American Society for Stereotactic and Functional Neurosurgery

2018 BIENNIAL MEETING
PRELIMINARY PROGRAM
DENVER, COLORADO

The Westin Denver Downtown • June 2-5, 2018

CNS
Jointly provided by the Congress of Neurological Surgeons and the American Society for Stereotactic and Functional Neurosurgery
The American Society for Stereotactic and Functional Neurosurgery is excited to invite you to the ASSFN 2018 Biennial Meeting, held June 2–5, 2018, in the mile-high city of Denver, Colorado. Functional Neurosurgery is rapidly evolving, and this evolution is not only being driven by neurosurgeons, but by engineers, neuroscientists, NIH, DARPA, and industry. To address this complex and growing field, our program this year includes leaders in the diverse arenas influencing the future of our specialty.

Join us as we welcome Honored Guest Dr. Philip A. Starr, the Dolores Cakebread Professor of Neurological Surgery, University of California San Francisco. Delivering the keynote address is Bryan Johnson, Founder and CEO of Kernel, OS Fund, and Braintree, who will speak on advanced neural interfaces, and the future of human and artificial intelligence.

Plan to arrive on Saturday, June 2, for three pre-meeting special courses that help you stay on top of the rapidly changing business of health care; with sessions on integrating clinical science and clinical practice, incorporating new technologies into your practice, and finances, reimbursement, and CPT codes. Sunday’s Opening Reception provides opportunities to connect with old and new friends alike while you enjoy delicious hors d’oeuvres and cocktails.

Daily plenary sessions explore thought-provoking topics with speakers working on the leading edge of technology. Discover the state of the BRAIN Initiative with a series of fascinating talks, and review the opportunities and challenges in the expanding reach of functional neurosurgery with the SPARC initiative. Explore the ethical implications of neuromodulation and neuroprosthetics, including the ethics of patenting regions of the brain, whether DBS and ECoG are safe and appropriate tools for exploring new therapies, and the ethics of neuro-augmentation.

Breakfast seminars start your day, and industry-sponsored lunches provide more opportunities for learning. Be sure to catch the best original science at the Poster Session with Wine and Cheese. Parallel Sessions allow you to tailor your meeting experience, with topics on network modulation and connectomics, pain, epilepsy, and radiosurgery. Be sure to visit our Exhibit Hall to see the latest and greatest in technology and connect with your corporate contacts.

The Westin Denver Downtown, set in the heart of the city, showcases exceptional views of the Rocky Mountains, and has a rooftop pool and fitness center. Enjoy Denver’s booming dining scene, and be sure to take some time to explore Larimer Square, the Downtown Aquarium, and the Denver Center for Performing Arts.

The ASSFN 2018 Biennial Meeting is an unparalleled opportunity to stay on the leading edge of functional and stereotactic neurosurgery, and collaborate with colleagues and acclaimed faculty from across the globe, all while enjoying the beauty of Denver!

Make your arrangements and register today at cns.org/assfn.

Target Audience
Neurosurgeons, Neurologists, Neuroscientists, Neuroradiologists, Psychiatrists, Nurses, and Biomedical Engineers.
MEETING DIRECTORS

Emad N. Eskandar, MD  
ASSFN President  
Massachusetts General Hospital  
Boston, MA

Aviva Abosch, MD, PhD  
Meeting Chairman  
University of Colorado  
Aurora, CO

Nader Pouratian, MD, PhD  
Scientific Program Chairman  
University of California, Los Angeles  
Los Angeles, CA

Clement Hamani, MD, PhD  
Scientific Program Committee  
Sunnybrook Health Sciences Centre  
University of Toronto  
Toronto, ON

R. Mark Richardson, MD, PhD  
Scientific Program Committee  
University of Pittsburgh Medical Center  
Pittsburgh, PA

Sameer A. Sheth, MD, PhD  
Scientific Program Committee  
Baylor College of Medicine  
Houston, TX

Jennifer A. Sweet, MD  
Scientific Program Committee  
University Hospitals Case Medical Center  
Cleveland, OH

Cristin Welle, PhD  
Scientific Program Committee  
University of Colorado, Denver  
Aurora, CO

Steven Ojemann, MD  
Local Arrangements Chairman  
University of Colorado School of Medicine  
Aurora, CO

HONORED GUEST: Philip A. Starr, MD, PhD  
Dolores Cakebread Professor of Neurological Surgery  
University of California, San Francisco; San Francisco, CA

