tinnitus  
Eric Kim

(5) Safe Direct Current Stimulation Increases the Dynamic Range of Head Velocities Encoded by Vestibular Prosthesis  
Dilawer Singh

Brain Computer/Machine Interface
Room: Harbor Gallery

(6) Incorporating Initial Polarization for Accurate Modeling of Extracellular Neural Stimulation  
Boshuo Wang

(7) Enhancement of Cortico-Cortical Evoked Potentials by Beta-Oscillation Triggered Direct Electrical Stimulation in Humans  
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(8) Topographical Approaches for Improved Neural Electrode Biocompatibility  
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(9) Blueprint for Implantable Brain Computer Interfaces Made of Commercial Off-the-Shelf Components  
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(11) Removal of Targeted Pathways on Blood-Derived and Not Brain-Derived Immune Cells Improves Intracortical Recordings  
Hillary Bedell

(12) ECoG-Based Identification of Motor Imagery-Associated Cortex: Application for Motor Rehabilitation  
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(13) Robust Online Control of a Humanoid Robot Using Electrocorticography and CSPs in a Motor-Imagery BCI  
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(14) Encoding of Cursor and Hand Shaping Velocities by Primary Motor and Somatosensory Cortices  
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(15) Bimanual Coordination of Natural Movement with Electrocorticographic Brain-Computer Interface Control by Individual with Hemiparesis  
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(16) Platinum-Iridium Electroplated Deep Brain Stimulation Electrodes  
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(17) Closed-Loop ECoG Stimulation Induces Hebbian Plasticity in Sensorimotor Cortex of Awake Monkeys  
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(19) Chronic In Vivo Cortical Interface Health Monitoring Using an Automatic Electrode Test Instrument (MET16)
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(20) Deep Brain Targeting Strategy for Bare Parylene Neural Probe Array
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Room: Severn

(21) Laser Pyrolyzed Carbon-Based Electrodes for Neural Interfaces
Ana Oliveira

(22) Dual Purpose Carbon Fiber Electrode Array for the Detection of Electrophysiological and Dopaminergic Activity
Paras Patel

(23) Flexible Boron Doped Polycrystalline Diamond Electrodes for Detection of Neurochemical and Electrophysiological Signals
Wen Li

(24) Nanostructured Platinum—A Competitive Material for Neural Stimulation and Recording
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(25) Electrodeposited Platinum-Iridium Films with Tailorable Pt:Ir Ratios for Improved Mechanical Properties
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(26) Fully Integrated Amorphous Silicon Carbide Ultramicroelectrode Array for Neural Stimulation and Recording
Felix Deku (Diversity Travel Award winner)

(27) Viability of a Novel Micro-Electrocorticography Design for Intracranial Implantation in Macaca Mulatta Primary Somatosensory Cortex
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(28) Dorsal Root Ganglia Neural Recordings and Source Localization with a Novel Nonpenetrating Thin-Film Microelectrode Array
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(29) A Super Long MEMS Neural Probe for Recording Neural Spiking in Deep Brain Structures
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(31) Development of Nano Electrode Array for Functional Imaging of Neural Network Using Electrical Impedance Tomography
Min Kim

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(33) Conductive Nanoparticle Electrocorticography Grid for MR-Safe Imaging
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(34) Sterilization of Softening Shape Memory Polymers Used as Substrate for Neural Devices
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(35) Design and Testing of a 96-Channel Neural Interface Module for the Networked Neuroprosthesis System
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(36) Electrochemical Evaluation of Shape Memory Polymer Electrodes
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(37) Electrical Performance of Single Material Silicon Carbide (SiC) Microelectrodes
Christopher Frewin

(38) Recent Advances in Photolithographically Defined Neural Interfaces on Softening Substrates
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(39) Highly Stable and Low Impedance IrOx for Recording and Stimulation with Silicon Microelectrode Arrays
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(40) Modification of a Neural Electrode Implantation Instrument for Surgical Use
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(41) Demonstration of NCA/MCMB Chemistry and 3mAh Microcell for Implantable Medical Device Applications Involving Neurostimulation
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(43) Center of Pressure Feedback Control of Task-Dependent Postures with an Implanted Standing Neuroprostheses
Brooke Odle (Diversity Travel Award winner)

(44) Chronic Implantation of PDMS-Based Optical Waveguides for Powering Wireless Microelectrode Array
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(45) Quantification of Dorsal Column Fiber Responses in a Model of Kilohertz-Frequency Spinal Cord Stimulation
Leonel Medina (Diversity Travel Award winner)