Dr. Starr is the Dolores Cakebread Professor of Neurological Surgery at the University of California, San Francisco. He completed his neurosurgery residency at Brigham and Women’s Hospital, followed by a fellowship in movement disorders surgery at Emory University with Drs. Roy Bakay and Mahlon Delong. He was recruited to UCSF in 1998 by Dr. Mitchel Berger to launch a clinical and research program in deep brain stimulation. His NIH-funded research addresses the effects of disordered basal ganglia output on cortical function in patients with movement disorders, mechanisms of therapeutic deep brain stimulation, and the use of totally implantable neural interfaces for long term brain recording and feedback-controlled DBS. With UCSF colleagues he developed new surgical approaches to achieve accurate implantation of drugs and devices at deep brain targets using interventional MRI. Dr. Starr, along with UCSF neurologist Dr. Jill Ostrem, directs a multidisciplinary clinic for comprehensive care of patients with movement disorders. Dr. Starr directs a fellowship training program in functional neurosurgery and is a past president of the American Society for Stereotactic and Functional Neurosurgery.
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<tr>
<th>Date</th>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>SATURDAY, JUNE 2, 2018</td>
<td>7:00 am–6:00 pm</td>
<td>Registration</td>
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<tr>
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<td>8:00 am–12:00 pm</td>
<td><strong>SPECIAL COURSE 1</strong> Building a Functional Neurosurgery Research Lab</td>
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<td>1:00–5:00 pm</td>
<td><strong>SPECIAL COURSE 2</strong> Functional Neurosurgery: Optimizing Finances, Value, and Efficiency</td>
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<td>1:00–5:00 pm</td>
<td><strong>SPECIAL COURSE 3</strong> Integrating New Technologies into Your Functional Neurosurgery Practice</td>
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<td>SUNDAY, JUNE 3, 2018</td>
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<td>7:00–8:00 am</td>
<td><strong>BREAKFAST SEMINAR 1</strong> The Underutilization of Functional Neurosurgery</td>
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<td>8:00–9:20 am</td>
<td><strong>PLENARY SESSION 1</strong> World State of Affairs in Functional Neurosurgery</td>
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<td>Non-CME Sponsored Breakfast Session</td>
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<td><strong>PLENARY SESSION 2</strong> BRAIN Initiative</td>
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<td>3:20–5:00 pm</td>
<td><strong>PLENARY SESSION 3</strong> The Expanding Reach of Functional Neurosurgery</td>
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<td>MONDAY, JUNE 4, 2018</td>
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<td>7:30 am–3:30 pm</td>
<td>Exhibit Hall open</td>
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<td>8:00–9:40 am</td>
<td><strong>PLENARY SESSION 4</strong> Engaging Engineers: Getting Technology to Clinical Practice</td>
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<td>9:40–10:20 am</td>
<td>Morning Break with Exhibitors</td>
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<td>10:20 am–12:00 pm</td>
<td>PARALLEL SESSION 3 Pain</td>
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<td>PARALLEL SESSION 4 Epilepsy</td>
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<td>Afternoon Break with Exhibitors</td>
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<td>ASSFN Award Ceremony</td>
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<td><strong>PLENARY SESSION 8</strong> Engaging Industry: Getting Technology to Market</td>
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<td>TUESDAY, JUNE 5, 2018</td>
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<td><strong>PLENARY SESSION 5</strong> NeuroEthics</td>
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<td>PARALLEL SESSION 5 Technology in Functional Neurosurgery</td>
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<td>PARALLEL SESSION 6 Radiosurgery</td>
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SATURDAY, JUNE 2, 2018

8:00 am-12:00 pm
Residents/Fellows: $150
ASSFN Members/Non-member Physicians: $250

SPECIAL COURSE 1

Building a Functional Neurosurgery Research Lab

Course Directors: Jeffrey G. Ojemann, Mark Richardson

Speakers: Harith Akram, Nicholas M. Boulis, Edward F. Chang, Itzhak Fried, Robert E. Gross, Michael G. Kaplitt, Mark Richardson, Philip A. Starr, Kareem A. Zaghloul

Learning Objectives:
Upon completion of this course, participants will be able to:

- Identify key elements for successfully integrating clinical science into clinical practice
- Describe key methods and analytic strategies for imaging and neurophysiological data acquired in functional neurosurgery patients
- Discuss the opportunities provided by the BRAIN initiative to excel as a neurosurgeon-scientist

Introduction and Welcome
Jeffrey G. Ojemann

Successful Labs
- Cognitive Neuroscience
  Itzhak Fried
- Language Laboratory
  Edward F. Chang
- Stem Cell Laboratory
  Nicholas M. Boulis

Primer on Neurophysiological Recordings
Mark Richardson

Signal Acquisition and Processing
Kareem A. Zaghloul

Primer on Advanced Neuroimaging Analyses
Harith Akram

Primer on Gene Therapy
Michael G. Kaplitt

The Resources You Need
Group Discussion

The BRAIN Initiative and its Impact on Functional Neurosurgery Science
Philip A. Starr

1:00–5:00 pm
Residents/Fellows: $150
ASSFN Members/Non-member Physicians: $250

SPECIAL COURSE 2

Functional Neurosurgery: Optimizing Finances, Value and Efficiency

Course Director:
Joshua M. Rosenow

Speakers: Zachary Hochstetler, Peter Konrad, Darlene A. Lobel, Julie G. Pilitsis, Joshua M. Rosenow, Ann R. Stroink

Learning Objectives:
Upon completion of this course, participants will be able to:

- Discuss how physicians and hospitals are reimbursed for functional neurosurgery procedures
- Review the process of creating CPT codes and their RVU values
- Describe the integration of allied health providers in optimizing clinical care
- Identify the role of physician advocacy in neurosurgery

Introduction and Welcome
Joshua M. Rosenow

DBS Surgery: Building a Practice and Coding
Darlene A. Lobel

Surgery for Chronic Pain: Building a Practice and Coding
Julie G. Pilitsis

Epilepsy Surgery: Building a Practice and Coding
Joshua M. Rosenow

CPT and RUC Process—View from the AMA
Zachary Hochstetler

Washington Committee Update
Peter Konrad

Physician Advocacy
Ann R. Stroink

Roundtable Discussion

1:00–5:00 pm
Residents/Fellows: $150
ASSFN Members/Non-member Physicians: $250

SPECIAL COURSE 3

Integrating New Technologies into your Functional Neurosurgery Practice

Course Director: Paul S. Larson

Speakers: Stephan Chabardes, Voelker A. Coenen, W. Jeffrey Elias, Kelly D. Foote, Mojgan Hodaie, Paul S. Larson, Mark Richardson, Gary K. Steinberg, Jennifer A. Sweet, Jon T. Willie, Daniel Yoshor

Learning Objectives:
Upon completion of this course, participants will be able to:

- Describe key new technologies introduced into clinical functional neurosurgery practice
- Identify the role, limitation, and integration of new technologies into practice
• Review emerging therapies that may impact clinical practice in the near term

Introduction
Paul S. Larson

New Pain Technologies: DRG, High Frequency, and Burst Stimulation
Jennifer A. Sweet

Robots in Functional Neurosurgery
Stephan Chabardes

sEEG: Interpreting the Network Signal
Daniel Yoshor

Directional Leads
Voelker A. Coenen

Integrating Tractography into Clinical Practice
Mojgan Hodaie

Stereotactic Laser Ablation
Jon T. Willie

Focused Ultrasound
W. Jeffrey Elias

Emerging Technologies: Gene Therapies
Mark Richardson

Emerging Therapies: Stem Cell Trials
Nicholas M. Boulis

Primer on Closed Loop DBS
Kelly D. Foote

Speakers: Edward F. Chang, Donald M. Whiting, Ashwin Viswanathan

Learning Objectives:
Upon completion of this session, participants will be able to:

• Describe the prevalence of medically-refractory epilepsy, rates of epilepsy surgery, and factors that affect underutilization of epilepsy surgery

• Review the prevalence of movement disorders, rates of movement disorder surgeries, and factors that affect underutilization of these surgeries

• Identify factors that affect underutilization of pain surgery in light of recent societal focus on the opioid epidemic

Epilepsy
Edward F. Chang

Movement Disorders DBS
Donald M. Whiting

Surgery for Pain
Ashwin Viswanathan

8:00–8:05 am
Meeting Introduction
Aviva Abosch

8:10–8:55 am
World Society Updates
WSSFN: Michael Schulder
AASSFN: Terry J. Coyne.
Other Societies, to be announced.

8:55–9:00 am

Introduction of ASSFN President
Aviva Abosch

9:00–9:20 am
Presidential Address
Emad N. Eskandar

9:20–10:00 am
Morning Break

10:00 am–12:00 pm
Plenary Session 2

BRAIN Initiative
Moderators: Edward F. Chang, Nitin Tandon
Speakers: James W. Gnadt, David McMullen

Learning Objectives:
Upon completion of this session, participants will be able to:

• Describe the goals of the BRAIN Initiative as it pertains to advancing mental health

• Review how the BRAIN Initiative is utilizing neurosurgery to advance our basic science understanding of human brain function

• Describe the vision of DARPA for advancing military health through the BRAIN Initiative

8:00–9:20 am
Plenary Session 1

World State of Affairs in Functional Neurosurgery

Moderator: Aviva Abosch

Speakers: Aviva Abosch, Terry J. Coyne, Emad N. Eskandar, Michael Schulder

Learning Objectives:
Upon completion of this session, participants will be able to:

• Describe the activities of major world societies that focus on functional and stereotactic neurosurgery

• Review differences in priority areas for stereotactic and functional neurosurgery internationally

• Identify current shortcomings and future needs for functional and stereotactic neurosurgery around the world

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• Describe the vision of DARPA for advancing military health through the BRAIN Initiative
The Goals of the BRAIN Initiative for Mental Health
David McMullen

10:20–10:40 am
BRAIN Initiative and Basic Science of Human Brain Function
James W. Gnadt

10:40–11:00 am
DARPA and BRAIN: The Impact and Future

11:00 am–12:00 pm
BRAIN Investigator Updates: The Scientific Impact of Neurosurgery

2:30–2:40 pm
Questions and Discussion

2:40–3:20 pm
Afternoon Break

3:20–5:00 pm
Plenary Session 4

Engaging Engineers: Getting Technology to Clinical Practice

Moderators: Jonathan Miller, Ali R. Rezai
Speakers: John Chae, J. Luis Lujan, Michael M. Maharbiz, Dejan Markovic, John Viventi

Learning Objectives:
Upon completion of this session, participants will be able to:
• Describe emerging sensing technologies for neuromodulation
• Review distinct modalities for neuromodulation, including electrical and non-electrical stimulation
• Identify key challenges and advances in microchip design towards miniaturization of neuromodulatory devices