Amiral Toossi

(47) An Adaptable Intraspinal Microstimulation Controller to Restore Walking After a Hemisection Spinal Cord Injury
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(48) Effective Cortical Activation with Implanted Micro-coils
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(49) Long-Term Stability of Stimulating Multicontact Nerve Cuff Electrodes on Human Peripheral Nerves
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(50) Decoding Bladder Activity with Dorsal Root Ganglia Neural Signals Using a Kalman Filter
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(51) Alteration of Efferent and Afferent Firing Patterns by Nerve Stimulation in Neural Regualatory Systems
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(52) Chronic Monitoring and Excitation of Lower Urinary Tract Function
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(56) Developing a Microfluidic Device for Safe DC Stimulation
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(57) Versatile Stimulation Circuitry for Neural Applications: Implementation in Vestibular and Cochlear Stimulation
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(58) Method for Restoring Coordinated Multi-Joint Movements After Paralysis by Direct Cortical Control of Muscle Stimulators
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(59) Comparison of Robotic Exoskeleton and Surface Stimulation for Treatment of Crouch Gait from Cerebral Palsy
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(60) DRG Stimulation Elicits Behavioral Response During Translational Postural Perturbation
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(61) Electrical Stimulation of the Cervical Dorsal Root Ganglia (DRG) for Sensory Restoration in Upper-Limb Amputee
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(62) A System for Inducing Artificial Hand Embodiment Using Concurrent Visual and Tactile Stimuli
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(63) Creating a Localized and Dynamic Facial Somatotopic Map of Area 3b Using Cutaneous Vibratory Stimulation
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(64) Five-Week Case Study on Home Use of a Sensory Restoration System for Upper Limb Amputees
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(65) MEA-Based Quantitative Measurement of Electrophysiological State of Quiescent Neuronal Networks
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(66) Dynamic Training of Multilayer SVM for Seizure Onset Detection
Daniel Ehrens

(67) Measurement of Norepinephrine via Fast Scan Cyclic Voltammetry in Whole Blood
Evan Nicolai

(68) Extracting Chronically Stable Features from Intracortical Recordings for Robust BCI Applications in Humans
Mingming Zhang

(69) Analyzing Coherence in Local Field Potentials with Manifold Learning
Amit Sinha

(70) Data-Driven Identification of Fine-Wire Intramuscular Electrode Locations
Carl Beringer

(71) A Multivariate Approach for Seizure Localization Using High Frequency Coupling
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Stephen Foldes

(73) recoveriX: BCI-Based Rehabilitation Therapy for Persons with Stroke
William Coon

(74) A Framework for Combining rTMS with Behavioral Therapy
Zoe Tsagaris

(75) Multisensory Neuromodulation: Activating Peripheral Nerves to Induce Brain Plasticity
Cory Gloeckner

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Room: Potomac

(76) Simultaneous Optical and Electrical In Vivo Analysis of the Enteric Nervous System
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(77) 3D Printed Microdrive for Chronic Neural Recording and Optogenetic Stimulation in the Rat Brain
Min Kim

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Room: Severn

(78) Low-Cost, Compact Current Source for Chronic Stimulation of Rat Retin
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(79) Interactions of Prosthetic and Natural Vision in Animals with Local Retinal Degeneration
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(80) Evaluating a High Resolution Retinal Resistivity Probe with Calibrated Multilayer Agarose Gel Phantoms
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(82) Frequency-Dependent Urodynamic Changes During Tibial Nerve Stimulation Using a Wirelessly Powered System in Anesthetized Cats
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Vishnoukumar Sivaji

(84) A Fully Wireless System for Long-Term Cortically Controlled Functional Electrical Stimulation
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(85) Evaluation of the Invisible Spinal Cord Stimulation Trial System
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(86) Evaluation of the Wireless Floating Microelectrode Array (WFMA) for Intracortical Stimulation
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(87) Wireless Arrays Reliably Evoke Stable, Graded and Selective Stimulation in Peripheral Nerves for Over 14 Months
Aswini Kanneganti

(88) Development of a Wireless Neuromodulation System for the Bladder
Thomas Richner
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Exhibitor by Booth

The Exhibit Hall will be in the Chesapeake Ballroom (C) and the Severn Room (S).

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Hotel Floor Plan

**Second Floor**

KEY
Room 1 - Severn Gallery
Room 2 - Severn Room
Room 2A - Severn Room I
Room 2B - Severn Room II
Room 2C - Severn Room III
Room 3 - Camden Gallery
Room 4 - Camden Room
Room 4A - Camden Room I
Room 4B - Camden Room II
Room 5 - Harborview Gallery
Room 6 - Harborview Ballroom
Room 6A - Harborview Ballroom I
Room 6B - Harborview Ballroom II
Room 7 - Board Room
Room 8 - Sassafras
Room 9 - Loch Raven Gallery
Room 10 - Loch Raven Room
Room 10A - Loch Raven Room I
Room 10B - Loch Raven Room II

**Third Floor**

KEY
Room 1 - Potomac Gallery
Room 2 - Potomac Room
Room 3 - Patapsco
Room 4 - Chesapeake Gallery
Room 5 - Chesapeake Ballroom
Room 5A - Chesapeake Ballroom I
Room 5B - Chesapeake Ballroom II
Room 5C - Chesapeake Ballroom III
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All patients do not respond the same way to spinal cord stimulation (SCS) and experiences may vary. Patients should consult a physician to understand the potential benefits and risks of treatment with SCS.

HF10 therapy statistics and competitive information are supported by this randomized clinical trial: Kapural L, Yu C, Doust MW, et al. Novel 10-kHz high-frequency therapy (HF10 therapy) is superior to traditional low-frequency spinal cord stimulation for the treatment of chronic back and leg pain: the SENZA-RCT randomized controlled trial. Anesthesiology. 2015;123:851-860.
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