3:20–3:50 pm
Emerging Sensing Technologies

3:20–3:35 pm
Chemical Sensing: Current Status and Barriers
J. Luis Lujan

3:35–3:50 pm
Ultra-Thin and Flexible Electrodes
John Viventi

3:50–4:05 pm
Emerging Microchip Design
Dejan Markovic

12:00–1:00pm
Sponsored Lunch Session

Non-CME Sponsored Lunch Session

1:00–2:40 pm
Plenary Session 3

The Expanding Reach of Functional Neurosurgery

Moderators: Aviva Abosch, Emad N. Eskandar
Speakers: Robert Greenberg, Kalyanam Shivkumar, Cristin Welle

Learning Objectives:
Upon completion of this session, participants will be able to:
• Discuss the role of peripheral neuromodulation in shaping brain activity
• Review the role of neurophysiology and neurostimulation in modulating cardiac health
• Describe the opportunities and challenges of using high density arrays to restore vision for the blind

2:00–2:30 pm
Keynote Speaker
Bryan Johnson
Bryan Johnson is the founder of Kernel, OS Fund and Braintree.
In 2016, Johnson invested $100M into his new company Kernel to build advanced neural interfaces to treat disease and dysfunction, illuminate the mechanisms of intelligence, and extend cognition. Kernel is on a mission to dramatically increase our quality of life as healthy lifespans extend. He believes that the future of humanity will be defined by the combination of human and artificial intelligence (HI +AI).

2:00–2:10 pm
Peripheral Stimulation can do more than Treat Pain
Cristin Welle

1:20–1:40 pm
SPARC: Neurocardiology: All Surgery will be Neurosurgery in the Future
Kalyanam Shivkumar

1:40–2:00 pm
Visual Cortex Stimulation and High Density Brain Stimulation
Robert Greenberg
4:05–4:20 pm
Functional Electrical Stimulation
John Chae

4:20–4:35 pm
Nonelectrical Stimulation
Michel M. Maharbiz

4:35–5:00 pm
Open Discussion

6:00–8:00 pm
Opening Reception

MONDAY, JUNE 4, 2018

7:00–8:00 am
Sponsored Breakfast Session

8:00–9:40 am
Plenary Session 5
NeuroEthics

9:12–9:40 am
Open Papers

9:40–10:20 am
Morning Break with Exhibitors

10:20 am–12:00 pm
Plenary Session 6
Costs, Cost Effectiveness and Outcomes in Functional Neurosurgery

Moderators: Ahmed M.T. Raslan, Joshua M. Rosenow
Speakers: Casey H. Halpern, Peter Konrad, Ashwini D. Sharan
Learning Objectives: Upon completion of this session, participants will be able to:
• Discuss whether early deep brain stimulation for movement disorders may reduce overall health care expenditures for movement disorders
• Review the cost effectiveness of DBS for movement disorders
• Identify key opportunities and obstacles for using big data emerging from functional neurosurgery to impact clinical care

Speakers: Tipu Z. Aziz, Judy Illes, Andres M. Lozano, Nitin Tandon

Learning Objectives: Upon completion of this session, participants will be able to:
• Identify key factors that influence our understanding of the neuroethics of “brain patenting”
• Review whether DBS and invasive intracranial recordings are safe enough to be used as an exploratory therapeutic tool
• Discuss considerations related to cosmetic neurosurgery to enhance “normal”

8:00–8:18 am
Neuroethics of Brain Patenting
Judy Illes

8:18–8:36 am
Is DBS Really Safe?
Tipu Z. Aziz

8:36–8:54 am
How Far are we from Cosmetic Neurosurgery?
Andres M. Lozano

8:54–9:12 am
The Slippery Slope of Intracranial Recordings and Stimulation for Research
Nitin Tandon

Moderators: Clement Hamani, Zelma HT Kiss
10:20-10:40 am  
Can Early DBS save the Health Care System Money  
Peter Konrad

10:40-11:00 am  
The Cost Effectiveness of DBS for Movement Disorders  
Casey H. Halpern

11:00-11:20 am  
The Potential for Big Data to Impact Functional Neurosurgery  
Ashwini D. Sharan

11:20 am–12:00 pm  
Open Papers

12:00-1:00 pm  
Lunch and Honored Guest Talk  
Philip A. Starr

1:00-2:40 pm  
Parallel Session 1  
Psychiatric Neurosurgery

Moderators: Emad N. Eskandar, Sameer A. Sheth  
Speakers: Andrew Drysdale, Wayne Goodman, Suzanne N. Haber

Learning Objectives:  
Upon completion of this session, participants will be able to:  
• Identify the array of brain regions that have been targeted for psychiatric neuromodulation and how these relate anatomically  
• Discuss the role of advanced imaging in identifying disease subtypes and how this could be used to stratify patients for therapy or clinical trials

1:00-2:40 pm  
Parallel Session 2

Movement Disorders

Moderators: Ron L. Alterman, Alon Y. Mogilner  
Speakers: Ron L. Alterman, Warren Grill, Philip A. Starr, Ludovic Zrinzo

Learning Objectives:  
Upon completion of this course, participants will be able to:  
• Describe the advantages of limitations of awake versus asleep deep brain stimulation implantation surgery  
• Review what has been gleaned from invasive human studies about the pathophysiology of movement disorders  
• Discuss mechanisms underlying the therapeutic benefits of deep brain stimulation

1:00-1:15 pm  
The Patient Must be Awake for DBS Implantation  
Ron L. Alterman

1:15-1:30 pm  
Asleep DBS Implantation is the New Standard  
Ludovic Zrinzo

1:30-1:45 pm  
The Neurosurgical Science of Movement Disorders  
Philip A. Starr

1:40–2:00 pm  
Therapeutic Mechanisms of Deep Brain Stimulation  
Warren Grill

2:00–2:40 pm  
Open Papers

2:40–3:20 pm  
Afternoon Break with Exhibitors

3:20–5:00 pm  
Poster Session with Wine & Cheese

Moderator: Zelma HT Kiss

Learning Objective:  
Upon completion of this session, participants will be able to:  
• Provide examples of recent research in functional neurosurgery that expands our understanding, therapy, or technology of neurological diseases treated by functional neurosurgery

5:10–6:00 pm  
ASSFN Business Meeting  
Presiding Officer: Emad N. Eskandar
TUESDAY, JUNE 5, 2018

7:00–8:00 am
Sponsored Breakfast Session

Non-CME Sponsored Breakfast Session

8:00–9:40 am
Plenary Session 7
Network Modulation and Connectomics for Neurosurgery

Moderator: Nader Pouratian
Speakers: Suzanne N. Haber, Cameron McIntyre, Sameer A. Sheth

Learning Objectives: Upon completion of this session, participants will be able to:
• Describe key imaging and neurophysiological approaches to measuring and detecting structural and functional connectivity
• Identify approaches for visualizing structural brain networks, with a focus on its relevance to neuromodulation
• Review the network basis of neuropsychiatric disease and functional neurosurgical therapies

8:00–8:18 am
Primer on Detecting and Quantifying Brain Networks
Nader Pouratian

8:18–8:36 am
Visualizing Brain Networks
Cameron McIntyre

8:36–8:54 am
The Network Basis of Disease
Suzanne N. Haber

8:54–9:12 am
The Network Basis of Therapy
Sameer A. Sheth

9:12–9:40 am
Open Papers

9:40–10:20 am
Morning Break with Exhibitors

10:20 am–12:00 pm
Parallel Session 3
Pain

Moderators: Julie G. Pilitsis, Jennifer A. Sweet
Speakers: Tipu Z. Aziz, Jennifer A. Sweet, Ashwin Viswanathan

Learning Objectives: Upon completion of this session, participants will be able to:
• Describe and contrast network versus focal approaches to evaluating and treating patients with medically refractory epilepsy
• Identify the opportunities and limitations of more targeted therapies, such as laser ablation and deep brain stimulation, in the management of medically refractory epilepsy
• Review what has been learned from sEEG and chronic sensing devices about human cognition

10:20–10:35 am
Epilepsy Surgery is Network Surgery
Patrick Chauvel

10:35–10:50 am
Who Cares About Networks? All Epilepsy is Focal
Jonathan Miller

10:50–11:05 am
Less is More: Epilepsy Surgery in the Era of Ablation and Neuromodulation
Guy M. McKhann

11:00–11:20 am
Deep Brain Stimulation for Pain: VC/VS and ACC
Tipu Z. Aziz

11:20–12:00 pm
Open Papers

10:20 am–12:00 pm
Parallel Session 4
Epilepsy

Moderator: Nitin Tandon
Speakers: Patrick Chauvel, Itzhak Fried, Guy M. McKhann, Jonathan Miller

Learning Objectives: Upon completion of this session, participants will be able to:
• Describe and contrast network versus focal approaches to evaluating and treating patients with medically refractory epilepsy
• Identify the opportunities and limitations of more targeted therapies, such as laser ablation and deep brain stimulation, in the management of medically refractory epilepsy
• Review what has been learned from sEEG and chronic sensing devices about human cognition
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<th>Time</th>
<th>Session</th>
<th>Speaker/Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:05–11:20 am</td>
<td>Probing Neural Function and Circuits with sEEG and Neuropace</td>
<td>Itzhak Fried</td>
</tr>
<tr>
<td>11:20 am–12:00 pm</td>
<td>Open Papers</td>
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<tr>
<td>12:00–1:00 pm</td>
<td><strong>Sponsored Lunch Session</strong></td>
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<td></td>
<td>Non-CME Sponsored Lunch Session</td>
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<tr>
<td>1:00–2:50 pm</td>
<td><strong>Parallel Session 5:</strong> Technology in Functional Neurosurgery</td>
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<tr>
<td></td>
<td><strong>Moderators:</strong> Jonathan Miller, Mark Richardson</td>
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<tr>
<td></td>
<td><strong>Speakers:</strong> Voelker A. Coenen, Kelly D. Foote, Nitin Tandon</td>
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<tr>
<td></td>
<td><strong>Learning Objectives:</strong> Upon completion of this session, participants will be able to:</td>
<td></td>
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<tr>
<td></td>
<td>• Delineate the potential advantages of directional leads for deep brain stimulation and the data supporting this innovation</td>
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<tr>
<td></td>
<td>• Discuss the growth of responsive neurostimulation in epilepsy and emerging uses of these closed loop systems</td>
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<tr>
<td></td>
<td>• Review results that have emerged from chronically implanted sensing devices and how this may impact the future of neuromodulation and functional neurosurgery</td>
<td></td>
</tr>
<tr>
<td>1:00–1:20 pm</td>
<td>Directional Leads: A Real or Theoretical Advantage?</td>
<td>Voelker A. Coenen</td>
</tr>
<tr>
<td>1:20–1:40 pm</td>
<td>Neuropace: Indications and Opportunities</td>
<td>Nitin Tandon</td>
</tr>
<tr>
<td>1:40–2:00 pm</td>
<td>What We’ve Learned from Chronic Sensing</td>
<td>Kelly D. Foote</td>
</tr>
<tr>
<td>2:00–2:50 pm</td>
<td>Open Papers</td>
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<tr>
<td>2:00–2:50 pm</td>
<td><strong>Parallel Session 6:</strong> Radiosurgery</td>
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<td></td>
<td><strong>Moderator:</strong> Michael Schulder</td>
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<tr>
<td></td>
<td><strong>Speakers:</strong> Antonio DeSalles, Alessandra A. Gorgulho, Michael Schulder</td>
<td></td>
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<tr>
<td></td>
<td><strong>Learning Objectives:</strong> Upon completion of this session, participants will be able to:</td>
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<tr>
<td></td>
<td>• Describe the impact that frameless radiosurgical approaches and hypofractionation have had on clinical practice</td>
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<tr>
<td></td>
<td>• Identify how the exponential growth in immunotherapies has impacted the use and outcomes of cranial radiosurgery</td>
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<tr>
<td></td>
<td>• Review the distinct approaches to treating large intracranial arteriovenous malformations and the outcomes for each</td>
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<tr>
<td>1:00–1:20 pm</td>
<td>The Impact of Fractionated Stereotactic Radiosurgery</td>
<td>Antonio DeSalles</td>
</tr>
<tr>
<td>1:20–1:40 pm</td>
<td>The Impact of Immunotherapies on Complications of Radiosurgery</td>
<td>Michael Schulder</td>
</tr>
<tr>
<td>1:40–2:00 pm</td>
<td>Dose Staging versus Volume Staging for Large AVMS</td>
<td>Allessandra A. Gorgulho</td>
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<tr>
<td>2:00–2:50 pm</td>
<td>Open Papers</td>
<td></td>
</tr>
<tr>
<td>2:50–3:30 pm</td>
<td><strong>Afternoon Break with Exhibitors</strong></td>
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<tr>
<td>3:30–3:40 pm</td>
<td>ASSFN Award Ceremony</td>
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<tr>
<td>3:40–5:00 pm</td>
<td><strong>Plenary Session 8:</strong> Engaging Industry: Getting Technology to Market</td>
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<tr>
<td></td>
<td><strong>Moderators:</strong> Nicholas M. Boulis, Andre Machado</td>
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<tr>
<td></td>
<td><strong>Speakers:</strong> Ashok Gowda, Bertin Nahum</td>
<td></td>
</tr>
<tr>
<td>3:40–3:55 pm</td>
<td>What Clinicians Need from Industry</td>
<td>Andre Machado</td>
</tr>
<tr>
<td>3:55–4:40 pm</td>
<td>Examples of Successful Collaboration</td>
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<tr>
<td>3:55–4:10 pm</td>
<td>Visualase</td>
<td>Ashok Gowda</td>
</tr>
<tr>
<td>4:10–4:25 pm</td>
<td>Medtech/ROSA</td>
<td>Bertin Nahum</td>
</tr>
<tr>
<td>4:25–4:40 pm</td>
<td>Stimwave</td>
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<tr>
<td>4:40–5:00 pm</td>
<td>Open Discussion</td>
<td></td>
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<tr>
<td>5:00 pm</td>
<td><strong>Meeting Adjourns</strong></td>
<td></td>
</tr>
</tbody>
</table>

All speakers and topics are subject to change.
Meeting Location
The Westin Denver Downtown
1672 Lawrence Street, Denver, CO 80202
Telephone: 303-572-9100

Hotel Reservations
To book a reservation at The Westin Denver Downtown at the group rate of $239, please use this web address: http://bit.ly/2yzlYCo. Or, you can click on the link on the ASSFN website (assfn.org) or call 888-627-8435 and reference "ASSFN 2018 Biennial Meeting."

The deadline for making reservations at the ASSFN group rate is Thursday, May 10, 2018. Any reservations requested after this date will be based on availability.

Complimentary internet will be provided in all ASSFN attendee guestrooms.

Deposit
Reservations must be guaranteed by a major credit card equal to one night’s room and tax.

Changes and Cancellations
For changes to your hotel reservation, please contact The Westin Denver Downtown at 888-627-8435.

If you cancel by 6:00 pm, US Mountain Time, 48 hours prior to check in date, there will be no forfeiture amount.

If you cancel after 6:00 pm, US Mountain Time, the forfeiture amount will be the cost of one night’s stay plus tax.

Meeting Registration
Register today using one of these four methods:

Online: www.wyndhamjade.com/cns/assfn18
Fax: 972-349-7437
Phone: 800-931-9543 or 972-349-5539
Mail: ASSFN Registration and Housing Center
6100 W. Plano Parkway, Suite 3500
Plano, TX 75093

The ASSFN Registration Center is not responsible for faxes or emails not received due to circumstances beyond their control.

What’s Included in the Registration Fee?
Medical registration includes the following:

• Daily Continental Breakfasts
• Daily Beverage Breaks
• Daily Plenary and Parallel Sessions
• Entrance to the Exhibit Hall
• One ticket to Sunday Opening Reception
• Admittance to the Poster Session with Wine & Cheese on Monday

Registration Cancellation/Refund Policy
All refund requests must be received in writing by May 10, 2018.

Requests accepted via:
Email: ASSFN@wyndhamjade.com
Fax: 972-349-7437
Mail: ASSFN Registration Center
6100 W. Plano Parkway, Suite 3500
Plano, TX 75093

Cancellations made before May 10, 2018
Receive a full refund less $100 processing fee. Pre-meeting course registration fees will be refunded in full until this date.

Cancellations made after May 10, 2018, and no-shows
Absolutely no refunds will be issued after this date for registration and pre-meeting courses regardless of cause.

Americans with Disabilities Act/Special Needs and Requests
The ASSFN wishes to take the necessary steps to ensure that no individual with a disability is excluded, denied services, segregated or otherwise treated differently than any other individual because of the absence of auxiliary aids and services. Please let us know if, under the ADA, you require special accommodations or services in order to attend the ASSFN Biennial Meeting.

Your requirements should be sent directly to the ASSFN Registration Center at: ASSFN@wyndhamjade.com, or call 888-739-9842. Please provide any requests at least 30 days prior to the Biennial Meeting to guarantee accommodation.

Accreditation
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 and the American Society for Stereotactic and Functional Neurosurgery. The Congress of Neurological Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA Credit Designation Statement
The CNS designates this live activity for a maximum of 33.5 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

CME Credit
A maximum of 29.5 AMA PRA Category 1 Credits™ may be earned for Scientific Sessions only.

Additional CME credits can be earned by attending the optional Saturday half-day courses (four (4) credits).

Physician Assistant/Physician Extender: Attendees will receive credits for attendance at the Plenary/Parallel Sessions and for any optional events attended. Each physician assistant/physician extender should contact his or her individual membership association and certification board to determine the requirements for accepting credits. All attendees will receive a Certificate of Attendance.

Posters
Physicians may claim AMA PRA Category 1 Credits™ directly from the AMA for preparing a poster presentation, which also includes the published abstracts. Physicians may claim credits on their AMA PRA certificate application, or apply directly to the AMA for an AMA PRA Category 1 Credit™ certificate.

Physicians may claim AMA PRA Category 2 Credits™ for viewing scientific posters. Physicians should self-claim credit on their AMA PRA certificate application form.
ADVANCE DEADLINE: Thursday, May 10, 2018: All meeting confirmations will be sent via email.

FOUR WAYS TO ADVANCE REGISTER:
1. Online: (Credit card only)
   www.wynjade.com/cns/assfn18
2. Phone: 888-739-9842 or 972-349-7556
3. Fax: 972-349-7437
4. Mail: ASSFN Registration Center, 6100 W. Plano Parkway, Suite 3500, Plano, TX 75093

REGISTRATION INFORMATION
Please print or type legibly using one form per person. The name and address below will be used for the CME Certificate.

<table>
<thead>
<tr>
<th>LAST NAME</th>
<th>FIRST NAME</th>
<th>CREDENTIALS</th>
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<tbody>
<tr>
<td>____________________________</td>
<td>____________________________</td>
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<thead>
<tr>
<th>INSITUTION/HOSPITAL/OFFICE/COMPANY</th>
<th>NATIONAL PROVIDER IDENTIFIER (NPI) NUMBER</th>
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<tbody>
<tr>
<td>____________________________</td>
<td>____________________________</td>
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<thead>
<tr>
<th>ADDRESS</th>
<th>CITY</th>
<th>STATE/PROVINCE</th>
<th>COUNTRY</th>
<th>ZIP/POSTAL CODE</th>
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<tbody>
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</tbody>
</table>

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<tr>
<th>TELEPHONE (International, include country code)</th>
<th>FAX</th>
<th>EMAIL</th>
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<tbody>
<tr>
<td>________________________________________________</td>
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Deposit: Reservations must be guaranteed by a major credit card equal to one night’s room and tax.

Changes and Cancellations: For changes to your hotel reservation, please contact The Westin Denver Downtown at 888-627-8435. If you cancel by 6:00 pm, US Mountain Time, 48 hours prior to check in-date, there will be no forfeiture amount. If you cancel after 6:00 pm, US Mountain Time, within the 48 hours of your check in-date, the forfeiture amount will be the cost of one night’s stay plus tax.

REGISTRATION CATEGORY

<table>
<thead>
<tr>
<th>REGISTRATION CATEGORY</th>
<th>RECEIVED ON OR BEFORE MAY 10, 2018</th>
<th>RECEIVED AFTER MAY 10, 2018</th>
</tr>
</thead>
</table>

**PHYSICIANS**

ASSFN Member Physician
(including foreign ESSFN/WSSFN members - subject to verification)

Nonmember Physician

Nonmember Physician: Join ASSFN* and register (includes $300 membership application fee)

**NON-PHYSICIANS: PhD / RN / NP / PA/ Students**

Graduate Students/Post-doctorates* (Must submit a letter confirming student status.)

ASSFN Associate member, Non-physician (PhD, RN/NP/PA)

Nonmember Associate, Non-physician (PhD, RN/NP/PA)

Nonmember Associate, Non-physician: Join ASSFN* and register (PhD, RN/NP/PA)
(includes $160 membership application fee)

**RESIDENTS/FELLOWS**

Resident/Fellow (with letter from Program Director)

SUBTOTAL FOR REGISTRATION SECTION $_________
## Breakfast Seminar - Sunday, June 3

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Underutilization of Functional Neurosurgery</td>
<td>7:00–8:00 am</td>
<td>$55</td>
</tr>
</tbody>
</table>

**Subtotal for Breakfast Seminar**  
$_______

## Pre-Meeting Special Courses - Saturday, June 2 - Seating Is Limited

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
<th>Fee</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building a Functional Neurosurgery Research Lab</td>
<td>8:00 am-12:00 pm</td>
<td>$150</td>
<td>Residents/Fellows</td>
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<td></td>
<td></td>
<td>$250</td>
<td>ASSFN Members</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250</td>
<td>Nonmember Physicians</td>
</tr>
<tr>
<td>Functional Neurosurgery: Optimizing Finances, Value, and Efficiency</td>
<td>1:00–5:00 pm</td>
<td>$150</td>
<td>Residents/Fellows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250</td>
<td>ASSFN Members</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250</td>
<td>Nonmember Physicians</td>
</tr>
<tr>
<td>Integrating New Technologies into Your Functional Neurosurgery Practice</td>
<td>1:00–5:00 pm</td>
<td>$150</td>
<td>Residents/Fellows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250</td>
<td>ASSFN Members</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$250</td>
<td>Nonmember Physicians</td>
</tr>
</tbody>
</table>

**Subtotal for Pre-Meeting Courses**  
$_______

## Payment

- **Registration Total**  
  $_______
- **Pre-Meeting Special Courses**  
  $_______
- **Breakfast Seminar**  
  $_______
- **Registration Grand Total**  
  $_______

**Credit Card Authorization:** Credit card will be charged immediately

- Visa
- MasterCard
- American Express

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<tr>
<th>Credit Card Number</th>
<th>Expiration Date</th>
<th>CVV Code</th>
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By signing this form, I authorize the ASSFN Registration Center to charge my credit card for the total payment due, acknowledge that the ASSFN registration cancellation policies are in effect and grant the ASSFN the right to use photos taken at the ASSFN Annual Meeting which include me in promotional materials for future meetings. These fees are subject to audit in case of error. The ASSFN Registration Center reserves the right to correct the error and charge the appropriate fees.

**Check:** Full amount must accompany your registration form. Please make check payable to the ASSFN Registration Center. Please send your check to: ASSFN Registration Center, 6100 W. Plano Parkway, Suite 3500, Plano, TX 75093. (Any checks received from an overseas bank will be returned. Any checks returned for insufficient funds are subject to additional charges.)

Registration Cancellation Policy: Full registrations refunds, less a $100 processing fee, will be granted if written requests for cancellation are received by May 10, 2018. No refunds of any kind will be given after this date. Refunds will not be given for no shows. Written requests may be emailed to ASSFN@wyndhamjade.com, faxed to 972-349-7437; or mailed to ASSFN Registration Center, 6100 W. Plano Parkway, Suite 3500, Plano, TX 75093.
INDUSTRY INTERACTION OPPORTUNITIES

EXHIBIT HALL HOURS
Monday, June 4, 2018: 7:30 - 6:00 pm
Tuesday, June 5, 2018: 7:30 - 3:30 pm

BEVERAGE BREAKS IN THE EXHIBIT HALL
Monday, June 4, 2018: 9:40 - 10:20 am
Monday, June 4, 2018: 2:40 - 3:20 pm
Tuesday, June 5, 2018: 9:40 - 10:20 am
Tuesday, June 5, 2018: 2:50 - 3:30 pm

INDUSTRY SPONSORED ACTIVITIES
Sponsored Breakfast Symposia
Monday, June 4, 2018: 7:00 - 8:00 am
Tuesday, June 5, 2018: 7:00 - 8:00 am

Sponsored Lunch Symposia
Sunday, June 3: 12:00 - 1:00 pm
Tuesday, June 5: 12:00 - 1:00 pm

2016 EXHIBITORS
Ad-Tech Medical
Alpha & Omega
Boston Scientific
Brainlab
Cosman
Medical
Elekta
FHC
Focused Ultrasound
Insightec
Integra
Liva Nova
Mazor Robotics
Medtech
Medtronic
Monteris Medical
MRI Interventions
Neurologica
Neuropace
Nevro
Nuvectra
PMT Corporation
Renishaw
Sceneray
St. Jude

DATES TO REMEMBER
Wednesday, January 10
Abstract Submission Deadline

Thursday, May 10
Advance Registration Closes

Friday, May 10
Group Hotel Rate Deadline & Registration Refund Deadline

Saturday, June 2
ASSFN 2018 Biennial Meeting Begins

Tuesday, June 5
Meeting Adjourns